# AUTOMATIC PENALTY SYSTEM AGAINST OF COVID-19 PROTOCOL

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## ABSTRACT

*Technology improvements have a significant impact on every aspect of life, including the medical industry. Artificial intelligence has shown potential benefits in health care by analyzing data and making decisions. In a short period, COVID-19 has impacted over 100 countries. The only way to avoid covid19 is to have a full immunization. However, completing 100 % vaccination takes 1-2 years. As a result, we must practice COVID-19 Protocol SMS-Social distancing, Masking, and Sanitising. However, in some circumstances, the majority of individuals do not adhere to these guidelines, particularly in congested areas such as marketplaces, schools, and gatherings. This leads to a progressive increase in covid instances. Our Proposed method help to monitor, control and action were taken against of Covid-19 Protocol by recognizing face masks, Social distance on individuals using TensorFlow and OpenCV. The proposed system uses the Aadhar-Card database, CNN Machine learning algorithm for image Classification and identity. Observed that proposed system shown that 99.8% of accuracy, significantly minimizes the cost of the system compared with existing traditional methods. Also, Conclude that it's a necessary tool for the current scenario.*
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*Keywords: Computer vision, Face Mask, TensorFlow, OpenCV, COVID-19, Image Processing, Deep Learning are some of the terms used in this paper.*

## Introduction

COVID-19 wreaked havoc on people's lives. The epidemic claimed the lives of millions of people and impacted the lives of billions more. Almost every business enterprise, as well as education, food, and nutrition security, spirituality, employment, travel industry, enjoyment, transportation, and other areas, felt the detrimental effects. Corona virus had infected 56.6 million people as of November 2020 and 1.34 million have died as a result of it, accordant to the WHO (World Health Organization). This is in comparison to the Its takings roughly fourteen days for the virus to increase in the body of its host and damage them after they become infected, and in the meanwhile, In the 14th century, the Black Death destroyed almost 60% of Europe's population. it spreads to practically everyone who comes into interaction with the individual. As a result, keeping track of COVID-19's spread is incredibly difficult.

COVID-19 is primarily transferred through droplets produced by infected people coughing or sneezing. This spreads the virus to anyone who comes into direct touch (within one meter) with a person who is infected with the coronavirus. As a result, The spread of the virus quickly between the general public. The

country-wide lockouts have made it even harder to track and activity the covid. Face masks are an excellent way to stop a virus from spreading. Face masks are 96 percent efficient in preventing viral spread. Governments all across the world have enacted tough regulations requiring everyone to wear masks when going out. However, Some persons might not always wear masks or whether everybody wears a mask or not is hard to determine. Image recognition is particularly useful in such instances.

There are no effective face mask detection applications that can tell whether or not someone is wearing a mask. To maintain safety, more efficient systems for identifying face masks on individuals are needed for transportation, highly populated places, Districts of residence, large-scale production, and other endeavour. This project includes the identification of machine learning with Opencv and Tensorflow to detect facet masks on people.

## Classification

This is used to forecast the class of the data points. Categorization is a type of ensemble study where data are provided for working with the aims. They are used in multiple situations,

including clinical diagnosis, image classification, and target commercialization. The function (f) of mapping converts discrete output variables into input parameters (X) (y).

## Open CV

OpenCV is a computer vision library, free and open source. This library includes movement tracking and facial identification routines and algorithms, object tracking, classification, and recognition, as well as several additional applications. You can edit images and video streams in real-time to meet your needs.

## TensorFlow

The framework for the creation and development of neural networks is a free learning machine. This includes a set of tools, libraries, and community resources that help develop and deploy machine apps. Google created this and maintains it in 2015.

## Work Accompanying to this

The authors of [1] employed the PEA (Principal Element Analysis) approach to recognize face hidden behind masks, which is critical in the protection industry. It is one such rare work that focus in detecting facial expressions that are hidden under masks. They discovered that when a Faceshield is used, the efficiency of person face recognition drops by 70%.

The authors of [2] have devised a way for determining how a person is using a mask. Proper mask-wear, wrong facemask-wear, and no facemask-wear were identified as three kinds. The detection accuracy of this approach was over 98 percent.

### Harish Adusumalli et al (2021) Suggested

In this research, we offer a method for detecting face masks on humans using TensorFlow and OpenCV. Even if or not the human being is wearing a mask is indicated by a bounding box drawn over the individual's face. If a human's face is kept in comprehensive database, it will designate the designate of the person who is not wearing a face mask & send a message through email to a particular person alerting them to the fact that they not wearing a face mask.

### Vivek Kumar Pandey et al (2021) Suggested

We're going to use OpenCV to detect faces from the live webcam feed in real-time. Utilizing Python, OpenCV, TensorFlow, and Keras, we will use the comprehensive dataset to create a COVID-19 face mask spotter using personal computer sight. After the product has been successfully deployed, we will be able to build software that can be implemented at numerous locations such as college entrance gates, railway stations, airports, temples, hotels, and shops.

### Ms. Khushi Nikumbh et al (2021) Suggested

The goal of the study is to figure out whether or not the user is wearing a mask. If the user is not wearing the mask, it notifies them, and the photographs are transmitted to the registered email address. The Pandemic Preventer (mask detection system) runs in the background and encourages mask use. The face mask detector system may be used with any existing camera and does not require any new cameras to be installed. The Face Mask Detection System can be used in the office to guarantee that employees are adhering to workplace safety requirements. It keeps an eye on personnel who aren't wearing masks and reminds them to do so. It can also be used in schools and colleges to ensure that students are protected.

### Parul Maurya et al (2021) Suggested

For recognizing face masks, a hybrid model combining deep and traditional machine learning will be shown. This face mask detector is built with Python, Keras, OpenCV, and TensorFlow and is based on a dataset. Everyone should inspect their face before entering the building and make sure they have a mask with them. A beep alert will be triggered if somebody is found without a face mask. As a result, all of the workplaces are reopening. The number of instances of COVID-19 being reported around the country is steadily rising. It can be brought to a close if everyone observes the safety precautions. As a result, we expect that this module will assist in detecting people wearing masks to work.

### Arjya Das et al(2020) Suggested

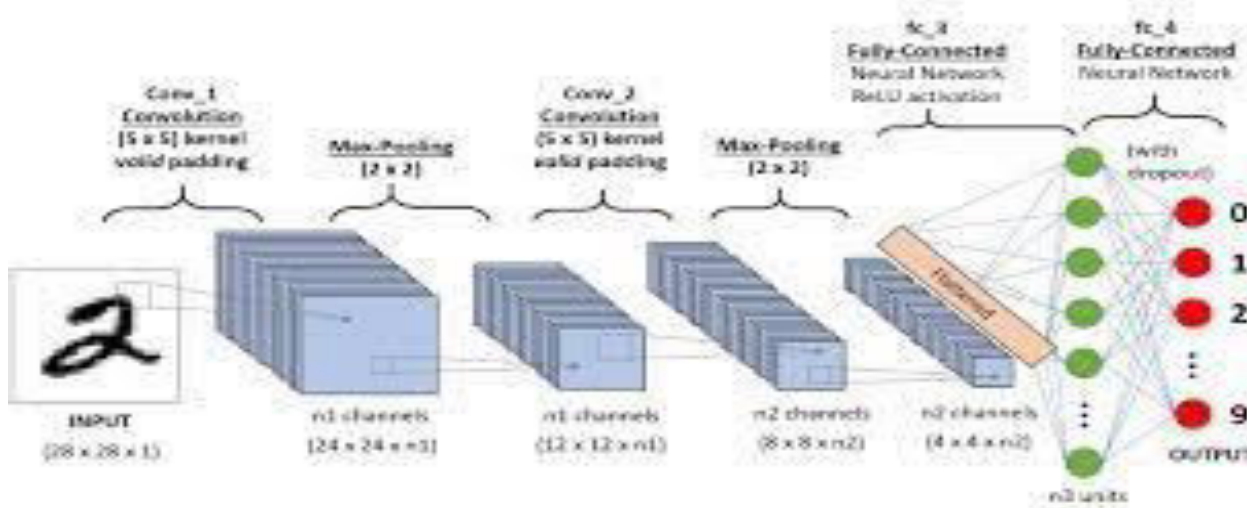The proposed approach detects the face successfully in the picture and decides if it is

masked or not. It can also detect an active face and mask as a monitoring task. The technology achieves a precision of up to 95.77 and 94.58 percent respectively on two separate data sets. Using the Sequential Convolutional Neural Network model, we investigate optimum parameter values to correctly detect the existence of masks without overfitting.

### Aakash Vishwakarma1 et al(2021) Suggested

We will try to detect faces throughout time with OpenCV from a live webcam broadcast. With OpenCV, Python, Keras,  and Tensor Flow, we will make a COVID-19 face mask detector with a computer view. Our goal is to…

### Methodological Approach

Collection of Datasets: After analysis, the information was extracted from the Kaggle Library and divided into training and testing.

To train a model to detect face masks: Faces were obtained using the normal OpenCV module, and then a Keras model was trained to recognize face masks.

Identifying a person who isn't wearing a mask: By referring to the database, The open CV model is designed to identify the names of the non-masked people.

Sending e-mail: Using smtplib, The system was constructed to send the non-mask person an email.

### CNN (Convolutional Neural Network)

CNN is a series of a pooling layers and convolutional and which allows extracting of the main feature from the images responding to the final object



Convolutionary Neural Networks are a class of profound neural networks used mostly in visual imaging in deep learning. This is an architecture specialising in the Artificial Neural Networks (ANN), which Yann LeCunn proposed in 1998. There are two parts to the Convolutionary Neural Networks. The first section comprises the Convolutionary layers and the Pooling layers for the main extraction of features. In the second part, the fully connected and the dense layers transform the extracted functions and act as the classification part in several nonlinear transformations.

Mathematical equation for convolutional layer:

$$y_{mn} = f\left(\sum_{j=0}^{j-1}\sum_{i=0}^{i-1} x_{m+i,n+j}\, w_{ij} + b\right)\ldots(1)$$

$$y_j^{(l)} = f\left(\sum_{i=1}^{n} x_i^{(l-1)} \times w_{ji}^{(l)} + b^{(l)}\right)\ldots(2)\; Y^i$$

$$= argmax\left(\frac{e^{y^i}}{\sum_{i=1}^{4} e^{y^i}}\right)\ldots(3)$$

$$f(x) = \begin{cases} x, & if\, x > 0 \\ 0.01, & otherwise \end{cases}\ldots(4)$$

$$z_i^{(l+1)} = w_i^{(l+1)} y^{(l)} + b_i^{(l+1)}\ldots(5)$$

$$y_i^{(l+1)} = f(z_i^{(l+1)}\ldots(6)$$

$$r_j^l \sim_{Bernouli(p)}\ldots\ldots(7)$$

$$y^{\sim(l)} = r^{(l)} \bullet y^{(l)} ....(8)$$

$$z_i^{(l+)} = w_i^{(l+1)} y^{\sim(l)} + b_i^{(l+1)} .....(9)$$

$$y_i^{(l+1)} = f(z_i^{(l+1)}) \ ...\ .(10)$$

any neuron assuming the k-th dimension, xˆ(k) use the following formula:

$$\hat{w}^{(k)} = \frac{x^{(k)} - E[x^{(k)}]}{\sqrt{var[x^{(k)}]}} ..........(11)$$

$$y^{(k)} = \gamma^{(k)} \hat{w}^{(k)} + \beta^{(k)} .....(12)$$

$$\mu = \frac{1}{N} \sum_{i=0}^{N} X_i' .......(13)$$

$$\sigma^2 = \frac{1}{N} \sum_{i=1}^{N} (X_i' - \mu)^2 .....(14)$$

$$X_i^{norm} = \frac{X_i' - \mu}{\sqrt{\sigma^2 + \varepsilon}} ......(15)$$

$$X_i = \gamma X_i^{norm} + \beta ....(16)$$

Global average Accuracy= $\frac{TP+TN}{TP+TN+FP+FN}$ ... . (17)

Precision= $\frac{TP}{TP+FP}$ ..... . (18)

Recall= $\frac{TP}{TP+FN}$ ..... . (19)

### Working

This project uses OpenCV, a coffee-based facial detector, Keras, TensorFlow, and MobileNetV2 to identify the facial mask on humans. The used dataset includes 3835 photos, 1916 photos with masked people, and 1919 photos with mask-free people.

The first step is to create a foundation model. Keras and MobileNetV2 are used in this process. On top of that, the ahead model is created. The head model is made up of a 128-layer network with a "Relu" activation function and a 0.5 dropout, followed by a 2-layer network with a "softmax" activation function. The combination of these three layers will produce model whimsy.

The created model will then be trained on the labeling data set, which is divided into two parts. For training, one section includes 75% graphics. For the prediction accuracy in the remaining part, the other 25% of photos are used. The model can be used to trace facemasks on the faces of people after training.

The classification method is loaded, and a picture As input is given with or without human face masks, or a continuous human video stream. If the input is a video stream, then the video image or frame for human face recognition has been transferred to the default face detector module.

A further prototype is how people's faces can be recognized. On the photos are marked the name and e-mail address of the person who donated the photos for the course of the model. This is done by using the Open CV. When the input picture is sent to the cv model, it identifies the person's face and directs the user to enter the person's name and address in the database. Input is used for the output of the first model. This person's identity corresponds to the person's identity.When your face matches, a bounding box with your name will be drawn over you and you will receive a mail and text telling him he doesn't wear a mask. Just the expression "mask" appears under the bordering box when the individual wears a mask; if the person wears not one, only the words "No Mask" are shown.
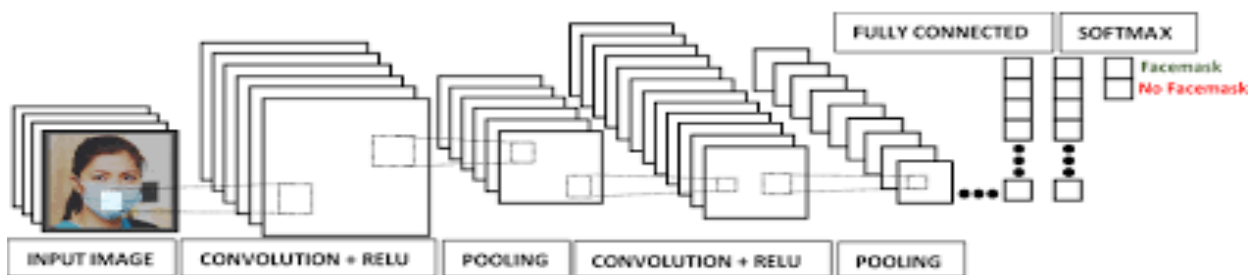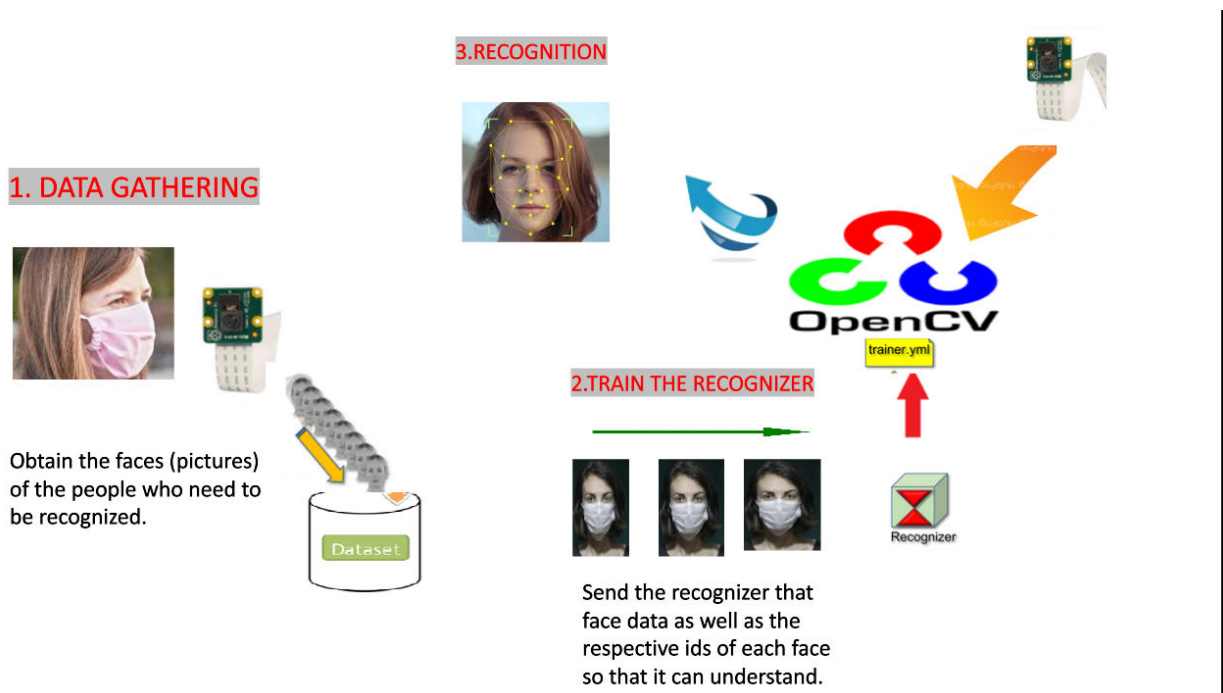


Fig.person is allowed

Fig. Person is not allowed because the person is not wearing mask

## Block Diagram



**Face Mask Detection system built with OpenCV, Keras/TensorFlow using Deep Learning and Computer Vision concepts**.

(a) no mask  (b) unprotected nose  (c) unprotected chin

(d) unprotected  (e) unprotected chin and mouth  (f) protected nose, mouth and chin

The system attempts to match faces in a database if a person recognizes a person who doesn't have a mask and the information is not in the database. Abounding box drawn across the face of the person shows if the person wears masks or not.

## Flow Chart

### MobileNetV2 Classifier training process using PyTorch



Apply MobileNetV2 Classifier on test data
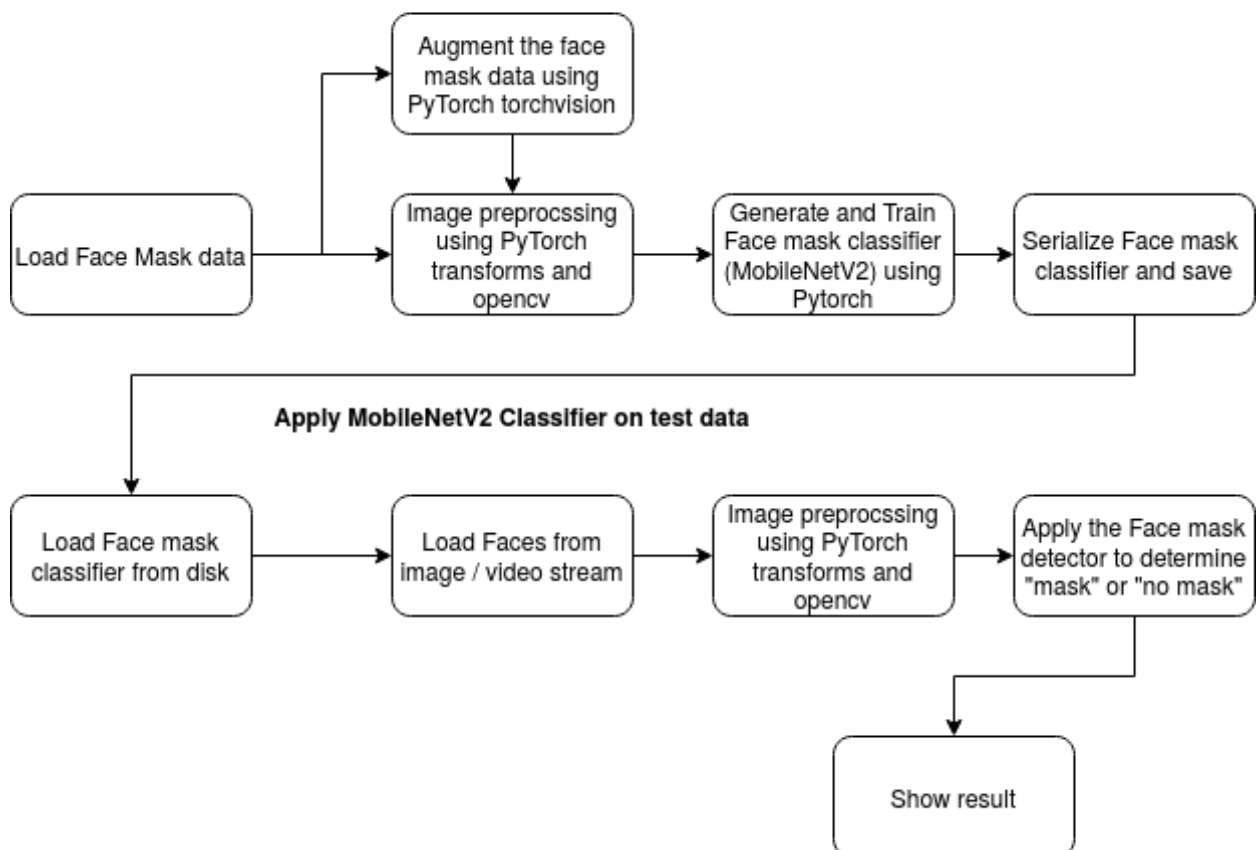
**An alert message is sent**
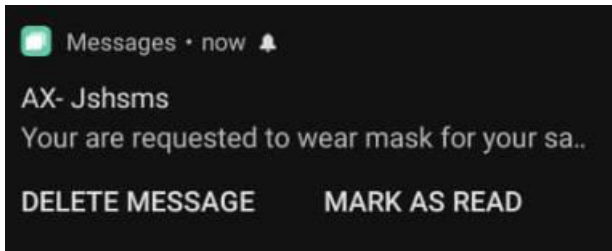


**Analysis**

Two datasets are used to train, validate and test the model. The method achieves precision of up to 95.77 per cent according to data set 1 (shown in fig. 7). Fig. 6 illustrates how optimised precision mitigates error costs. Dataset 2 is more versatile than dataset 1 because it also has multiple faces and masks of various colours. Consequently, the exactness of the model on data set 2 as shown in Figure 9 is 94.58 percent. Fig. 8 shows the contrast between training and loss of validation for dataset 2. MaxPooling is one of the main reasons for this accuracy.
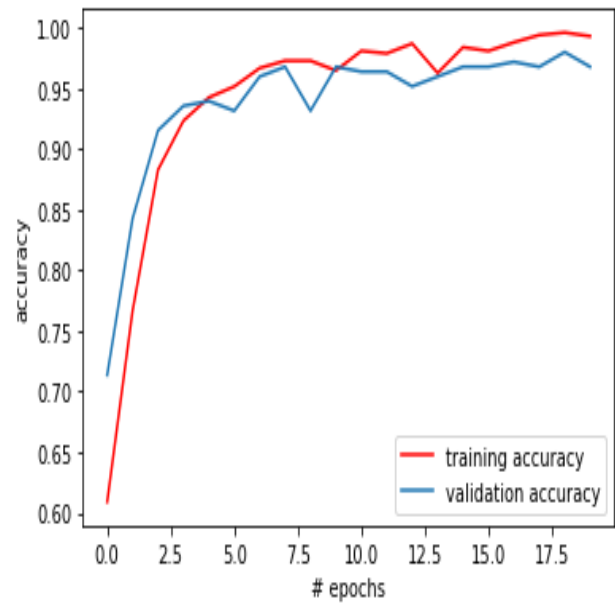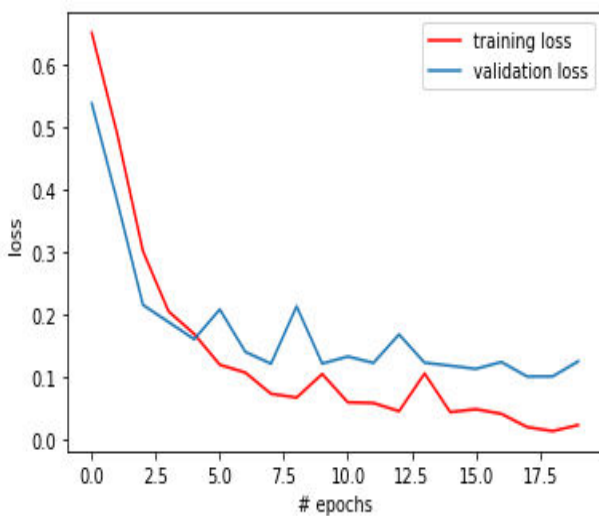




(a) Figure of Accuracy vs Epoch; and (b) Figure of Loss vs Epoch of ResNet50V2 Method

**Conclusion**

With the rising number of COVID instances around the world, a technology that can check masks on people's faces without the need of humans is desperately needed. This system fulfills the requirement. This technique can be used in public venues such as train stations and shopping malls. It will be extremely useful in enterprises and large enterprises with a large number of employees. This system is very useful here because it's easy to get and store the information of the people who work in this organization, and you will find people who don't wear a mask very easy and you will get a message to take action if you don't wear a mask.

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# A COMPARATIVE STUDY OF STRUCTURAL ANALYSIS ON ROTARY WEEDER BLADES USING ANSYS

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## ABSTRACT

*Rotary weederdriven by tractorptowere used to control weeds wide row crops. This Weeders has an advantage to invert weeds and mix trash with soil. Blades are critical parts of rotary weeder, removes weeds grown in the soil in between crop space. The analysis of selected blades of rotary weeder was done using ANSYS .The least maximum and minimum principal stress of 362.68 and 17.9MPa was observed during analysis for J type blades better than other two bladesand this stress value is less than the yield stress(758MPa) of material used for manufacturing of blades.The total deformationobserved was least with J- Blade (1.65mm) followed by L blade (3.05mm) and C- Blade(4.65mm). This results lead to J-blade is best suited for rotary weeder to control weeds in wide row crops.*

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*Keywords: Structural Analysis, Rotary Blade, ANSYS, Deformation, Allowable Stress.*

## Introduction

ANSYS is one of the finite element method used in design of machines/machine components to study the variation of stresses in material due to load . A static analysis determines the forces acting on the structure and its displacement ignoring the inertia and damping effect.ANSYS and Solid Edgehelps to find out stress concentration and analyze the principal stresses of machine components to redesign for manufacturing of prototype . ANSYS software was proved to be best software to choose the subsoiler shape for blades for maximum life.Rotary weeder has an advantage of better weed control and efficient inversion of weeds with soil when used in row crops. In small and middle agricultural implement manufacturing industries have not adopted perfectly design complonents for rotary weeders lead to breakdown of blades during field operation. Finite element analysis of MT250D Mitsubhishi tractor housing have showed maximum stress of 238.84MPa considering the factor of safety of 1.05, which was less than required value caused the failure (1)Analysis of the machineSaves time for designing of components of machine and provides accurate dimension which helps to save material (2)The structural analysis of sub soiler ANSYS 12 software lead to a result of a maximum principal stress of 298.43 which was below the value of yield stress of 524 MPa[3]. A study conducted in Turkey,the finite element analysis was used for sub soiler stress analysis and the result indicated an equivalent stress of 432.5 Mpa in the implement [4] .A study conducted on design of rotavater blades using ANSYS at Parabhani India resulted a maximum principal stress of 490 MPa at a force of 6031.09N exerted by 35 hp tractor[5]. The dynamic analysis of furrow opener of planter using SOLID WORKS and imported in ADAMS software to study the behavior for different conditions. [6].The analysis of soil –blade interaction in tillage of dry- sandy soil was done using Finite Element analysis has indicated the cutting width of blade has significant effect on cutting forces[7].The finite element analysis of key part (the ripple disc) was carried out the result indicated 35.97 MPaand material used for disc was 65Mn having yield limit of 430 MPa[8]. The use of ANSYS for design optimization of components of the machine provides saving of time, cost and material. [9]. Hence in this work an attempt has been made to analyze the deformation and find out maximum allowable stress for various types of blades assuming the standard load and boundary conditions using ANSYS.

## Material and Methods

## Model Design Andanalysis

The part drawing of L, C and J type

bladeswere drawn using SOLIDEDGE. The main parts of the rotary bladesare shank, fixing portion and blade ( Cutting Edge ). For modelingSolidworks-2011 software was used. The ANSYS 12.1 was used for analysis of stresses in the blades. The steps of ANSYS programming viz., Pre-processing, Solution andPost-processing phases were used to get the results (principal stresses and deformation).

After importing the drawings of each blades in ANSYS software and saved in.igs file format , in the first step (pre-processing phase) . Material Properties are defined as high carbon steel having yield strength of 790 MPa .The statement of problem were defined based on data.The meshing function of ANSYS were used to create a mesh structure of blades and define boundary conditions and apply the load in the preprocessor. In second step,analysis was carried out and report was generated. In third step (post processing phase), the values obtained were used by back substitution to compute theadditional and derived variables. The solution obtained was displayed as contours representing stress levels on the model using post processor software.

## Material Properties

The properties of material used for manufacturing of different types of blades selected for the study is presented in Table 1.

## Mesh Generation (Meshing)

The generation of Finite Element Mesh was created using CFX mesh after validation of the model. The course size mesh was selected for rotary blades. The total nodes of 1423 and total elements of 4370 ( C-Blade) followed by 634 nodes and 1852 elements ( L-blade) Followed by 500 nodes and 1478 elements ( J- blade) were obtained in mesh structure of blade .The solutions obtained was displayed as coloured contours representing maximum induced principal stresses and its exact location .

## Table 1 Properties of Material of Rotary Blades

| Sl. No. | Name of the Material | Properties of Material | | |
|---------|----------------------|------------------------|--|--|
| | | s of Elasticity, N/mm$^2$(Pa) | Poisson Ratio | ensity (1000 kg/m$^3$) |
| 1 | High carbon steel | 1.9e$^{+11}$ to 2.1e$^{+11}$ | 0.27 to 0.3 | 7.85 |

## Boundary and Loading Conditions

The basic requirements viz., property of blade material, depth of penetration of blade in soil , specific resistance of soil were applied during the analysis. The holes are drilled in Shank portion of the blade to match the hole on flange of rotaryweeder. The blades are fixed to flange using suitable fasteners makes the shank does not rotate in any directions.

The Boundary conditions were applied to the model . All these conditions lead to constrained in the all degree of freedom.

## Result and Discussion

The geometric modeling of various types of blades (Figure .1) were prepared in SOLIDWORKS software and saved in.igs file format loaded to ANSYS 12.1 programme. The generation of finite element mesh was created and boundary conditions were fixed and loads due to specific resistance of soil and depth of penetration and holes on the shank of the blade. The analysis was carried out to simulate deformation and principal stresses, Von-Mises. The load acting are shown in the fastening area of the L type blade (Figure.2), C type blade (Figure.3) and J type blade (Figure.4). The stress intensity at each points on the blades were evaluated based on the color chart and the results wereobtained..
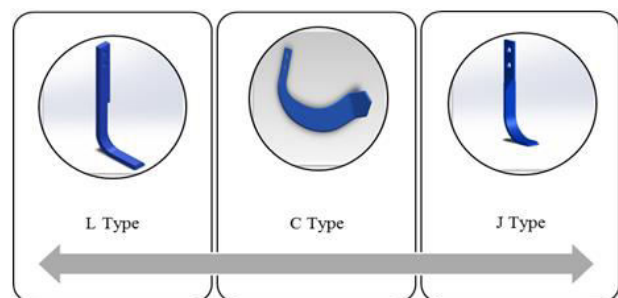


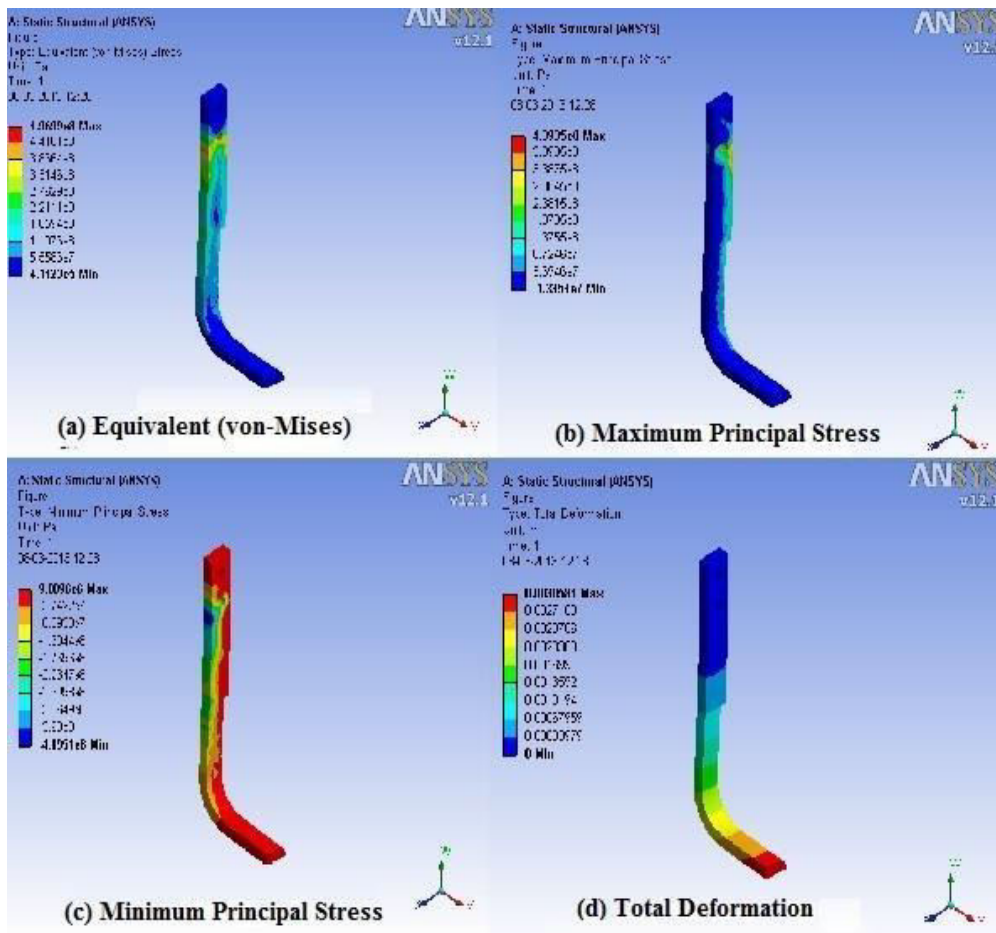Figure 1 Geometric Modelling of various types of blades
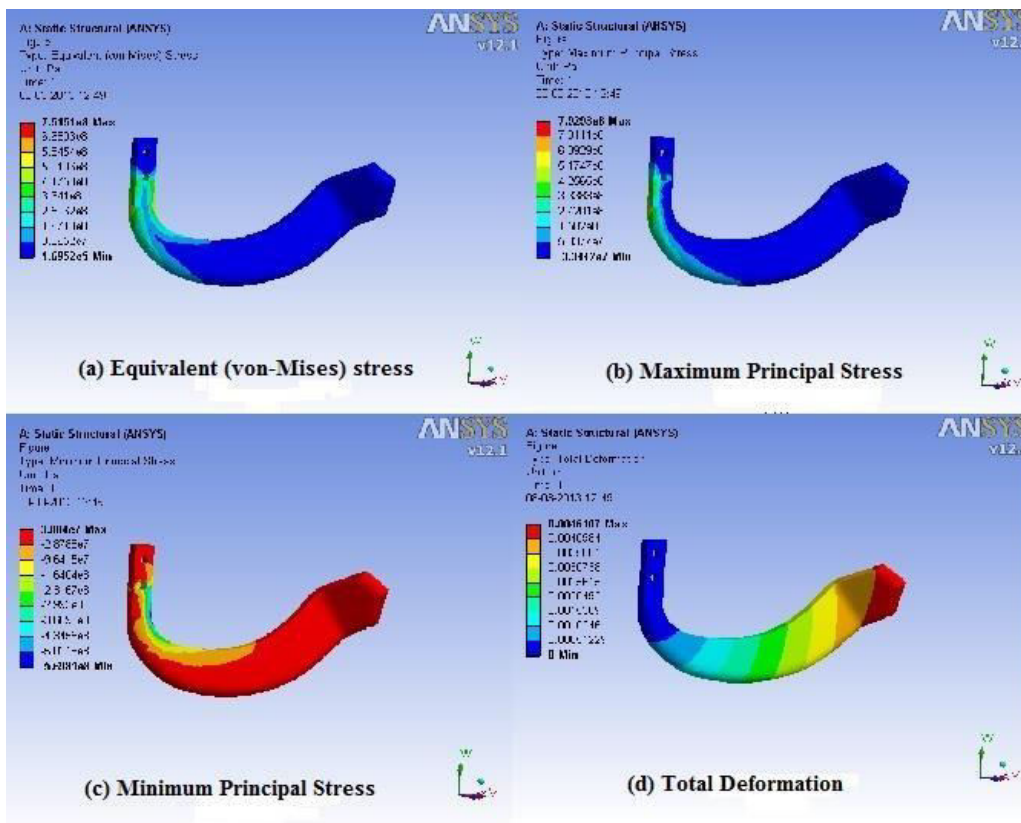
Figure 2 Stresses and Deformation Plots of L-Type Blade



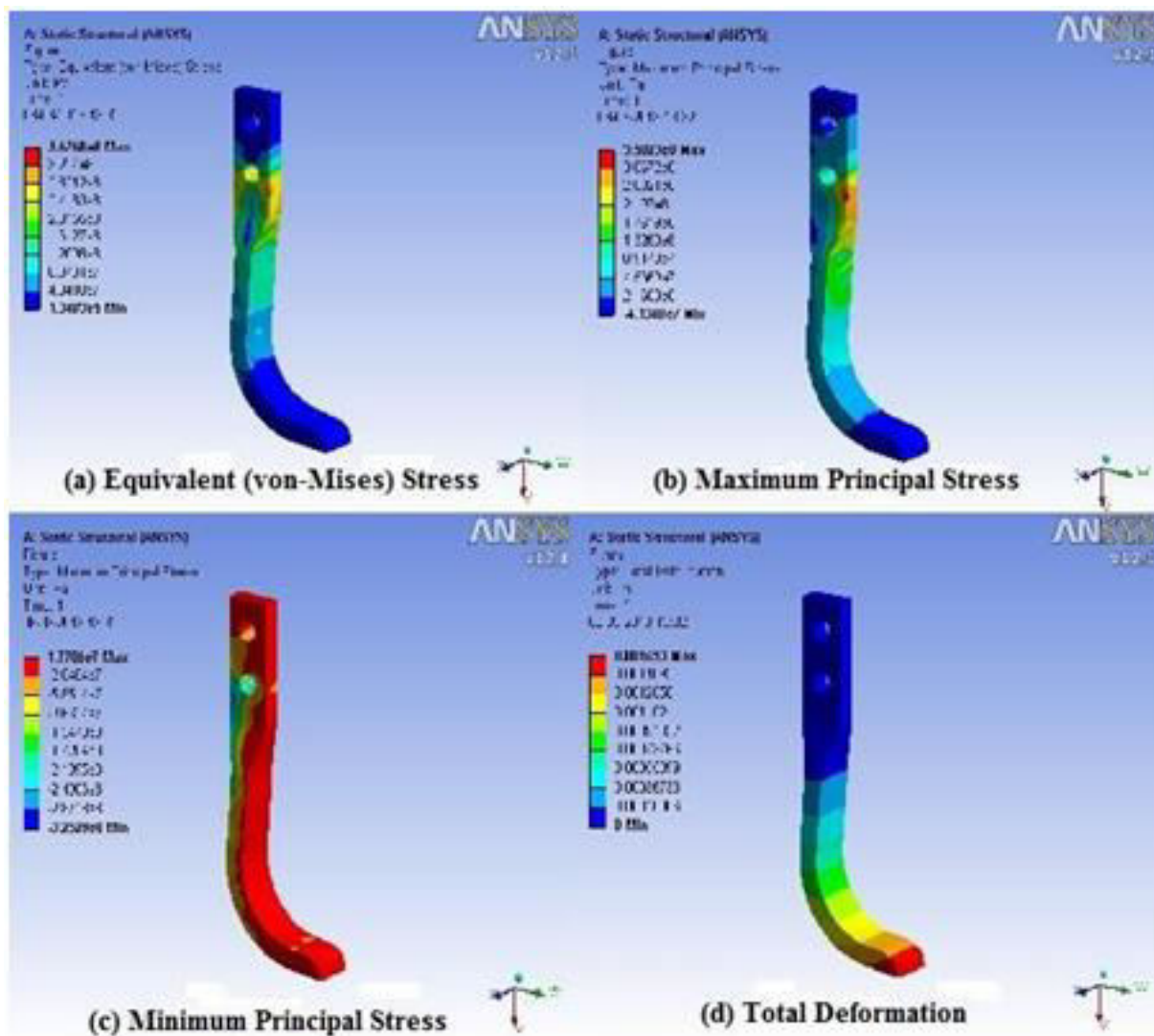Figure 3 Stress and Deformation Plots of C-Type Blade

Figure 4 Stress and Deformation Plots of J-Type Blade

**Table 2 . Effect of deformation in X,Y and Z axis withEquivalent stress of Blades under testing .**

| Types of blades | Deformation details | Displacement mm | Stresses (MPa) | | |
|---|---|---|---|---|---|
| | | | Equivalent (von-Mises) Stress | Minimum Principal Stress | Maximum Principal Stress |
| L-Type Blade | X- Axis | 0.12 | 495.97 | 9.09 | 438.35 |
| | Y- Axis | 0.18 | | | |
| | Z- Axis | 3.04 | | | |
| | USUM | 3.05 | | | |
| C-Type Blade | X- Axis | 1.26 | 752.5 | 38.84 | 730.9 |
| | Y- Axis | 4.58 | | | |
| | Z- Axis | 0.12 | | | |
| | USUM | 4.65 | | | |
| J-Type Blade | X- Axis | 0.99 | 363.68 | 17.9 | 362.68 |
| | Y- Axis | 0.01 | | | |
| | Z- Axis | 0.16 | | | |
| | USUM | 1.65 | | | |

The combined effect of deformation in X,Y and Z axis were represented as USUM in Table 2. The maximum and minimum principal stresses and equivalent stress (Von-Mises) for each type of blades is also presented in Table 2. The C type blade has maximum principal stress of 730.9MPa and

equivalent stress of 752.5MPa was observed. The maximum value of induced stresses and allowable stresses a factor of safety value was calculated as 1. It is found to be very low and this value decreases under dynamic loading conditions in the field operation. Hence the C type blade is not suitable for rotary weeder. The principal stresses for L -blade was 438.35 and 9.09 MPawhere as, for J type blade 362.68 MPa and 17.9MPa respectively with equivalent stress of 495.97 MPa (L type) and 363.68MPa (J type blade) were observed. These stress values were within 758MPa (Yield stress of the material) Hence L &J type blade may be adopted for rotary weeder. However the deformation was least with J type blade (1.65 USUM) was observed compared to all other blades tested. This result indicated J type blade is best suited for rotary weeders with minimum Von-Mises stress (363.68 MPa) compared to L and C type blades.

## Conclusion

Rotary weeder operated by tractor with PTO power of tractor was used for weed control.

The L, C, J type blades were used for rotary weeder. The solidworks was used to prepare geometric model of the blades and imported to ANSYS 12.1 software for analysis.The C type blade has maximum principal stress of 730.9MPa and equivalent stress of 752.5MPa was observed. The maximum value of induced stresses and allowable stresses a factor of safety value was calculated as 1. It is found to be very low and this value decreases under dynamic loading conditions in the field operation. Hence the C type blade is not suitable for rotary weeder. The least maximum and minimum principal stress of 362.68 and 17.9MPa was observed during analysis for J type blades better than other two blades. This stress value is less than the yield stress(758MPa) of material used for manufacturing of blades. The total deformation observed was least with J- Blade (1.65mm) followed by L blade (3.05mm) and C- Blade(4.65mm). This results lead to J-blade is best suited for rotary weeder to control weeds in wide row crops.

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# DATA WAREHOUSE DESIGN FOR BUSINESS INTELLIGENCE AND APPROACH FOR COVID-19 PANDEMIC

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## ABSTRACT

*Data warehouses, which serve as decision support systems, standardize data across the enterprise to create a single perspective of information. Decision makers can get the information they need from data warehouses. The creation of a data warehouse for this pandemic situation will be mainly to support to handle the situation based on the open datafrom government bodies. This open data can be very huge and should be categorized based on requirements and needs of analyzing, Hadoop Distributed File System will be best choice to store and maintain the data and Apache spark framework will be used as analyzing tool to get the insights and various reports.Using open source data warehousing and data mining tools, the current study shows how to create a data warehouse and extract useful data.. These reports can be very critical in making any decisions by government or public during this pandemic situation.*

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## 1. Introduction

"A subject-oriented, integrated, time-variant, and nonvolatile collection of data in support of management's decision-making process," according to the definition. In this definition the data is:

- The warehouse is subject-oriented, meaning it is organised around the enterprise's primary subjects (such as clients, products, and sales) rather than major application areas (such as customer invoicing, stock control, and product sales). The purpose of a data warehouse is to aid decision-making rather than to store data for specific applications.

- Because source data from several enterprise-wide software systems is combined, the result is integrated. The source data is frequently inconsistent, with different formats, for example. To give the user an uniform view of the data, the integrated data source must be made consistent. Because data in the warehouse is only accurate and valid at a specific point in time or over a specific period of time, it is time-variant.

- Non-volatile because the data is refreshed on a regular basis from various data sources rather than being updated in real time. New data is constantly added to the database as a complement, not as a replacement. This fresh data is continuously absorbed by the database, which gradually integrates it with the old data.

Integration of a range of application systems is possible with data warehouse systems. They aid in the processing of information by providing a firm foundation of consolidated historical data for analysis. These techniques have a more defined process. Many sales analysis and executive information systems (EIS), for example, obtain their data from summary files rather than operational transactions.Data warehousing is essentially the practise of employing summary files instead of operational data. However, some data warehousing systems overlook the necessity of modelling and constructing a Datawarehouse and instead focus solely on data storage and retrieval. These technologies may have powerful analytical capabilities, but they lack the attributes necessary to develop and sustain a corporate data warehouse. Instead of being on the host, these tools belong on the PC. A corporate (or divisional) data warehouse must be scalable, safe, open, and, most importantly, publishable.

- SCABLE means that your data warehouse must be able to manage increasing volumes and types of data, as well as an increasing number of people who can access it. For

this reason, most businesses prefer to store their corporate data warehouse in a relational database rather than a multi-dimensional database. More about dimensional modelling techniques later.

- SECURE means that your data warehouse administrator can regulate who has access to what data and when from a central location.

- OPEN denotes that the data in your data warehouse is accessible through a variety of queries and front-end tools. As a result, for a corporate-wide data warehouse, a relational data base should be your first choice. Some data analysis tools use proprietary data storage structures, which can be fed from this central data warehouse.

### Approach for Covid-19 pandemic

The disease Covid-19 is caused by the "novel corona virus." Fever, a dry cough, and trouble breathing are common symptoms. Aches and pains, nasal congestion, runny nose, sore throat, and diarrhoea are all symptoms that some individuals experience. Covid-19 is transferred mostly through droplets produced by a Covid-19 infected individual coughing or sneezing.. Data warehouse approach for this pandemic situation will be mainly to support to handle the situation based on the open datafrom government bodies. This open data can be very huge and should be categorized based on requirements and needs of analyzing, Hadoop Distributed File System will be best choice to store and maintain the data and Apache spark framework will be used as analyzing tool to get the insights and various reports. These reports can be very critical in making any decisions by government or public during this pandemic situation.

### 2. Literature survey

### 1. A Data Warehouse Approach for Business Intelligence

Business users can access and query data from numerous sources and geographically dispersed locations in a cloud-based data warehouse (DW). Business analysts and decision-makers rely on DWs for data analysis and reporting in particular. Many applications

require modelling and particular treatment of these types of data since they cannot be processed efficiently within a traditional multidimensional database. Temporal and geographical data are two aspects that have a significant impact on decision-making and marketing tactics. The telecommunications industry, which is rapidly dominated by huge volumes of data, is one of the key application domains of spatiotemporal data warehousing. A DW schema modelling technique is provided in this paper, which integrates temporal and geographical data in a broad data warehousing framework in a unified manner.As the volume and sharing of data grows, temporal and spatial data integration becomes increasingly critical. The goal of this study is to make it easier to comprehend, query, and handle spatiotemporal data for on-line analytical processing (OLAP).The proposed new spatiotemporal DW schema adds geographical and temporal inquiries to OLAP queries. A case study for the telecommunications business is created and implemented.

### 2. Design and Implementation of Open-data Data Warehouse

The paper's main goal is to create a data warehouse using open data from a variety of sources. We present a general overview of data warehouse foundations as well as the motivation for open-data. The information was designed to provide a variety of responses and allow the general audience to make informed decisions. Various technologies are used in the implementation. The goal is to locate open government data and analyse it in order to develop a business model while adhering to data warehouse standards such as ensuring data transformation and integration quality, integrity, and consistency. The data warehouse's main goal is to make information available and accessible to everybody.

### 3. Analysis of Administrative Management and Decision-Making Based on Data Warehouse

Based on the analysis of the shortcomings of traditional decision support systems, a new decision support system (DSS) architecture using data warehouse and data mining is proposed, and a data warehouse for

administrative prediction as the decision subject is established. The multi-dimensional data set of OLAP analysis is studied and established, and the data in the multi-dimensional data set are sliced, drilled and rotated. The data in multi- dimensional set are queried by MDX multi-dimensional query language, and the solution of displaying OLAP analysis data is put forward. Using modular design method, the management and decision system of B/S mode is developed to realize data warehouse management, multi-dimensional data set management, OLAP multi-dimensional comprehensive analysis and other functions. The tests analysis shows that the system can help enterprises to make scientific and reasonable sales decision-making plan, which also has a certain practical value.

## 4. Subject Oriented Data Partitioning – A Proposed Data Warehousing Schema

The data warehouse is an indispensible aspect of modern business, but since the amount of data it contains is enormous and rising at such a rapid rate, the queries that it handles from business leaders have gotten increasingly sophisticated. The data warehouse must respond to queries with high quality data in a short amount of time, yet the size of data and nature of the queries present a significant difficulty.Because the data warehouse must perform analytical operations on a huge collection of data while evaluating sophisticated queries, it is extremely difficult to get the required data set with minimal response time in data processing. This paper offers a new data warehousing design that creates a multidimensional connection tree hierarchy, replacing relational databases with partitioned databases, as opposed to the typical use of relational databasesin its every level instead of any individual data. This architecture enables a data warehouse to segment and analyse massive data in tiny batches to reduce response time, and to store summarised data to improve data availability during query processing. This schema improves the data warehouse's performance and decision-making ability by allowing easy and quick access to the required set of data.

## 5. Ways for a Machine-Building Enterprise

## to Collect Diverse Information in a Single Data Warehouse

In this post, we look at how to collect data from many sources in a heterogeneous data structure and combine it into a single data warehouse. A single information space of a machine-building firm is constructed based on the acquired data.

## 6. Reporting and Decision Support Using Data Warehouse for E-Commerce top-up Cell-phone Credit Transaction

As an e-commerce platform that spans Indonesia, a quick reporting system is required to analyse the business and make the best decisions. This paper describes how to utilise the Kimball and Ross approach to create a data warehouse to speed up the reporting process. Kimball and Ross created a 9-step methodology for data warehouses.This paper is about e-commerce business procedures, specifically online mobile balance top-up transactions. Furthermore, data can be presented in a dashboard as well as a simple, useful, and effective report.

## 7. A Hybrid Approach to Dynamic Enterprise Data Platform

Corporations today strive to make the most of the data generated by business software. One of the most essential objectives is to translate data into commercial profit as quickly as possible. It is necessary to receive data from source systems, process it, and use it as a basis for business decisions for this purpose.The process of gathering, analysing, and making data meaningful can be approached in a variety of ways. In this study, we combined the best features of many current methodologies to create a hybrid solution. By utilising open source software, this solution can easily interface with new data sources and reduce the amount of time required for data integration, preprocessing, deduplication, and entity mapping components.

## 8. Security Concerns in Data Warehouses: Virtual Private Database Implementation and Analysis

At early days, the term data Warehouse was primary concern for few large organizations as it was developed and deployed by them only

for managerial decision problems. Further with growth in economical penchant and with advances in technology now it is possible for small to medium scale players to work with data warehouses. To develop and deploy a data warehouse is a tedious process in itself and its security is even a greater concern. Theembellishment focusing the security factors is not always a beneficial part for the organization that is why the security factor prognosis for a data warehouse is the task of utmost importance. Several important security issues are discussed in this work. Access based security for data warehouse data is implemented with the help of Virtual Private Database which is server enforced congealed access control.

## 9. Design guidelines for building user centric Metadata models for data warehouse systems

Organizations benefit from metadata modelling and management because it aids in understanding data sources, existing system relationships, and the business value of each system element. The user-centric meta model focuses on broad types of users, such as business users, technical users, and organisation administrators, who will use metadata to accomplish specific purposesas per their roles. In this paper, we look at the design principles that should be followed while creating a user-centric metadata model.

## 10. Application of Data Mining of Clinical Data

The use of data science technologies has quickly spread to a variety of fields. The primary goal of this study is to apply data mining and data science principles to the domain of patient data. It is frequently neglected due to the volume and diversity of generic patient data.This study examines the entire life-cycle of medical health data, from its acquisition to the extraction of useful information. The method of data collecting becomes less important with data mining using digital solutions, and the progress of data storage technologies in terms of velocity and size makes data processing quick.Anonymity is another milestone in medical health data that must be handled utilizing cryptographic

approaches and well-protected data warehouses. Clinical data is the key to unlocking the nation's healthcare secrets. It can be utilized to make comparisons and serve as role models for improving the healthcare system.Individuals are being encouraged to progress toward a disease-free world through the use of smart digital solutions Keywords.

## Data warehouse for covid-19

Similar implementation approach can be used in analyzing the current pandemic situation because of Covid-19. The Covid-19 virus outbreak has posed a significant challenge to national resources, prompting a scramble to adapt existing technology while also innovating and deploying newer ones.

Data from all the state's health ministry records can be extracted in a weekly/monthly/daily wise, can be organized in a proper structure. Here our ETL (Extract Transformation load) system comes into picture, which is responsible to extract data from various sources, enforces data quality and consistency, conforms data so that separate flat files can be used together, and delivers data into presentation layer. Once the data is dumped into presentation layer, can be used this to represent in a web application to display the insights daily and ratio of spreading percentage which can in-turn help government or local bodies to take appropriate action against community spread and movement of goods and essentials across the country.

### Covid-19 open-data access

As we know data sources are the initial and vital findings in any Data warehouse implementation. Data sources for covid-19 are various data sets from government bodies varying from central health to state heath bodies, can also be drilled down to grampanchayat level especially when it comes to India. These data will include:

- Number of positive cases

- Quarantined or kept in observation

- Recovered cases

- Active cases

- Deceased

- Travel history
- Migrants data
- Hospitality requirements
- PPE availability/requirements
- BPL population percentage

Many companies are providing access to cloud data warehouse for COVID-19, Yellowbrick is one of them which provides access to this data for research and study. And companies like"Stich" provide direct access to raw data and way to integrate this to your warehouse without ETL scripts.

**Covid-19 data analysis**

Now with the huge data when we have transformed them to our servers by categorizing them based on our requirements, we need to define the strategy or what has to be analyzed and steps performing the same. Things which can be analyzed based on the data we captured above can be:

- Taking decisions on public access/movement based on increase ratio of positive cases in a week/monthly data
- Supply needs based on availability
- Travel restrictions based on migrant's data
- Funds needed depending on PPE/Medical requirements
- Essentials supply based on BPL ratio

**3. Implementation**

Considering the amount of data which can be very huge, we can use HDFS (Hadoop Distributed File System) - a distributed file-system that stores data on commodity machines, providing very high aggregate bandwidth across the cluster to store the data sets with additional HA (High Availability) cluster, this fulfils our data storage needs.

Now with respect to processing this data Apache also has Hadoop MapReduce is a large-scale data processing framework based on the MapReduce programming model, which is significantly faster than standard RDBMS techniques.

Our plan is to use Apache Spark, which is a

free and open-source distributed general-purpose cluster computing framework. Spark is a programming language that allows you to program large clusters with implicit data parallelism and fault tolerance, which is 10X faster when compared to Hadoop MapReduce in processing.

**Architecture**
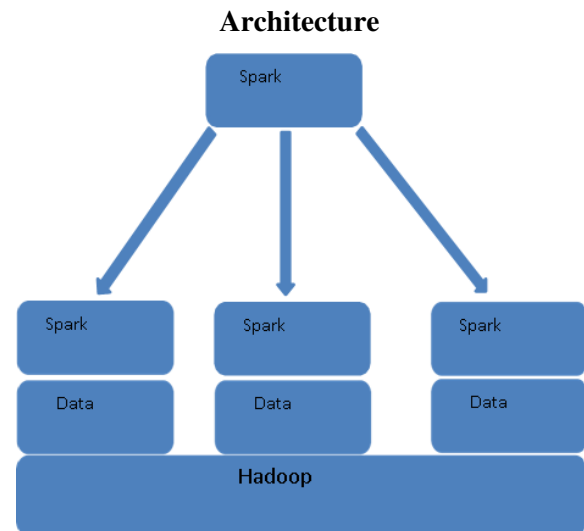


**4. Applications of data warehouse Exploiting Data for Business Decisions**

The ability of a decision support system to give relevant information to the decision-maker determines its value.

Information that can be acted upon when the moment is right. This implies that the data must be in the following format:

- Applicable. The data must be recent, relevant to the topic of interest, and detailed enough to indicate any potential problems or benefits.
- Conclusive. The data must be sufficient to allow the decision-maker to take measures that will benefit the organisation.
- Timely. Information must be available in a timely manner to enable for effective decision-making.

Each of these requirements has implications for the characteristics of the underlying system. To be effective, a decision support system requires access to all relevant data sources, potentially at a detailed level. It must also be quick to return both ad-hoc and pre-defined results so that the decision-maker can investigate to an appropriate level of depth without affecting performance in other areas.

### Decision Support through Data Warehousing

Implementing a data warehouse, which integrates several data sources, is one way to create a decision support system.

Data sources that are already available, as well as data analysis tools that are simple to use. The data sources of an organisation are usually departmental or functional databases that have evolved to meet unique and localised needs. Integrating such narrowly targeted decision-making resources at the enterprise level necessitates the integration of additional functional capabilities:

- Quick response to queries. Data sources are often designed for data storage and processing rather than query response time..

- Data depth has been increased. Many business decisions are made by comparing current data to past data. Because most data sources are focused on the present, they lack this depth.

- Support for business languages. The decision-background maker's is usually in business or management, not database programming. It is critical for such a person to be able to request information using words rather than syntax.

A data warehouse satisfies these objectives by consolidating data from numerous and independent sources into a single repository for analysis. This repository is usually a relational database that has the capacity for further data depth as well as query support.A separate component, geared for extracting, compiling, and presenting summary information in response to word-based inquiries, such as "show me last week's sales by region," provides analytical features.

### 5. Conclusion

The nested data warehouse has been created and implemented. A telecommunications corporation was used in the case study. Good judgments must be made based on the efficient handling of pertinent data for a firm to be successful. This is made easier with a well-designed data warehouse.A significant research stream focuses on data warehouses for the telecommunications industry. It can help with phone bill generation, tracking how funds are spent, and logging telephone system usage, as well as network administration, call reporting, dispute resolution, and overall business management.A prototype implementation using real data is currently being developed for the verification of the argument. Solving similar difficulties will be a part of future effort.

The solution suggested in this study can readily be applied to other business domains' support services. The final step is to test our model with several cloud vendors. The Apache Hive DW has been built up, and initial testing has been completed, yielding extremely encouraging results in terms of quality and time complexity.

The goal of the second paper was to create an open-data data warehouse with open government data. The federal award transaction has been chosen as the business process to be simulated.

After determining the business strategy, we had to make a critical decision on the granularity of the data warehouse. We chose the most granular data - individual transactions conducted by federal agencies - to ensure maximum dimensionality and flexibility.

We've transformed data to ensure data quality, integrity, and consistency, and we've conformed data so that disparate flat files can be utilized together, as well as provided data to the display layer.

Then, using online analytic processing (OLAP) technology, we can create a multidimensional model of the presentation layer in which the data is kept in cubes.

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# ARDUINO BASED SMART HEALTH KIT

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## ABSTRACT

*Prior to the advent of the internet of things, correspondence between specialists and patients was distinctly through visits, messages and telephones. There were no strategies that could empower specialists to screen their patients constantly and make ideas appropriately.. But with the advent of the internet of things, the entire scenario has changed. The health care industry is getting smarter with new tech innovations. IoT takes patient care to a new level. Many hospitals have invested a huge amount of money in IoT enabled technology for patient monitoring. It has allowed specialists to give great consideration by distantly checking the patients utilizing IoT empowered gadgets. In this paper, we are utilizing Arduino Uno with different sensors to gather fundamental patient data like Blood pressure, heartbeat, IBT, and Blood Glucose level. Data collected from these sensors is uploaded to thingspeak using wifi module.*

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*Keywords: NIR, IOT, SOC, GSM, MCU, SMS, IBT.*

## 1. Introduction

We are all in the digital era now. We are using innovative technologies to leverage time & to make human life much easier.

In the traditional method, to consult a physician for a general health checkup, patients have to take prior appointment & get their names registered in the clinic, and also after the consultations, there will be a delay in generating medical reports. Due to this prolonged process, working individuals will in general overlook the tests or procrastinate it. For a common man its bit difficult to meet with the medical expenses for regular & repeated checkups. For this purpose, various systems have been developed to bring down the cost, delay involved in generating the medical reports. IoT is one such methodology that grants specialists to give phenomenal consideration by distantly checking the patients utilizing IoT empowered gadgets. This novel approach reduces time consumption in the process.

The Internet of Things (IoT) has opened a world of possibilities in many fields, the healthcare sector has no exception for this. With advancement in digital technologies, how doctors interact or communicate with their patients is changing. Constant measurement of some vital parameters of the patient such as heartbeat, IBT, sugar level,BP& many other parameters are very important to diagnose the disease. By using some digital devices it's very easy for the doctor to diagnose the disease. The physiological parameters procured by the sensors are conveyed to healthcare providers. The information is analyzed for possible issues by a medical health care providers and if an issue is recognized health providers are immediately alerted.

By implementing this paper, we can offer a more affordable framework for monitoring the health of patients in distant inaccessible places. The system will automatically send an alert signal to the care taker of the patient, if any of the patient's parameter goes abnormal. Care taker can take necessary steps to save the life of the patient.

## 2. Problem Statement

In health care facilities, the various readings regarding patients health is taken at regular intervals so that the health can be monitor and any abnormality can be addressed immediately by changing the treatment accordingly. These readings may include parameters like, sugar level, blood pressure, heartbeat and IBT. These readings can be taken by healthcare specialist or supporting staffs and taking too many

readings manually might result in inadvertent errors. These readings can be sent using gsm or rf units in the form of sms to the concerned. Moreover it was not possible to show the history of patient's health. So, the main aim of the paper is to present the current information as well as history of readings regarding the patient's health to the health care specialist or patient's attendance. The IOT technology is used to enable this presentation. The patient's health can be monitored remotely and important alerts are sent regularly so that the patient receives appropriate health care when necessary.
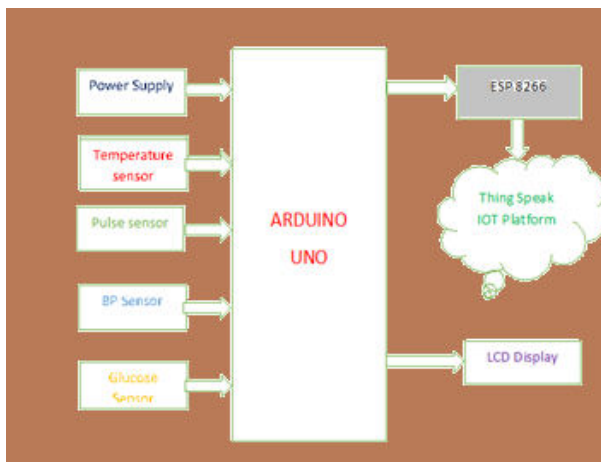


Figure1, block diagram

Fig1 shows the block diagram of patient monitoring system. The chief components of the system are Arduino uno, sensors, Wi-Fi module & an LCD. In this project we are using LM35 for measuring the body temperature & a pulse sensor for measuring heartbeat of a patient. When the system is turned on, the raw data collected by the sensors are analog in nature. The data is supplied to the analog input pins of arduino. Each analog input pin has a-10-bit ADC inside it, which will convert the analog data into digital format. The microcontroller inside the board will process the data & display it on LCD screen. If any of the parameters like internal body temperature, pulse rate surpasses the threshold level, then microcontroller will send an alarm signal to the buzzer & the buzzer starts beeping.in this way, it alerts the patient's attendants or doctors that the patient's condition is critical & he needs immediate medical attention or care. Finally the processed data is uploaded to web using thingspeak and Wi-Fi module. Once the data is available on the web,

doctors & other healthcare professionals can analyze the data & monitor patients who are outside the conventional healthcare settings like at home or in workplace. IOT enables doctors and medical experts need not always be in direct physical contact with their patients. They can be monitored remotely regardless of their geographical locations.
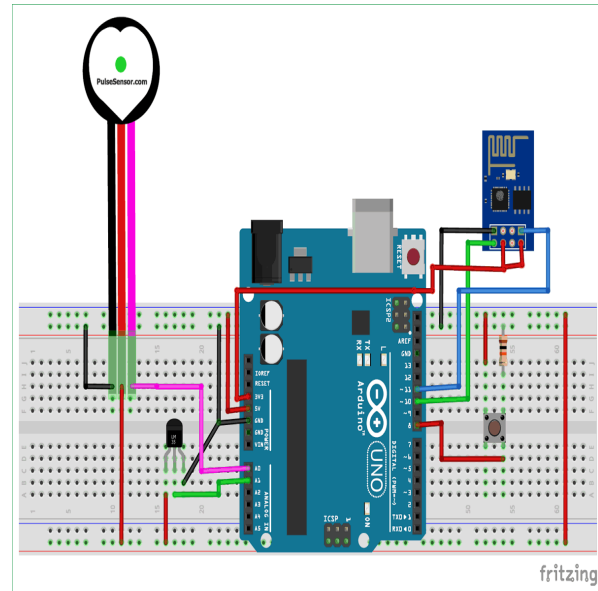


Figure 2. Interfacing of Sensors with Arduino

## 3. Components required

### 3.1 Arduino Uno

Arduino Uno uses ATmega 328 as a main controller. ATmega328 is an MCU from the AVR family; it is an 8-bit microcontroller which means that its data-bus and internal registers are designed to handle 8bit data.

Different memory supported by this chip are

Flash memory: 32KB Rom memory. Used for storing application.

SRAM memory: 2KB volatile memory (RAM). Used for storing variables while it's running.

EEPROM memory: 1KB non-volatile memory. Used to store data which should be available even after the board is powered off.

It has 14 digital I/O pins out of which 6 pins will provide pulse width modulated o/ps. Each pin can sink or source 20ma current. It's got 6 Analog input pins each pin has 10-bit ADC. Arduino uno comes with inbuilt USB port. Simulation is done using arduino IDE. It

requires 7 to 20V DC when connected to external power supply.

### 3.2 Temperature Sensor

LM35, it's a 3 terminal precision microcircuit temperature sensor which produces an output voltage that's directly proportional to the change in temperature. The change in voltage is 10mv for each 1°C change in temperature. it's used to measure surrounding temperature starting from -55 °C to 150 °C. It requires 5V supply for its operation but are often operated from a 3.3V supply also. The drain current is a smaller amount than 60uA.
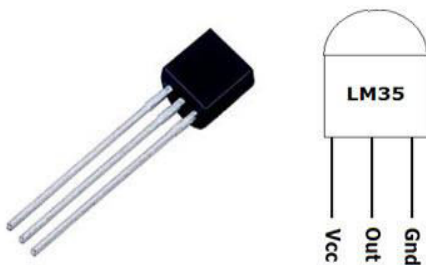


### 3.3 Pulse Sensor

Pulse sensor is one which is used to measure heartbeat. The sensor has LED on one side and an electronic circuitry on the other side. This circuitry consists of amplifier & noise cancellation network. Generally the sensor will be clipped on to either the fingertip or earlobe.

The light emitted by LED is made to fall on the veins directly. When heart pumps the blood, more blood will flow through the veins because of this more light will be reflected towards receiver. The sensor estimates the adjustment in volume of blood which causes an adjustment in the light intensity. The progression of blood is dictated by the rate at which the heart beats, since light is consumed by blood the signal pulses are identical to the heart beat pulses.
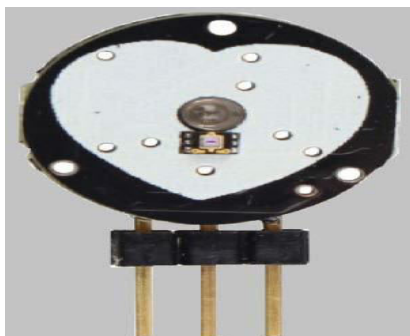


### 3.4 Pressure sensor & Motor control unit

In this unit, a piezo resistive pressure transducer is utilized to sense the pressure. The sensor produces an output voltage which is proportional to the applied pressure. To create a pressure, a motor control unit is used. This control unit turns on & off the motor at correct time. The cuff can be inflated and deflated using motors. First the air is pumped into the wrist cuff by turning the motor on. The signal picked up by sensor is passed through amplifier & signal conditioning circuit, this signal is then fed to the micro controller for processing. The processed signal is then displayed on LCD.

### 3.5 NIR Sensor

To measure Blood glucose level, NIR sensor is used. The transmission and gathering of light around a frequency of 1550nm is picked in view of generally minimal effort when contrasted with different frequencies with equivalent or higher reaction to glucose. This sensor consists of infrared LED & photo diode. Infrared LED is used as a transmitter & a photo diode is used as a receiver. This sensor is placed on the earlobe in such a way that, one side of the earlobe is exposed to IR lED, the other side is exposed to photodiode. The absence of bone tissues in the earlobe makes it suitable for measuring glucose level.. Now the light is made to fall on the earlobe by turning on the IR LED. The attenuated light on the other side is received by photodiode. The measure of near infrared light passing through the ear lobe relies upon the measure of blood glucose in that area. At the receiver side, to remove high frequency noise, an RC low pass filter is used. The filtered output is amplified & sampled, later it will be processed by the microcontroller to display the blood glucose level.

### 3.6 Wifi Module

The ESP8266 wifi moduleutilizes 802.11 b/g/n conventions. It is a self-contained System on chip with incorporated TCP/IP protocol. Its Standby power consumption is less than 0.1mW
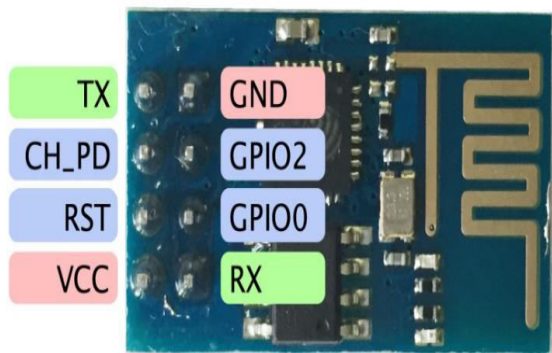
### 3.7 IoT Platform

Internet of Things (IoT) is an emerging trend where an enormous number of installed gadgets (things) are connected to the Internet. These associated devices communicate with people and other things and convey sensor information to cloud where the the information is processed and analyzed to obtain significant insights. Thingspeak is an IoT analytics platform service which permits the user to collect, investigate & show live streams of information in the cloud. Thingspeak delivers instant visualizations of information sent by the sensors. In Thingspeak, the data is processed & analyzed using matlab code. Based on the processed data, we can configure some actions like sending an E-Mail automatically to the concerned person about the current health status of the patient.

### 4. Result

When the system is powered up, pulse sensor will be fixed to the fingertip of a patient to record the heartbeat. NIR sensor will be fixed to the earlobe to read blood glucose level. LM 35 sensor will read the body temperature of the patient & pressure sensor will indicate the blood pressure. The data collected by all these sensors are processed by arduino& then it is uploaded to thingspeak using ESP8266 wifi module. Figure 4, 5, 6 & 7 show the bodytemperature, heartbeat, blood pressure & glucose level of the patient displayed on thingspeak.
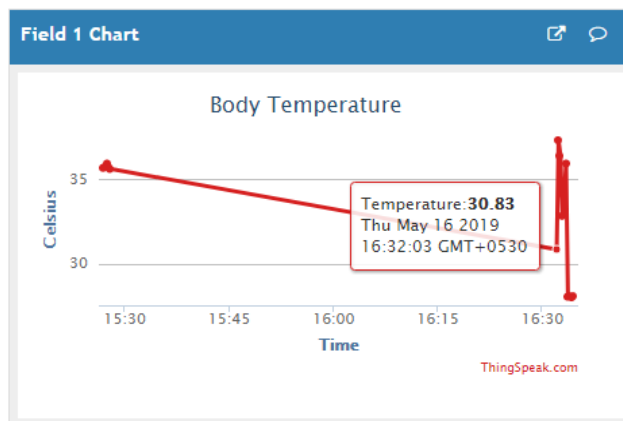


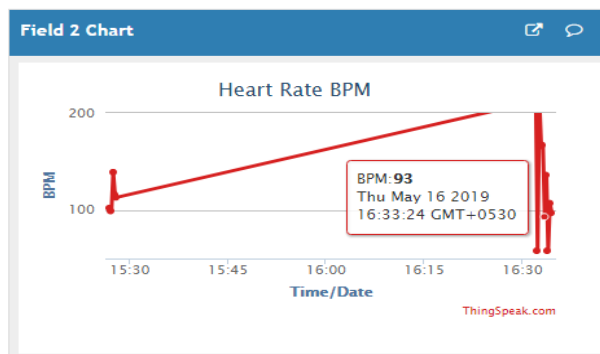Fig 4. Body temperature of the patient
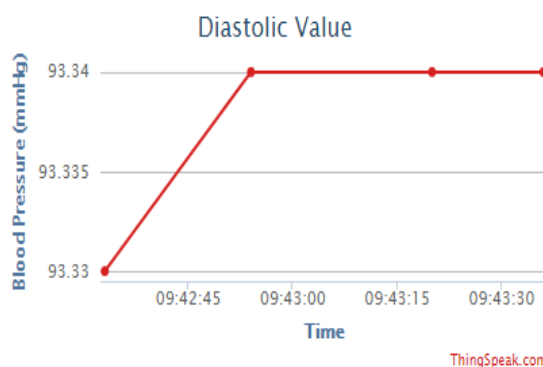


Fig 5. Heartbeat of the patient.
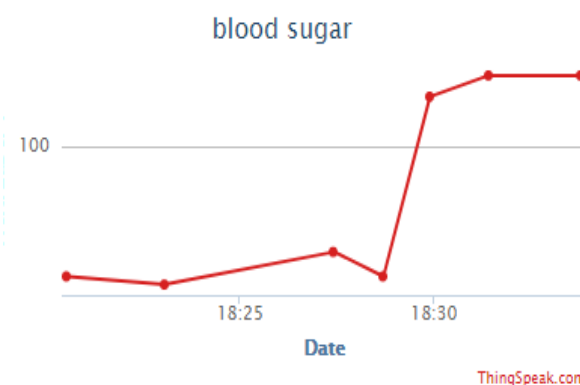


Fig 6.Blood Pressure.



Fig 7.Blood Glucose level.

## 5. Conclusions

IOT Monitoring proves to be more beneficial when we need to monitor & record the changes in the health parameters of the patient over the period of time. Doctors can study the data available in the database & accordingly suggest the treatment or prescribe the medicine for the patients, this reduces hospital visits & stays for routine check-ups.

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# PERFORMANCE AND ERROR ESTIMATION ANALYSIS OF QAM WITH MRC RECEIVER FOR L-TAS/SC OVER A-M FADING CHANNELS

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## ABSTRACT

*Effect of fading is reduced by Diversity combining technique But in a practical situations, without error in channel and perfect channel estimate are impossible so analysis of channel is essential for considering an imperfect channel estimation (ICE). Quadrature Amplitude Modulation with ICE are examining over α-μ fading channels for Transmit Antenna Selection (TAS/SC), Maximal Ratio Combining (MRC), Selection Combining (SC), and TAS/MRC receiver. It has been observed that the performance of ABER improves for both 8-QAM and 16-QAM system as compared to 32-QAM with the increase in fading parameter μ for both TAS/SC and TAS/MRC system. The values of both transmit antenna and the user increases for TAS/SC systems and the performance of ABER can be improved. Monte-Carlo simulation method have been used for the verification of numerical results.*

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## 1. Introduction

The diversity combining techniques depends mainly on the complexity restrictions occurring on the communication systems in concern by channel state information (CSI) at receiver. Selection Combining (SC) is the simplest combining system where the transmit and received antenna so that the total received selected signal power is maximized. Maximal Ratio Combining (MRC) is the optimal combining scheme of co-phased and multiplied to a weighted factor of received signals and it is proportional to the signal amplitude added algebraically. Channel error is a factor that is strongly associated with a practical system. So, for matchless outcome, the receiver must have efficient estimation of received signal phase and envelope information [1].

For practical aspect, the selection of perfect channel estimation is a challenging one, which is important to provide synchronization of the phase and envelope the transmitted as well as the received signals for better performance of coherent receivers [2].The short term α-μ fading channel consists of Rayleigh fading, One-sided Gaussian, Nakagami-*m*, Weibull, by replacing of certain values for α and μ. The bit error rate (BER) expression for coherent modulation can be found by applying the moment generating function (MGF) for α-μ fading channel given [3]. The importance of channel estimation error were studied in terms of two way relay networks (TWRNs) by taking account of separate and cascaded information schemes [4,5]. The bit error level of Gray-coded MPSK with random phase error is presented in [5]. From ref.[5], it found that fading channel bit error level converges the Additive White Gaussian noise (AWGN) channels bit error level. Mathematical Expressions for the bit error probability(BEP) of the rectangular QAM(R-QAM) or M-ary quadrature amplitude modulation (M-QAM) with and without in view of spatial diversity, concatenated double μ, μ-μ or μ-fading, are calculated for the BEP of digital QAM modulation in process of additive white Gaussian noise ( AWGN) in[6] by Cho and Yoon expressions. The issues of the independent but non-identically distributed (i.n.i.d.) double α-μ random variables (RVs) is studied in [7].

Meijer's G-function in terms of α-μ fading channels, energy detection (ED) were derived for cognitive radio network (CRN) and wireless sensor network (WSN) in [8]. The performance of a κ-μ Extreme fading conditions communication system is examined and derived fresh systematic expressions for the normalized average channel capacity, average error rate, and asymptotic error analysis in [9].

The performance of $α-μ$ fading channels occurrence of co-channel interferences in the error of dual-hop AF relaying network is

investigated and analyze over other fading models such as Nakagami-m ($\alpha = 2$ and $\mu = m$), Rayleigh ($\alpha = 2$ and $\mu = 1$), and other fading models where the value $\alpha = 2$ with different values of $\mu$ in [10]. The Hexagonal quadrature amplitude modulation (HQAM) for a dual-branch selection combining (SC) receiver is studied in detail. The performance of error probability (EP) are derived in terms of the Chiani, Prony, Chernoff, Trapezoidal approximations for Gaussian Q-function with η-μ fading channels in [11]. The prior work, the L-TAS/SC Receiver over KG Fading Channels Performance and Estimation Error analysis is investigated [12]. The ABER for QAM modulation considering ICE for arbitrary number of transmitting antenna over α-μ fading channel are examined. The model of system was discussed in section 2 and the evaluation of system using ABER details are given in section 3 . The numerical results obtained and its detailed analysis are presented in section 5.

## 2. System Approach

Let us consider the system consisting of $L_t$ transmitting antenna and R receiving antennas. Among all the transmitting antenna, the best transmitting antenna which can maximize the post processing SNR of the selected MRC receiver. MRC receiver signals are co-phased and multiplied by its weighted factor. The instant MRC receiver SNR output is indicated by γ can be written as $\gamma = \sum_{m=1}^{R} \gamma_m$ , where $\gamma_m$ is the current SNR of the $m^{th}$ division of each MRC receiver. The instant PDF of SNR for the α-μ fading channel is specified by [3] as

$$f(\gamma) = \frac{\alpha \mu^{\mu} \gamma^{\frac{\alpha\mu}{2}-1}}{2\Gamma(\mu)\overline{\gamma}^{\frac{\alpha\mu}{2}}} e^{-\mu\left(\frac{\gamma}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}} \quad (1)$$

The received SNR CDF is given as [6],

$$F(\gamma) = \frac{1}{\Gamma(\mu)} a\left(\mu, \mu\left(\frac{\gamma}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}\right) \quad (2)$$

where, lower incomplete gamma function $a(g,h) = \int_0^h x^{g-1} e^{-x} dx$. An estimate of channel vector $\alpha_l(t)$ is considered at the receiver end which is given as $\alpha_l(t) = [\alpha_l(t), \ldots, \alpha_L(t)]^T$ where, $\alpha_l(t)$ is first branch component of the vector and $[.]^T$ is the transpose of the vector. The each level of channel estimation can be given as $e_l(t) = \alpha_l(t) - \alpha_l(t)$ where, $\alpha_l(t)$ - channel coefficient vector for L branches.

It can be written as $\alpha_l(t) = [\alpha_l(t), \ldots, \alpha_L(t)]^T$. The channel estimation error functional model and its analyses of BER performance was given [2] as $\alpha_{i,l}(t) = \rho_l \alpha_{i,l}(t) + w_{i,l}(t)$ where, $(l = 1, 2, 3, \ldots, L)$ and the diffusion component indicated as 'i'. $\{w_{i,1}(t)\}_{l=1}^{L}$ is the second zero mean equivalent estimation error and its variance ($\sigma_w^2$ ). The complex number $\rho_l$ is given as $\rho_l = |\rho_l| e^{j\Delta\theta_l}$, $\Delta\theta_l$ is the phase offset of $\rho_l$ [2]. If we are considering ICE, the value either $|\rho_l| < 1$ nor $\Delta\theta_l \neq 0$. For MRC, the detection of transmitted symbol is $x(t)$ . The complex decision variable (DV) can be represented [7] as- $G = \sum_{l=1}^{L} a_l(t) y_l(t)$ with consideration of ICE. The new DV can be modified by using half plane decision method [8] by turning of the complex DV $G$ with plane angle of $\beta = \pm\left(\frac{\pi}{2} + \frac{\pi}{A}\right)$, A is the constellation size of the modulation scheme used. The new expression obtained is

$$G(\beta) = \Re\left(Ge^{-j\beta}\right) = \sum_{l=1}^{L} G_l(\beta) \quad (3)$$

$G_l(\beta)$ is the decision element at each branch. Considering half plane decision method [2],

$$\gamma_{ICE}^{MRC} = B(\beta)\sum_{l=1}^{L} \gamma_l \text{ where,}$$

$$B(\beta) = \frac{|\rho_l|^2 \cos^2(\Delta\theta_l - \beta)}{\left[\left(1 - |\rho_l|^2\right)\overline{\gamma}_l + 1\right]}, \gamma_l = \frac{E_b}{N_0} \alpha_l^2$$

The instantaneous SNR PDF in (1) can be regenerated using ICE as-

$$f(\gamma) = \frac{\alpha\mu^\mu \gamma^{\frac{\alpha\mu}{2}-1} B^{\frac{\alpha\mu}{2}-1}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu}{2}}} e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}} B^{-1} \quad (4)$$

The CDF of the expression can be written as

$$F(\gamma) = \int_0^\gamma \frac{\alpha\mu^\mu \gamma^{\frac{\alpha\mu}{2}-1} B^{\frac{\alpha\mu}{2}-1}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu}{2}}} e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}} B^{-1} d\gamma \quad (5)$$

The above integral can be solved by using [9, 3.381]

$$F(\gamma) = \frac{1}{\Gamma(\mu)} g\left(\mu, \mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}\right) \quad (6)$$

where, lower incomplete gamma function is $a(\mathrm{g,h}) = \int_0^h x^{g-1} e^{-x} dx$ by taking of $\Gamma(\mu)$ as gamma function. The highest transmitting antenna for TAS/MRC system can be selected by corresponding highest received SNR and kind of MRC technique is used at the receiver. The PDF of received SNR in such a system assuming all $\left(|x_{m,k}|\right)$'s are to be iid and can be given by [3] as

$$f_{\gamma_{(L)}}(\gamma) = \mathrm{L}F_\gamma(\gamma)^{L-1} f_\gamma(\gamma) \quad (7)$$

Eq (7) holds true for both TAS/MRC as well as TAS/SC systems. For TAS/MRC systems, L is transmitting antenna whereas TAS/SC, L = TR. Where T is the transmitting antenna and R is receiving antenna. Putting the values of eq. (4) and (6) in eq. (7), the SNR PDF can be written as

$$f_{\gamma_{(L)}}(\gamma) = L \left[\frac{g\left(\mu, \mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}\right)}{\Gamma(\mu)}\right]^{L-1}$$

$$\times \left(\frac{\alpha\mu^\mu \gamma^{\frac{\alpha\mu}{2}-1} B^{-\frac{\alpha\mu}{2}}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu}{2}}} e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}}\right) \quad (8)$$

On making mathematical rearrangement, we obtain

$$f_{\gamma_{(L)}}(\gamma) = \frac{L\alpha\mu^\mu}{2\Gamma(\mu)^L \overline{\gamma}^{-\frac{\alpha\mu}{2}}} \gamma^{\frac{\alpha\mu}{2}-1} B^{-\frac{\alpha\mu}{2}} e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}}$$

$$\times \left\{g\left(\mu, \mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)\right)\right\}^{L-1} \quad (9)$$

Writing the incomplete gamma function in series using [10] as

$$f_{\gamma_{(L)}}(\gamma) = \frac{L\alpha\mu^\mu}{2\Gamma(\mu)^L \overline{\gamma}^{-\frac{\alpha\mu}{2}}} \gamma^{\frac{\alpha\mu}{2}-1} B^{-\frac{\alpha\mu}{2}} e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}}$$

$$\times \left[\Gamma(\mu)\left(\mu\left\{\frac{\gamma B^{-1}}{\overline{\gamma}}\right\}^{\frac{\alpha}{2}}\right)^\mu e^{-\mu\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}}}\right]^{L-1}$$

(10)

On making mathematical rearrangement, the above equation is obtained sequentially-

$$f_{\gamma_{(L)}}(\gamma) = \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu L}{2}}} \gamma^{\frac{\alpha\mu L}{2}-1} B^{-\frac{\alpha\mu L}{2}} e^{-\mu L\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}} \quad (11)$$

$$f_{\gamma_{(L)}}(\gamma) = \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu L}{2}}} \gamma^{\frac{\alpha\mu L}{2}-1} B^{-\frac{\alpha\mu L}{2}} e^{-\mu L\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}}$$

$$\times \sum_{h_1=0}^\infty \sum_{h_2=0}^\infty \cdots \sum_{h_{L-1}=0}^\infty \frac{\mu^{\sum_{i=1}^{L-1} h_i} \left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha}{2}\sum_{i=1}^{L-1} h_i}}{\left\{\prod_{i=1}^{L-1}\Gamma(\mu+h_i+1)\right\}}$$

(12)

$$f_{\gamma_{(L)}}(\gamma) = \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu L}{2}+\frac{\alpha}{2}\sum_{i=1}^{L-1} h_i}} e^{-\mu L\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}}$$

$$\times \sum_{h_1=0}^{\infty} \sum_{h_2=0}^{\infty} \cdots \sum_{h_{L-1}=0}^{\infty} \frac{\mu^{\sum_{i=1}^{L-1} h_i}}{\left\{ \prod_{i=1}^{L-1} \Gamma(\mu + h_i + 1) \right\}}$$

(13)

## 3. Consideration of Ice-Average Bit Error Rate

Bit Error Rate (BER) of particular system depends on both fading distribution and type of modulation techniques have been used. The digital communication system for M-array modulations, the SNR-PDF receiver output of ICE-ABER can be accomplished by considering the average of the conditional bit error rate. Expression of imperfect channel-ABER for M-QAM modulation with L-MRC over Hoyt fading is derived in [16]. Its utilized in this work.

$$P_e = \int_0^{\infty} P\left(e \middle| \gamma_{MRC}\right) f_{\gamma_{MRC}}\left(\gamma_{MRC}\right) d\gamma_{MRC}$$

(14)

where, conditional BER modulation scheme-$P\left(e \middle| \gamma_{MRC}\right)$. The conditional BER expression for coherent modulation can be written as

$$P\left(e \middle| \gamma_{MRC}\right) = a Q\left(\sqrt{b \gamma_{MRC}}\right) \text{ (15)}$$

where, a and b are the variable parameters used for different modulation schemes.

The incomplete gamma-function can be stated as $Q(.)$ and it can be written as by using equation (15),

$$P\left(e \middle| \gamma_{MRC}\right) = \frac{a}{2\sqrt{\pi}} \Gamma\left(\frac{1}{2}, \frac{b \gamma_{MRC}}{2}\right) \text{ (16)}$$

Putting the values of eq. (13) and eq. (16) in eq. (14), the ABER expression can be derived in terms of $\gamma$,

$$P_e = \int_0^{\infty} \frac{a}{2\sqrt{\pi}} \Gamma\left(\frac{1}{2}, \frac{b\gamma}{2}\right) \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\gamma^{-\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i}} e^{-\mu L\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}}$$

$$\times \sum_{h_1=0}^{\infty} \sum_{h_2=0}^{\infty} \cdots \sum_{h_{L-1}=0}^{\infty} \frac{\mu^{\sum_{i=1}^{L-1} h_i}}{\left\{ \prod_{i=1}^{L-1} \Gamma(\mu + h_i + 1) \right\}}$$

$$\times \gamma^{\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i - 1} B^{-\frac{\alpha\mu L}{2} - \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i} d\gamma \text{ (17)}$$

$$P_e = \frac{a}{2\sqrt{\pi}} B^{-\frac{\alpha\mu L}{2} - \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i} \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\gamma^{-\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i}}$$

$$\times \sum_{h_1=0}^{\infty} \sum_{h_2=0}^{\infty} \cdots \sum_{h_{L-1}=0}^{\infty} \frac{\mu^{\sum_{i=1}^{L-1} h_i}}{\left\{ \prod_{i=1}^{L-1} \Gamma(\mu + h_i + 1) \right\}}$$

$$\times \int_0^{\infty} \gamma^{\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1}h_i - 1} \Gamma\left(\frac{1}{2}, \frac{b\gamma}{2}\right) e^{-\mu L\left(\frac{\gamma B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}} d\gamma \text{ (18)}$$

Solving the integral using [9, (6.455.1)],

$$P_e = \frac{a}{2\sqrt{\pi}} B^{-\frac{\alpha\mu L}{2} - \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i} \frac{L\alpha\mu^{\mu L}}{2\Gamma(\mu)\overline{\gamma}^{-\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i}}$$

$$\times \sum_{h_1=0}^{\infty}\sum_{h_2=0}^{\infty}\cdots\sum_{h_{L-1}=0}^{\infty} \frac{\mu^{\sum_{i=1}^{L-1} h_i}}{\left\{\prod_{i=1}^{L-1}\Gamma(\mu+h_i+1)\right\}}$$

$$\times \frac{\left(\frac{b}{2}\right)^{0.5}\Gamma\left(\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i + 0.5\right)}{\left(\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i\right)\left(\frac{b}{2} + \left(\frac{\mu L B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i + 0.5}\right)}$$

$$\times {}_2F_1\left(\begin{array}{c} 1; \frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i + 0.5; \frac{\alpha\mu L}{2} + \frac{\alpha}{2}\sum_{i=1}^{L-1} h_i + 1; \\ \dfrac{\mu L\left(\dfrac{B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}}{\dfrac{b}{2} + \mu L\left(\dfrac{B^{-1}}{\overline{\gamma}}\right)^{\frac{\alpha L}{2}}} \end{array}\right) \quad (19)$$

which is the expression for the ABER of TAS-MIMO system under $\alpha - \mu$ fading channel for M-QAM modulation with ICE.

## 4. Results and Discussion

The numerical evaluation results are discussed in this section by chosen of two fading parameters such as α, μ. Fig.1 shows the BER performance of 8-QAM, 16-QAM and 32-QAM with respect to different μ values while keeping $\alpha$, $\Delta\theta$, and $\rho$ are constant. The values has been calculated for L = 3. The numerical results has been evaluated and analysed for ABER with error estimation. In fig 1, QAM system with ICE for a TAS/MRC system graph was plotted for various fading parameters (μ) . In fig. 2, the values has been plotted for different number of transmit antenna of QAM system keeping all the other parameters constant for TAS/MRC system. In fig. 3, varying the values of fading parameter μ, the results have been plotted for a QAM system with ICE for TAS/SC system considering transmit antenna T = 2 and the number of user K = 2 keeping constant the number of receiver antenna. Fig. 4 shows the comparison of ABER of QAM system with ICE for TAS/SC and TAS/MRC system with T = 1 and K = 2 and μ = 1 and 2. It has been observed that the performance of system cna be enhanced for TAS/MRC as compared to TAS/SC system.
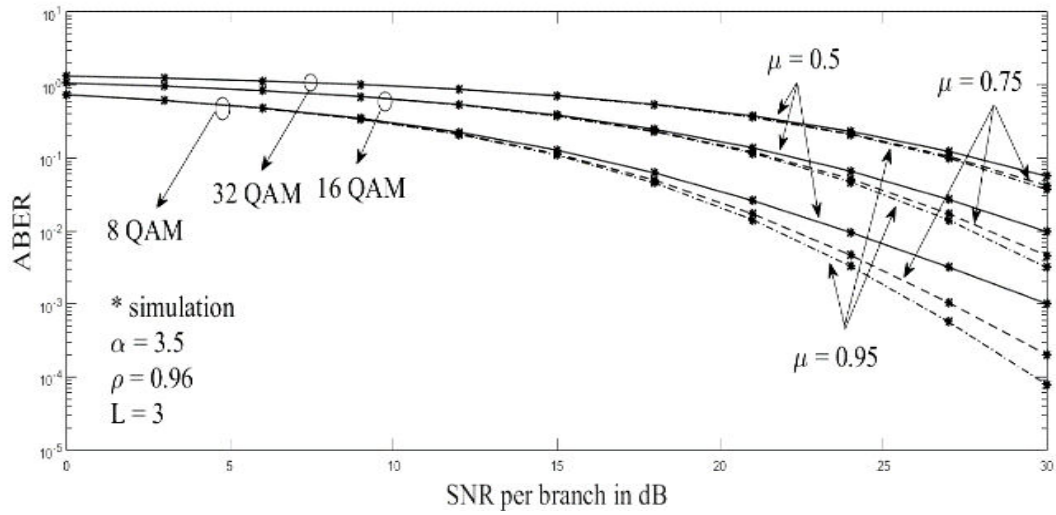
Figure.1 QAM system with ICE & ABER performance for TAS/MRC system
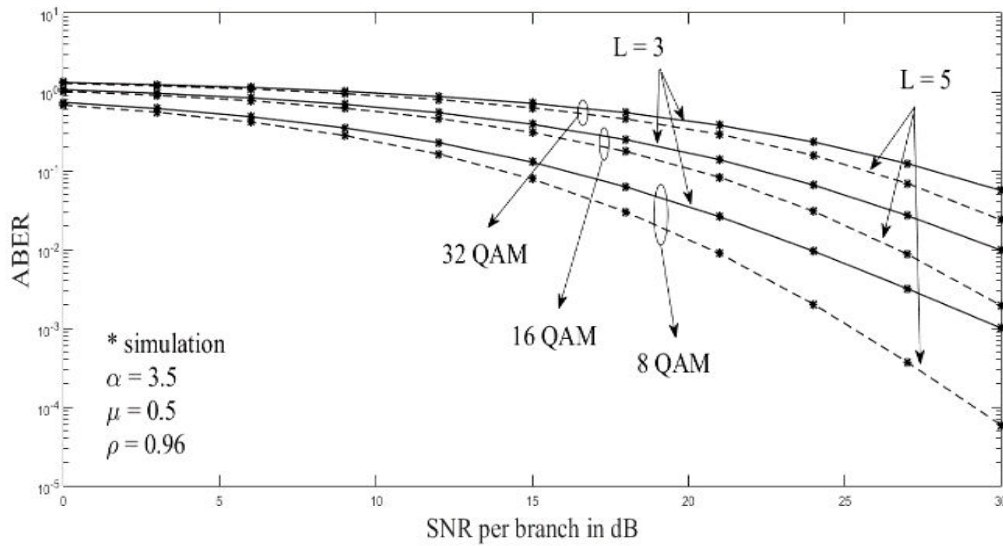


Figure. 2 QAM system with ICE & ABER performance for TAS/MRC system
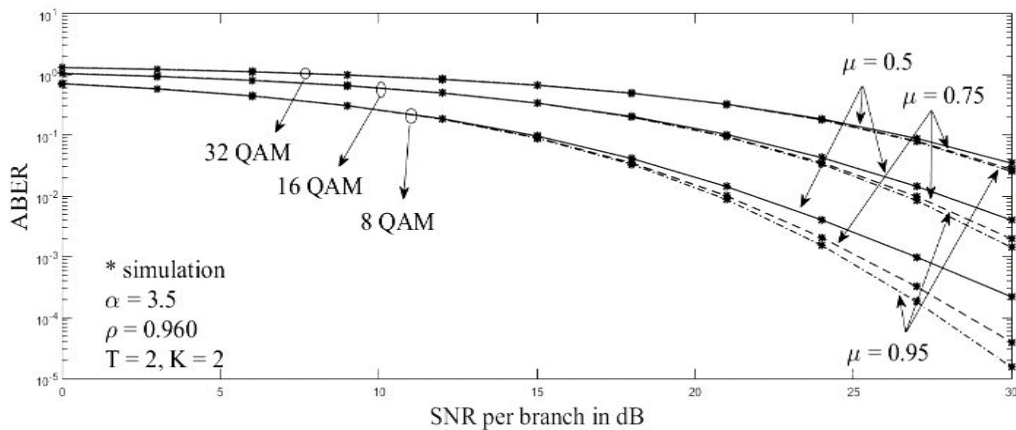


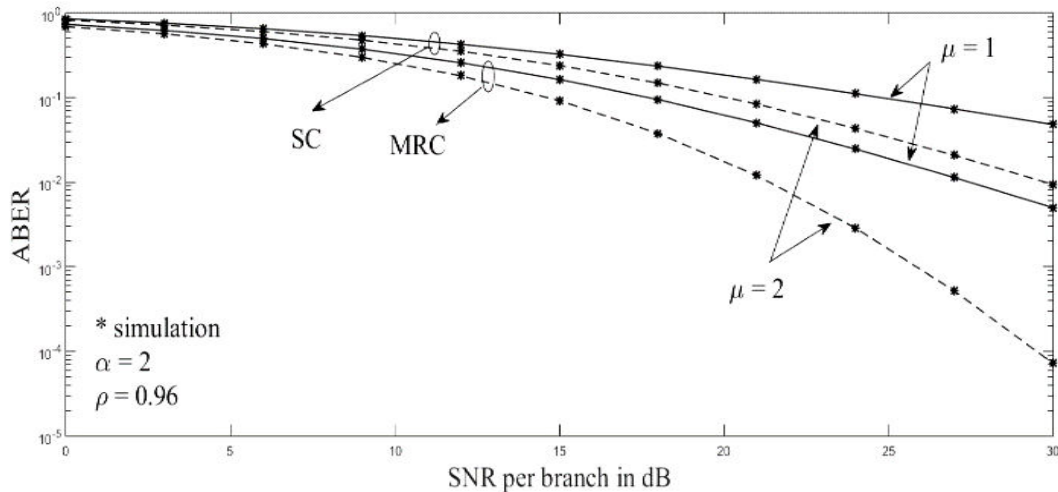Figure. 3 QAM system with ICE & ABER performance for TAS/SC system

Figure. 4 TAS/SC and TAS/MRC system ABER comparison with ICE for 8- QAM system

## 5. Conclusion

The ICE-ABER performance of two systems TAS/SC, TAS/MRC over $\alpha - \mu$ fading channels were discussed. The expressions have been derived for the closed confluent hyper geometric functions. It has been observed that the performance of ABER improves for both 8-QAM and 16-QAM system as compared to 32-QAM with the increase in fading parameter μ for both TAS/SC and TAS/MRC system. The values of both transmit antenna and the user increases for TAS/SC systems and the performance of ABER can be improved. The method employed has been verified by using Monte Carlo simulations.

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# METHOD TO IDENTIFY COVID19- CLINICAL SYMPTOMS

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## ABSTRACT

*The covid pandemic became one of the major challenge for everyone one of us. Due to the increase of number of cases unpredictable features are identified in our body which are not even able to predict by the professionals. And which results in having a major effect on vital organs mainly heart pumping, clotting of blood .we recommend a technique to identify and detect the presence of virus by using deep neural network. This method helps to alleviate the overabundance of radiologists efforts to recognize effected organ. Currently the technique we are using for Identification of virus is transcription polymers chain reaction. Draw backs of chest Radio analysis it cannot identify the early stages of covid -19. Identification of covid cases by using deep learning techniques and the review of the person put together by deep learning algorithm . And we clearly predicts that our advanced technique has an perfection of 98.08% and 87.02%,Therefore ,it helps in seperation of virus infected person from non – infected body.*
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*Keywords: CNN, alleviate, virus detection, CAD system, Deep learning.*

## Introduction

Current prerequisites of medical sector are focusing to supply the citizens with a cautious way of living by eradication of death dealing complaints. Due to many unconditional and unavoidable causes long-term and contagious diseases are growing among the people around the world. Among these diseases, mostly some can be fully cured at the early age by diagnosing . And regarding the severity of illness the victim can drop by the health Centre for identification and detection of syndrome. In contradiction to other health complaints, the syndrome which is present inside the body is serious and consequently in addition more methods commencing for identification of diseases and its condition and initiating the required treatment for handling and curing the disease. In our body the respiratory system can be damaged due to the adverse effect on the lungs and may lead to the death from untreatable lung syndrome.Lung fever and other infectious disease caused by bacteria such as tuberculosis are main defects of lungs. Besides, some of the microorganisms like virus ,bacteria and fungi cause to minimal and severe diseases by contamination in the lung. And can be recommended to get a medicine for healing the illness.

The pulmonary specialists will advise the required range of diagnostic technique to identify the nature and origin of the syndrome when the victim is warded in the hospital due to the reason of respiratory infection. Numerous techniques are used to measure the complete blood count and arterial blood gas (ABG) test and plural effusion it is also called water on the lungs are adapted in lab analyses.Over 4,00,000 victims of this pandemic were identified and 2,50,000 where passed over due to the covid-19 by 5 may 2020, this covid-19 brought a utmost consequences on human life which resulted in decrease of economic growth.

Currently used technique is reverse transcription polymerase chain reaction (RT-PCR). Pre - identification and detection are recognised by vital task of cardiac radiographic images such as X-rays. Features can be identified from the examination from the radiological pictures of victims because of shallow RT-PCR perceptivity off 61-71%. CT is a evitable method of identification of covid-19 lung fever (pneumonia) and be able to act as recognising agent as well as RT-PCR . Regarding CT outcomes symptoms are observed from first one or two days and the CT indicates normal stage. The factors at most serious sickness of lung is detected after 10 days after appearance of symptoms of the victim suffering from covid-19.

Fig: Diagram for RT-PCR architecture.



Fig : Applications of deep learning network

During at early stages of pandemic Chinese medical hubs were insufficient of testing kits which often predicts incorrect and negative results . So specialists are recommended to identify with the help of CT reports. Scientists also analysed that the CT findings can also helpful in detection of pre- stages of covid-19 by combining properties of clinical image with the findings of laboratory. The radiographical pictures accumulated from the cases of covid-19 given a helpful scientific details. Important things ware discovered by researchers from covid-19 imaging studies in a covid-19 victim.

The techniques used in automatic diagnosis by the help of machine learning in the medical sector has a quite standards by playing the vital role besides physicians.Deep learning is most favoured artificial intelligence sector which helps in expansion of end to end archetype. To achieve reliable results by making use of input details without requirement of physical extraction of properties. There are many applications of deep learning which had a positive outcomes. such as, arrhymicdetection, brain disease classification, skin cancer classification, pneumonia detection.

Due to the rise of cases deaths are being increasing ,to decrease this epidemic situations we need sufficient skills in the area on the basis of AI method and automatic detection system elevated a great influence on medical field. Due to the lack of professionals in radiology department it is a major challenge as to assign a specialists for every health Centre simple, fast and helpful  AI methods play a major role to overcome these pandemic situation and contributes patient with consistent aid. An specialists in radiology department place a significant importance. A technology in radiography helps to attain scientific results. Besides, it is also helpful in lowering the disadvantages like deficient availability of RT-PCR kits,Cost of examination, and time delay for waiting test results.not long ago , of the extreme images were used for the identification of covid-19 syndrome so as to identify and detect the covid-19 in x-ray images. One of the scientist named the use of models of deep learning and we recommended model called COVIDX-Net. It is a model with consists of seven convolutional neural networks (CNN) model. The leading purpose of this model is it provides the precise amount for the identification of patients X-rays  who is suffering with covid- 19 through CNN.
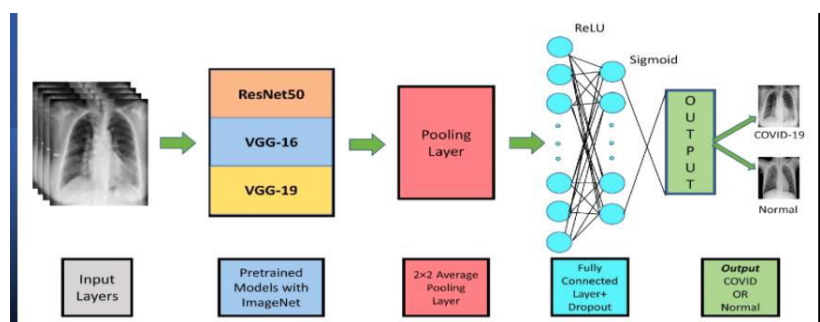


Fig :Daigram and Work Flow for the Detection of Covid -19 by Applying CNN Model.

X-rays are more preferable than CT scan beacause the main moto beyond this preference is the availability of x-ray machines is more in hospitals. And also the other reason CT scan machine cost more than the X-ray machine. Additionally x- ray images contain less ionizing radiations than CT scan.
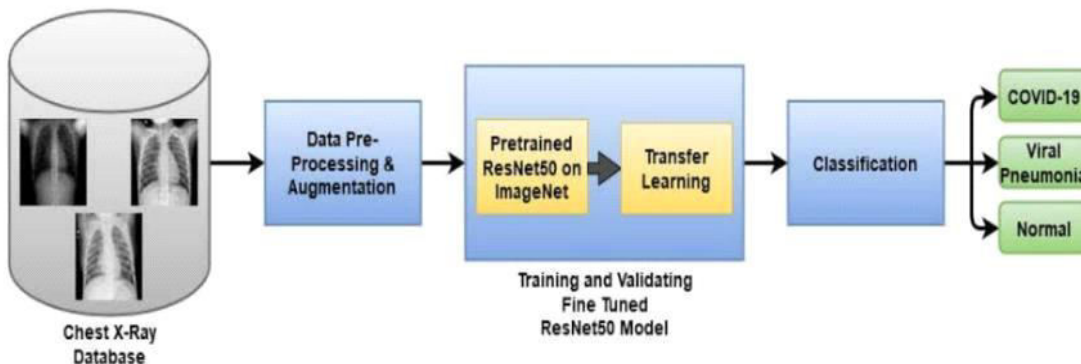


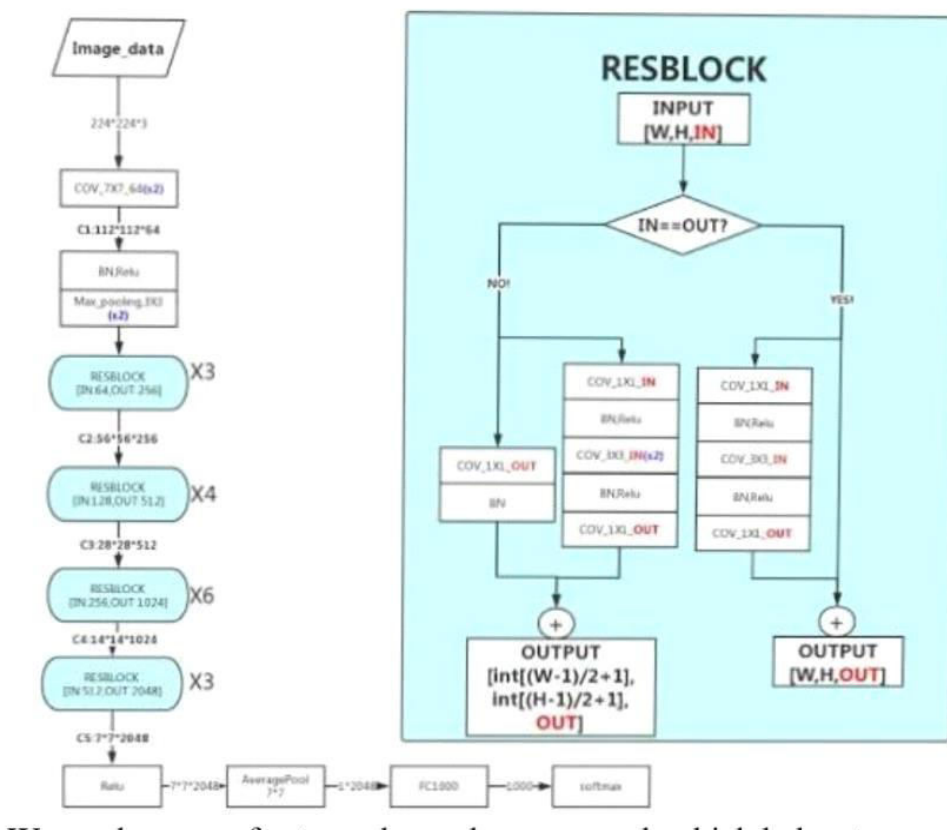Fig: identification of covid-19 from x-ray images of patients.



Fig : Flow chart for proposed technique.

We made a use of extremely modern approach which helps to categorize the individual with covid 19 with architecture named Resnet-50. We preferred architecture named Resnet-50 because it has a very positive outcomes from every part of imaging medical

**Data Extraction and Methods**

We made a use of generally available data which includes both covid images of x rays and images of normal x rays . As shown in below the figure represents the lung which is

not affected by virus whereas in figure 2 we can identify the virus affected organ.



• THE LUNG WHICH IS NOT EFFECTED DUE TO VIRUS

• THE LUNG WHICH IS EFFECTED DUE TO VIRUS
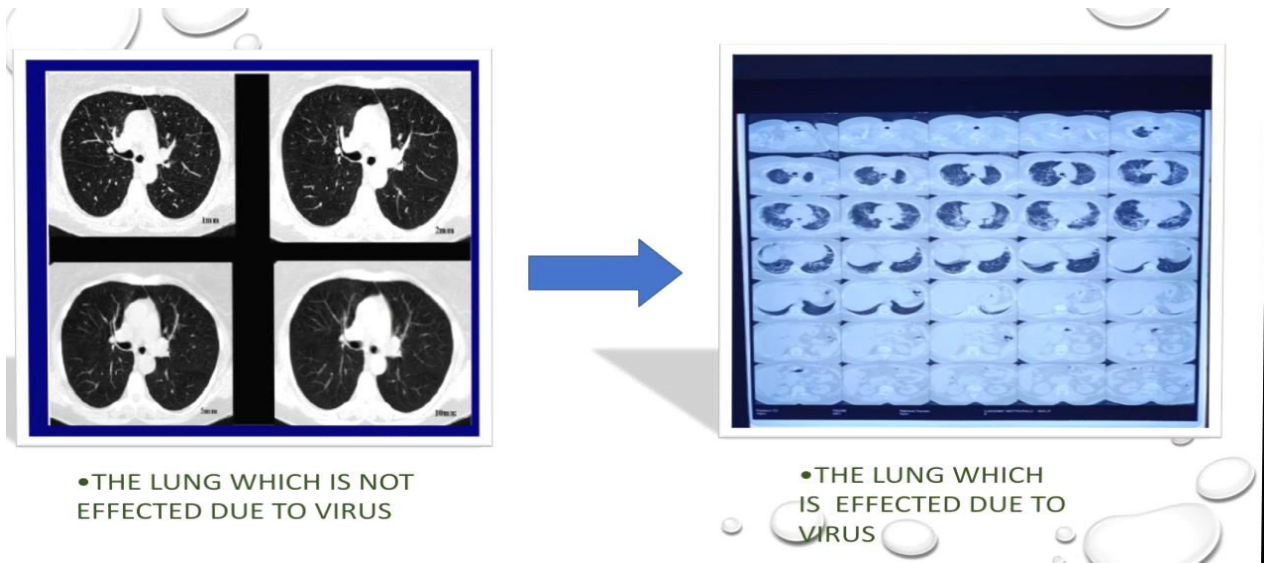
**Detection of Corona Virus**

**Architecture Used**

In this learning the CNN model is helpful for categorizing the images as it is either normal or covid affected and depicted in this area. Initially the co-occurance by the used architecture we identify all the images as 224×224. As described above we used Resnet-50 for the purpose of transition learning. Due to well secured network it helps in maintaining the wealthy awareness for various facts from earlier trainings. Especially for classification of image base issues, the mentioned proposals have proved that it is mostly successful. The model used for evaluating DL algorithm is cross validation. This qualitative study provides a useful estimator performance.
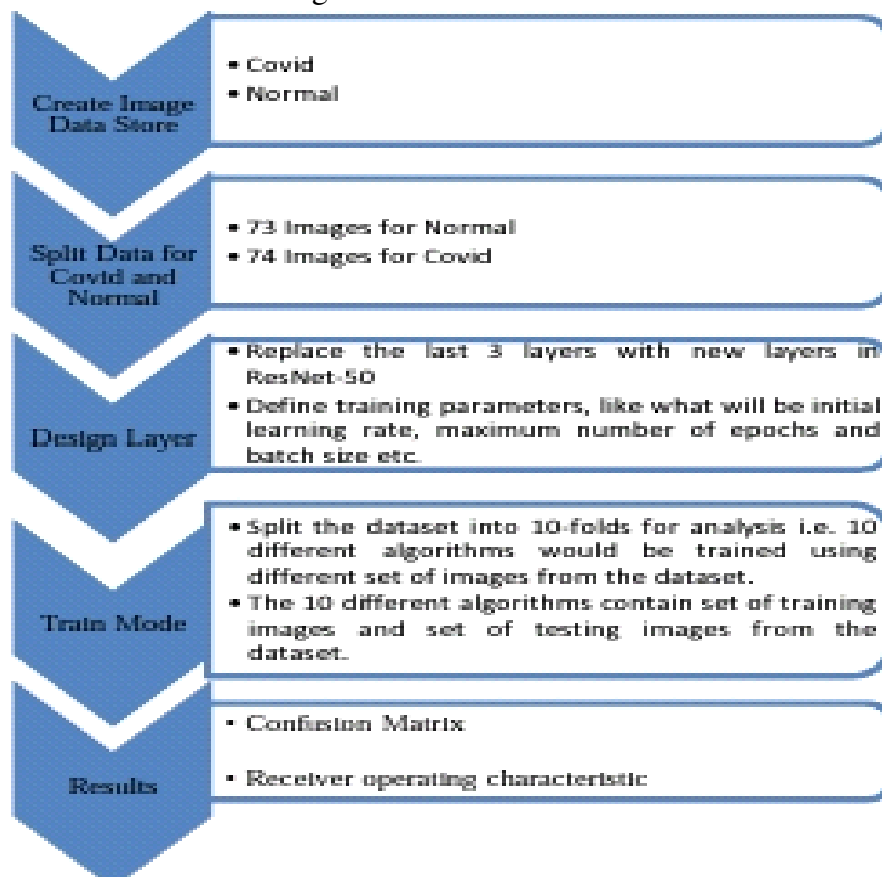


Fig : Flow chart for proposed algorithm.

## Conclusion

Even though the RT PCR tests are regarded as the high graded for covid-19 detection but due to its time taking process to finalize the decision because it shows the incorrect and false results .consequently medical imaging models like CT scans and X rays have main alternative methods for scientists chest radiography consist of less price and also radiation dose is very less. It is the most commonly available machine in every health centre .The analysis represents a complete study of present using solutions generally based on techniques of Deep Learning for Pre identification of Covid-19 .we trust that by the help of more data availability more desirable deep learning can be upgraded for detection and reducing the covid-19 precisely .Artificial Intelligence method can be used for creation of more number of quick robot and independent machines makes a great support for health centres and also helps in reducing the overburdance of professionals, distribution of foods and by helping both staff and patients also many required task .But the major dispute regarding this process is lack of confidence and trust on independent machines most of us acquitted by the serving of humans. lastly ,the major thing we need to concentrate that to decrease the incorrect and false the predicting results and helps in getting the most possible accurate and true outcomes.

**Table: Tabular form for Obtained Accuracy Tests.**

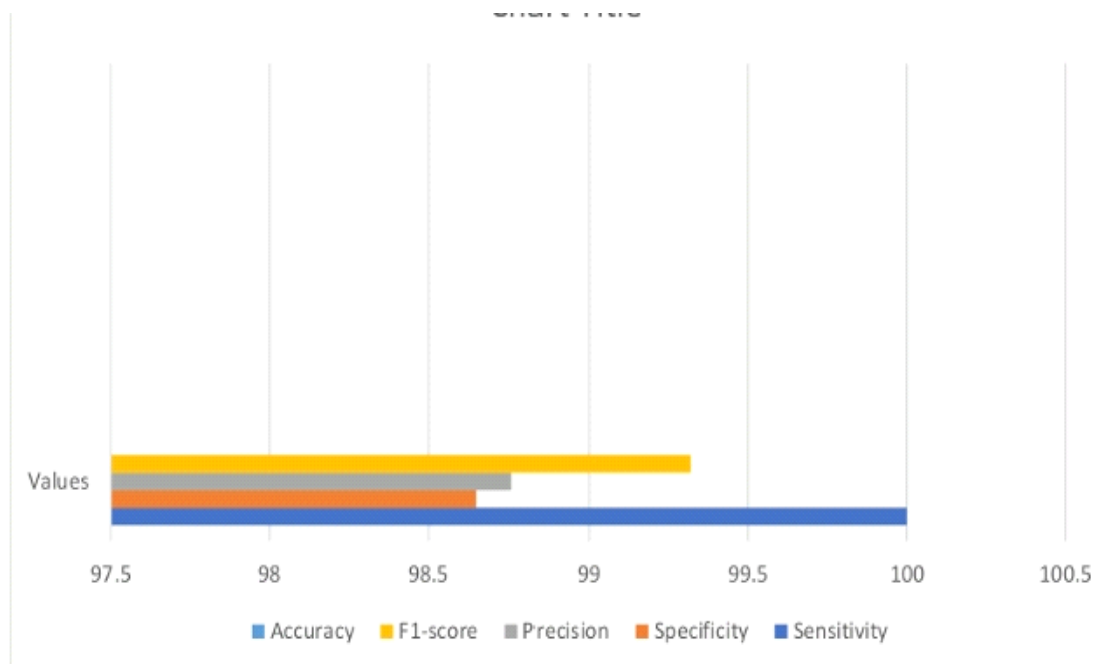| FOLDS | SENSITIVITY | SPECIFICITY | PRECISIION | F1-SCORE | Accuracy |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0.8750 | 0.8750 | 0.9333 | 0.9333 | 0.9333 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0.9865 | 0.9865 | 0.9932 | 0.9932 | 0.9932 |



Fig: Graphical Representation of Obtained Accuracy.

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# MACHINE LEARNING BASED VILLAGE MARKETING MOBILE APP C2C FOR FARMERS TO SELL THEIR GOODS

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## ABSTRACT

*Innovation of IoT in the Agriculture field, farmers are using different types of technologies and methods for improving productivity of the crops by smart irrigation, smart farming. But they are facing so many problems while selling their goods like price, on time sales and etc. Existing business models like C2C,B2C,,B2B are supporting to a mediators for gaining more than the farmers. Proposed Machine Learning based Village Marketing mobile App provides facilities to sell their goods directly to firm with expected price and exact time without involvements of mediators. Proposed system improves the former likelihoods by finding the opt buyers using Gradient descent ML algorithm. Observed that GD-ML method is 99.8% accuracy and Also, Conclude that  Impact of COVID-19, proposed farmer friendly Mobile App is essential to overcome the current scenario.*

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*Keywords: Village marketing, Mediator, Platform , Company, Farmer, Application, Connection, Selling, Buying.*

## Introduction

In most of the countries generally people are depending on agriculture sector in major portion. Not only in India, but also in some of the countries like Vietnam, China , Banglades,Srilanka,..etc their economy depends on agriculture sector in major portion. Farmers are playing key role in their countries GDP and development. But from the last two decades the number of farmers  in all countries are gradually decreased. This is because there is a big boom of migration from agriculture sector to other sectors like service sector and industrial sector. These two sectors (industrial sector and service sector) are very important for any country for their development. But in the same manner we can also increase the agriculture sector with modern techniques and provides some benefits to farmers to increase their productivity  and fix some MSP. According to the some of the reports the migration of people from agriculture sector other sectors is gradually increasing and is nearly of 5% in each year. Technologies are developed for decreasing the hard work but not decreasing the work. It is clearly visible in agriculture sector. In all countries production is also increasing gradually in every year but the number of farmers doing farming is decreasing. This is because there is no standard platform for farmers to sell their crops. Not only in India in so many countries, farmers are facing this type of problems. This is a biggest problem in every country and all country governments are trying to implement some schemes to help farmers but they are not come into force. In some countries, some of the implementations like minimum selling price MSP is introduce . But this is also not giving good results.

Every year nearly 9000 of Indian farmer are losing their lives due to some of the economical problem. Farmers are increasing their productivity day by day. But there is no increment in there economical background and there is no change in there life. There is a good price for all products in the market nowadays. But it does not help to the farmers. This is because farmers selling their crops through a mediator other consumer sir companies. Because farmers they don't know where companies are established. what is the price of the product .what is the requirement of the market. What is the price fixed by company. So that's why they are selling their crops through a mediator. Companies also facing this type of situation. Companies are also they don't know where farmers are selling their crops. Where a required product is are available. So that's why companies  are also buying through a mediator. Due to this the price any product is gradually increasing and this increase in price can be taken by mediator only. Now I can explain with an example. In a small village named xyz there are 100 farmers. These farmers are

cultivating paddy and wheat every year. They are producing nearly 100 bags by every farmer. So in that village there are 10,000 pad bags and 10,000 wheat bags are available. But they don't know where to sell these crops. So they are selling these crops to other companies or consumers through mediator. So this Mediator and can take crops from farmers at a price half 1000 per bag. But this mediator sale to a company at a price of 1800 per bag. After that company makes that crop as a product and market with price of 2500 bag. Companies are selling their products into marketWith more

prices. This is because  company also taking crop from mediator at  higher price. So here are both farmers and company not getting benefit. Here mediator only getting more benefit. So farmer losing 800 rupees per bag and a company  also taking crops from mediator and losses 800 rupees per bag. Due to this most of the startup companies are are not working properly. They are stopping their companies due to losses because of higher price of buying through a mediator. Here we have some of the bar diagrams which can gives a clear vision of Present agriculture situation in the world.
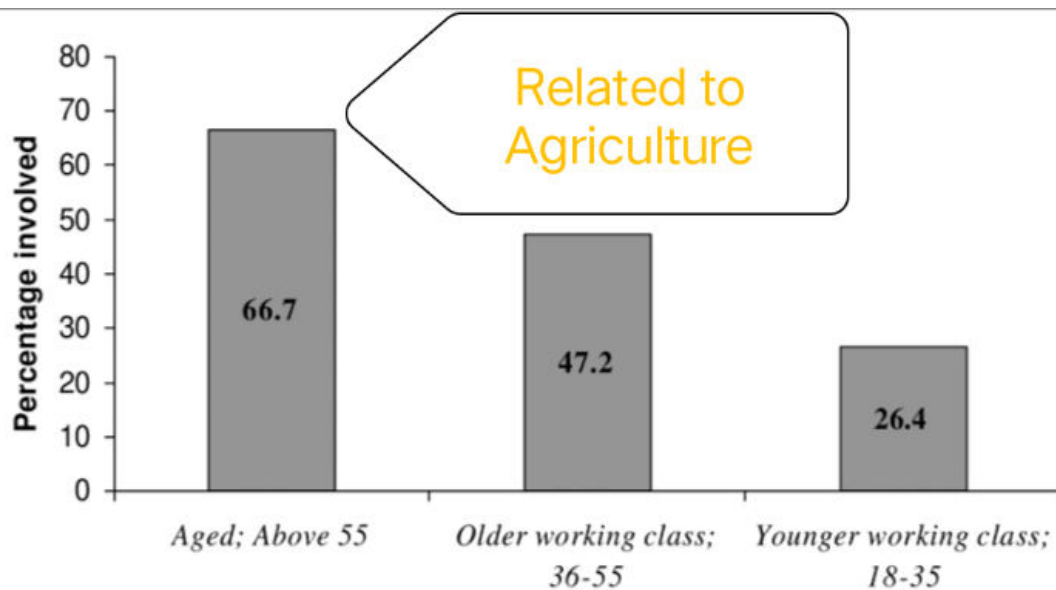


Figure1. .Bar graph of different age groups participation in agriculture sector

.This bar diagram clearly shows that only above 55 age person are in agriculture sector in aged person with 66.7% after that people between 36 to 55 are in the range of 47% and the working classes between 18 to 35 adjust only 26 percentages. This is clearly shows that within 10 to 20 years there is no farmer . Not only in India there is no farmer in the world. Due to this farmers are protest  for MSP in India .

### Review of Existing System

 In the present situation, there is no  existing system for farmers to connect with company. But there is a one system named FUSION INFORMATICS App which connects farmer directly with consumer. This app was developed for both Farmer and consumers. The main intension of this app is to provide fresh vegetables and products for consumers and also

to help for farmer's .But when the result came into force was completely disappointed. Because farmers have not that much of time and  capability to deliver this products. One of the major disadvantage of this app is it is working for only vegetables  but this app is not suitable for farmers. This app is suitable for only agricultural products only. So there is no platform for farmers to sell their crops. This is the main disadvantage in agricultural field.

The present system in agriculture sector is farmer can sell their products to  company or consumer through a mediator only. That's why farmers in India and in world  are facing so much difficulty in agriculture. This situation will continue for few years then there is no farmer in the world. The present system in the agriculture sector is Represented with flowchart below.
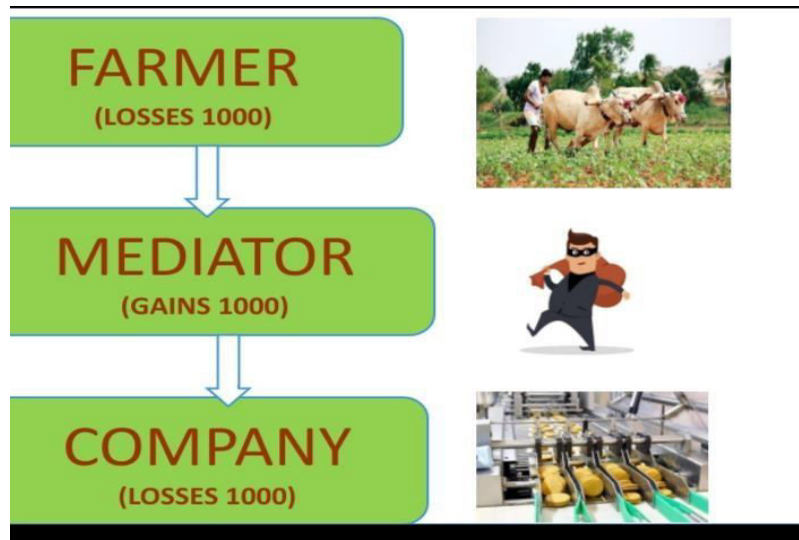
Figure2.Flow chart of how farmers are losing during selling their crops.

The given flowchart explain with an example. Suppose a farmer is cultivating 1 bag of wheat. So after completing of the crop farmer wants to sell this crop. But he don't know where to sell his crop. So this demerit helps to a mediator for gaining more amount than farmer and company. So farmer can sell their crops to a mediator. This mediator taken this one bag of wheat at a price of 1000 rupees. After that this mediator can sell this crop to a company at a price of 2000 rupees. So here both farmer and company losing 1000 rupees per bag. She is completely destroying agricultural sector. Every year production is high prices are also high but farmers percentage is decreasing. This is because this whole again is enjoyed by mediator in major portion. So to avoid this situation in present society and in agriculture sector we can want to come within system which helps farmers to sell their crops. The drawbacks of the present system in agriculture sector is explained in below table.
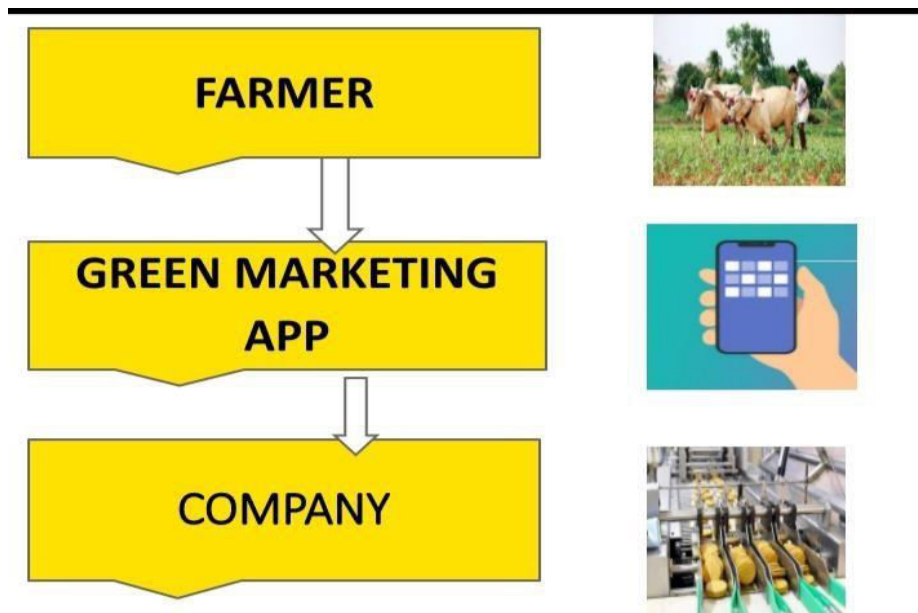
**Proposed system**



Figure3.proposed system

For avoiding the hurdles faced by farmers during selling their crops, we are introducing strong platform for farmers to sell their crops. Our system is app based system. This project is completely app based system . Project title is village marketing. . This project creates a

strong platform for farmers by connecting farmers with company directly. The main theme of this application is to connect farmer with company directly. To avoid this mediator between farmer and company we are proposing this project. Now we discuss about how this village marketing app works. The application interface contains some information. The first interface contains login and register options. If you are already a user then login in, otherwise register now by clicking the register button. After your Registration it will Move to next interface . The next interface contains farmer and company option. If you are a farmer then click on farmer option. After that the next interphase contains company name, crop name, price per kg , requirement of a company, company details like location phone number distance between you and the company location and etc.

In that interface We have crop name and price per KG. If a farmer can see this interface, if he was satisfied with the price available in village marketing app then he will directly contact to the company officials according to the details which are available in the village marketing app. The price per KG and requirement of a crop Can be updated by a company according to their requirement by clicking on the

company on the second interface. Suppose a company is buying one bag of Paddy from a mediator at a price of ₹2000 per bag.Then this company can fix a rate of ₹1700 per bag in village marketing app.

So company saves 300 per bag. This is helps to a company to get crops at a low price .It is very useful for startup companies. Here farmer also getting ₹700 more when compared by selling through a mediator per bag.So here both farmer and company are getting more amounts. So this village marketing application helps both of them a lot. If a farmer successfully informed to company according to the details which are available in the village marketing Then company officials are came into farmer's village and farmers fields 2 by their crops. Here farmer no need to go outside for selling their crops. company also no need to check where farmers are available, where crops are available. They Simply see village market app . So this village marketing app helps both farmers and company in great manner.If company taking crops from farmer land they can consume only ₹40 per bag for travelling charges, it may be vary according to the distance between farmer location and company. In the below they have some of the block diagram of our system.
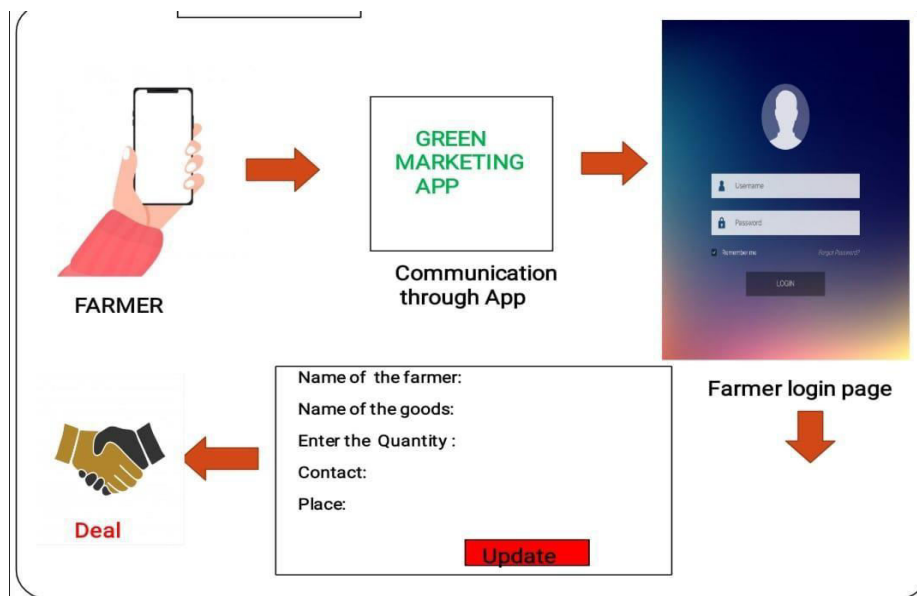


Figure4. Block diagram of Village Marketing  App

In the above block diagram we have the complete information related to the village marketing app.It is clearly explains that there

no other external mediator between them. so it helps to Farmer and company a lot. It is systematic representation of the our proposed

system. firstly,we can move to the farmer which are in the field of agriculture or farmers. it is very useful to earn about the how this app really works. so this is the one of the best one of the less knowledge people.soevery one can use this app with minimum knowedge.firstly the farmer can check the our village marketing app which is helpful for the farmers in the basic knowledge. in that app there is a interface which is having the all product names along with the product name, price, required quantity for the company etc.after that the farm can chose the one company which can give the good price for the farmer andvalso to the local area companies.after your successfully informed to the company by a farmer then he will directly come with the farmers hous.the given below shows that the table representation.

## If you click on Farmer

| S.NO | CROP NAME | QUANTITY REQUIRED | PRICE PER QUINTOL |
|------|-----------|-------------------|-------------------|
| 1. | PADDY | 50000 KG MIN.1000KG | 4000 INR |
| 2. | WHEAT | 60000 KG MIN.2000KG | 5000 INR |
| 3. | POTATO | 1000 KG MIN.100KG | 1000. INR |

If farmer can see the company requirements,if he was satisfied with company price then he will contact Company officials through details given in GREEN MARKETING APP

## If you click on company.

If a company wants any crop,then they will update their requirement in our APP

| S.NO | CROP NAME | QUANTITY REQUIRED | PRICE PER QUINTOL |
|------|-----------|-------------------|-------------------|
| 1. | PADDY | 50000 KG MIN.1000KG | 4000 INR |
| 2. | WHEAT | 60000 KG MIN.2000KG | 5000 INR |
| 3. | POTATO | 1000 KG MIN.100KG | 1000. INR |

Company also update their details like Company name,location,mail id,phone no.etc,,,

Table1.app  interface for farmers and company

**Block Diagram**
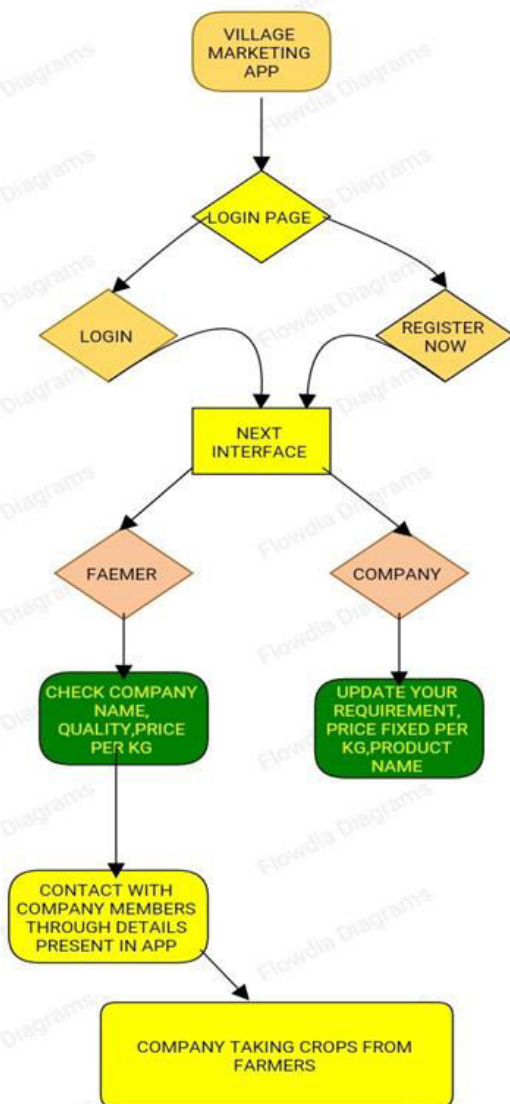


**Analysis of Result**

According to some of the  survey reports ,the number of persons using technology and smart phones is gradually  day by day. Every country is trying to make their nation digitalization. India also one of the fast growing country in the world with gradual incresement  of Technology. As a part of digitalization, farmers are also contributing in great manner.So,farmers have a full of clarity to how to use our village Marketing app.By using this online paltform to sell farmers crops it helps them a lot.Farmers can known what is the demanding product in market.They can also have a price selection option.So it can full fill the idea of Minimum selling Price msp.company also have a great chance to elaborate their business.This village marketing app will also helps to start up companies.Becausr ,if they want to produce any product,forstthey need raw material. So this village marketing app provides and fullfill their needs.When more companies starts using this village marketing app , farmers also have to increase their crop prices. Some of the expected graph of Village Marketing performance.



Figure5.Gradual Increment Of Farmers Economical Condition  By Using Village Marketing App

**Conclusion**

- The machine learning based Village marketing app is an online platform which provides a strong platform for farmers to sell their crops to companies. It will removes the mediator between farmer and company. Only our village marketing app provides a strong medium to sell their crops.

- This is completely app based system which connects farmer directly with companies and provides some confidence to farmers.

- The main feature of this village marketing app is ,farmer have a price selection option. i,e Farmer can choose best company which provides sufficient and proper price for their crops.

- It can also help to startup companies a lot. Suppose a company wants to start a potato chips industry. They don't know where potatos are cultivated intheir surroundings. So our app helps them a lot.

- In this app ,company official can update their requirements like crop name, requirement in Tones, Price efforted by a company to 1 kg, Company details, contact details, etc.

- Like that all companies can update their requirements in village marketing app. It doesn't not make any side effect to anyone.So companies can easily update their needs.

- Whenever a farmer can see the requirements of any Company, price fixed by Company, if he was satisfied with company price then a farmer can directly contact with company officials through the details given in village marketing app.

- After successful intimation of a farmer to Company officials, then the company/Industry members can come to your location and take your crops.

- At the time of Company taking crops from farmers, they can make complete transaction of the crops to farmers according to price fixed in village marketing app

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# FACE SKIN DISEASE CATEGORIZATIO-N USING RESNET.

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## ABSTRACT

*Dermatology, due to its complexity, is one of the most unpredictably and difficultly diagnosable terrains. Large tests are regularly performed in the field of dermatology to determine the pores and skin condition that the patient is suffering. The time can also differ from one practitioner to the next. This is also supported by research primarily based on enjoyment of that character. As a result, there is a requirement for a tool that can diagnose pores and skin illnesses without any of these restriction . We recommend an automatic photo based totally tool for recognising skin ailments that makes use of the system learning class. Many disorders of the skin have very indistinguishable visible attribute, that adds extra demanding conditions to the decision-making beneficial functions based on the image. The correct evaluation as an example illnesses of photographs may improve the evaluation, shortenthe time for diagnostics ,plus result in finer also more therapy that is both affordable and effective for individuals . Here existing device will use a computational method to analyse, relegate and procedure photo facts based aboard the numerous capabilities of the photographs .Filters are used to skin pictures to eliminate unwanted noise and to improve the overall quality of the picture. Using sophisticated methods and The Convolutional Neural Network (CNN) is a type of neural network that (CNN), extract features, Sort the image into categories. Primarily placed entirely about the set with regards to rules of the SoftMax is a type of classifier, as well as the analysis file as a result.*

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*Keywords:  Dermatology, Convolution, Texture, Segmentation, Disease.*

## I.  Introduction

In the present paper, an automation detects the facial skin defects and proposed the recognition system. The facial area and extracts the region of interest, is located by the system automation. To classify the capacity defects into spot like acne and normal skin, the ResNET-based classifier is used.in this research using neural network we have been attempted to expand a prototype to discover the skin diseases. In the choice of the neural network, we have chosen ResNet that is a convolutional network.

## II. Proposed System

In this proposed work, the database is constructed and composed with numerous facial skin pictures of different persons. the pictures are taken from the Dermnet. The images of the skin contamination are considered with the natural parts. It has been visible that the proposed framework yield exactness differs as for skin illness. We have collected more images from the web. More pictures are downloaded on diverse specific infections. On this section the pictures are standardized through eliminating the pigments in the hair and skin, to avoid the confusion in analysis. Also, the picture that is given as the input are now no longer to be of preferred size as needed through affecting proposed algorithmsize as needed. As a result essential so the needed picture size is acquired. In the beginning, to increase the dimensions of our database, using a few pre-processing picture strategies, the pictures are regenerated, gathered from exclusive sources, which were then scaled to in shape the system. Next in the next process these pictures after that, they're utilised for training and validation. Our model can effectively discover 8 facial skin diseases the identification of facial skin diseases and

type is carried out through a pretrained ResNet network model. Its architecture is shaped of 3 sorts of layer they are convolutional layer, pooling layers and absolutely linked layer. To extracts the features the input pictures, pass by the way of a sequencelayers of convolution with filters. After then, there's a non-linear activation feature is utilised. The Rectified Linear Unit (ReLU) is the maximum feature used because it fastens the training section. To

lessen size of their dimensions and therefore overfitting is under handled the developed function maps pass through pooling layers. Maximum or common merging can be carried out. The pictures are categorised the useof a SoftMax activation characteristic, Finally Maximum or common merging can be carried out. The result acquired is deflated after which provided to the absolutely linked surface.

## A. Architecture Diagram
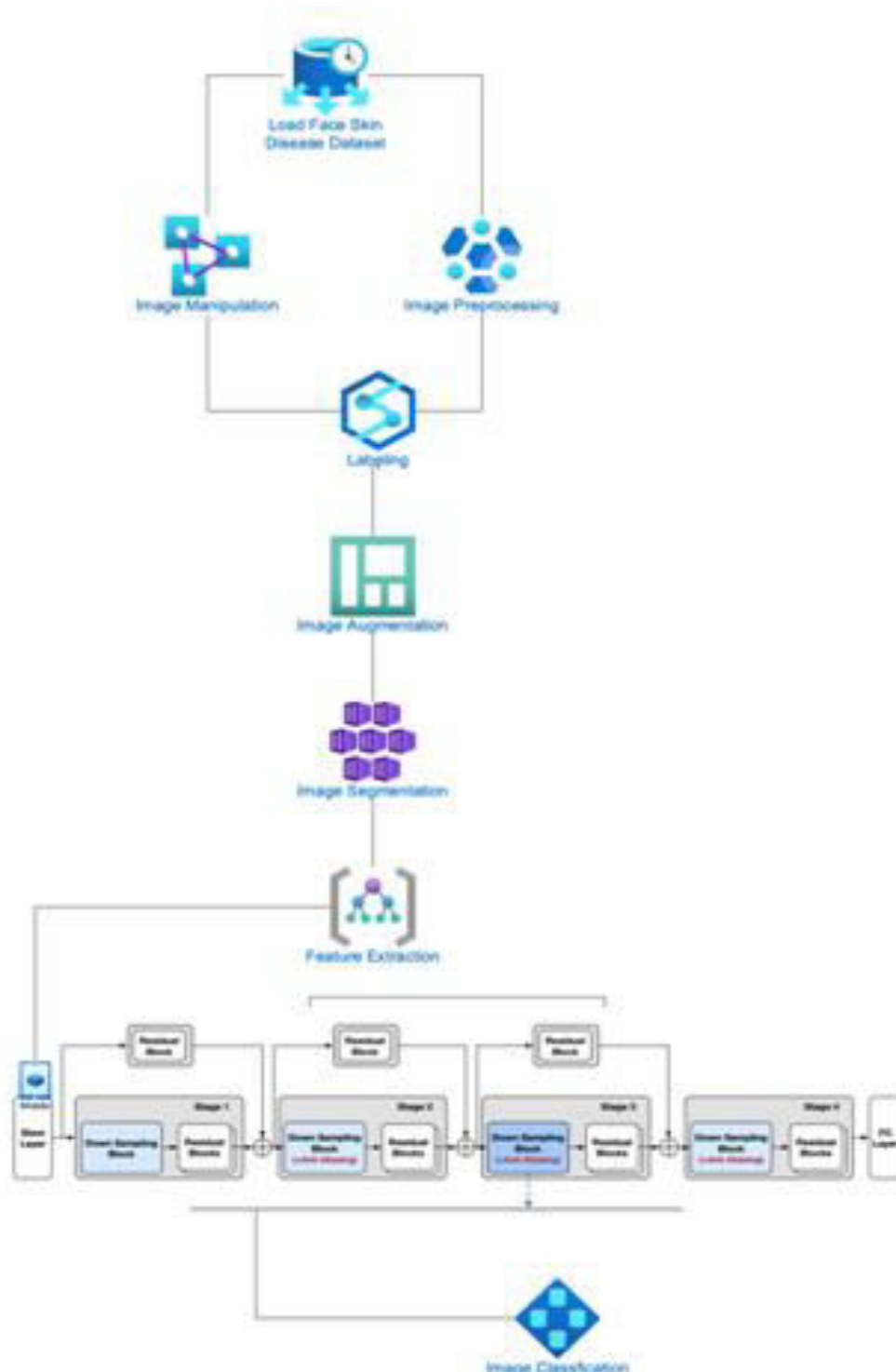
A graphical representation of a set of architectural concepts, including their principles, elements, and components, is called an architecture diagram. What exactly is a diagram? What are the different sorts of architectural diagrams? The Dragon1 open EA Method makes it crystal clear: if a diagram does not depict an idea, principle, or portion of a principle, it is not an architecture diagram because it does not depict (a part of) the architecture. Software architecture diagrams, system architecture diagrams, application architecture diagrams, security architecture diagrams, and so on are all examples of architecture diagrams. System architects require system architecture diagrams in order to comprehend, explain, and express ideas for the system's structure and the user needs it must fulfil. It's a basic framework that may be used to help partners understand the design, negotiate adjustments, and clearly convey intentions during the system planning process.

## III. Algorithm

Step 1:Adding the required libraries .

The Importing the libraries is the first step. that will be used to classify the photos. Numpy, Keras, and Matplotlib are required in this example ,

import numpy as np from keras.preprocessing.image import image from keras.preprocessing.image import img_to_array from keras.applications.resnet50 import preprocess_input from keras.applications.imagenet_utils import decode_predictions plt import matplotlib.pyplot

Step2: Preprocessing images for ResNet-50

Before beginning the preprocessing, load a photo from the dataset. Remember to set the correct target size when loading the image, which is 224*224 for ResNet. The image is now readable and plottable. img = image.load_img('imagelocation") plt.imshow(img) image.img to array = img (img) np.expand dims(img, axis=0) img = np.expand dims(img, axis=0) preprocess input = img (img)

Step 3:In Keras, Use the ResNet-50 model to make a forecast.

After the image has been preprocessed, just instantiate the ResNet-50 model to begin categorising. Now you may put the model to work. forecast function on the picture that has been preprocessed and is called 'img'. Use the print feature.with the prediction decode argument 'preds' in the decode prediction argument and 'print' in the print argument to output the prediction.

ResNet50(weights='imagenet') model model.predict = preds (img).

## IV. Literature Survey

1. Extracting Blood Vessels from Full-Field OCT Data of Human Skin through RPCA Pin for a Limited Time Hsien Lee, Chin-Cheng Chan, Sheng-Lung Huang, Andrew Chen, and Homer H.(2018). This paper proposes a method for dividing full-area OCT data into segments using a short-time RPCA method Decomposes each segment into a low-rank form that represents the human skin's relatively static tissues and a sparse matrix that represents the blood vessels. Pros:Extract the applicable functions from images .Cons: Need to be in addition fine-tuned and ensemble based techniques would possibly assist in order to enhance the category performance .

2. Long-Term Monitoring of Skin Recovery through Micromachined Microwave Near-Field Probe Joachim Oberhammer, Fritzi Töpfer, and Lennart Emtestam (2017). The found biphasic development of the microwave reflection signal has the same opinion nicely using capacitance measurement trends from the literature. Pros: Visually inspected plus in comparison with ground fact in phrases of accuracy.Removing the speckle noise affects Cons:Does not work nicely with excessive dimensionality .Does not work properly with huge dataset.

3. Ketoconazole-conjugated ZnO nanoparticles based semi-strong formula and examine their effects on skin disease. Murugaiyan Latha Mala, Kaliyaperumal Viswanathan, Rajasekar vaiyamalai, Diviya Bharathi babu, Kaliyaperumal Viswanathan Gopal Dhinakarraj, Priyadharshini,

Muthusamy Raman(2018). In this case of examine, theZinc oxide (ZnO) nanoparticles coupled with ketoconazole have been organizedin a single action method the use of dextrose as an intermediate compound. Pros:Easier to interpret the output coefficients. Effective in excessive dimensional spaces. Cons:Sensitive to noisy data .Can be computationally expensive.

4. Assessment of chronic kidney disease using skin texture as a key parameter: for South Indian population Soundararajan Periasamy, Madhanlal Udhayarasu, Kalpana Ramakrishnan (2017). Timely tracking kidney function, especially for themes that have records of hypertensive or diabetes they may be able to avoid developing chronic renal disease situation. Pros: It is one of the most accurate learning algorithms available. For many data sets, it produces a quite accurate classifier. It runs successfully on massive databases.Proving High Robustness and imperceptibility.Cons: A lot of pre-development education . Existing device is Opportunistic and uncontrollable Difficulties to obtain better performance .

## V. Project Modules

### A. Dataset Collection

Image databases for skin diseases of there are several illnesses accessible openly. Though, a few are entirely others are open source, partially open source, or both. for sale. The photographs are obtained either through a camera or a device that is stored locally. Regardless of the source, it is very necessary that The image in the input is clear plus accurate. A higher-resolution photograph be necessary for this. Depending on the dataset, the Dermoscopic or clinical images can be used as input. All of photographs were taken in a differentmeasurement when we compiled them. Our informational indexes come in a variety of heights, widths, and sizes. In any event, for the preparation and testing of the informational index, our profound neural classifier requires a comparable informational index. Individual consent and necessary permission were obtained in accordance with

institutional policy. The goal of this study is to measure ethnic diversity parameters on the basis of skin tone, hence dermis photographs from all patients were gathered.

### B. Image Preprocessing

The image will be enhanced by eliminating background noise plus undesired sections a skin condition, next split into distinct segments to distinguish it from normal skin, and elements of the photograph will be retrieved toward determine if the skin diseased or not. We increased the size of our informational collection to avoid overfitting. As a result, our crucial dataset has been extended, which motivates us to categorise our model. Using a variety of distinct sources, we expanded our authentic informational collection. Segmentation and image enhancement unit: Transports the damaged area by bringing into focus intensifying it plus subdividing it into multiple segments to distinguish it from the surrounding skin.

In this phase, the image is normalised by eliminating background noise such as pigments in hair and skin, which possess confound the investigation. Furthermore, the picture provided as a source may be of no use the minimum size required by the method, as a result important to obtain the requisite image size.

### C. Segmentation of Image

Segmentation of image separates the diseased skin derived from surrounding healthy dermis plus retain help detect skin diseases. There are three methods for image segmentation: 1)based on pixel, 2) based on edge, and 3) based on region. Based on pixel segmentation classifies every pixel in a picture as belonging to a homogeneous region or an item. Binary thresholding or a derivative of it can be used to accomplish this. The edge-based technique finds plus connects to the edge pixel construct the skin lesions' bounding form. Adaptive snake, gradient vector flow, and Operators Robert, Prewitt, Sobel, and Canny, for example, can be used. The regionbased approaches are based on continuity and on the basis of comparable a pattern of intensity levels inside the neighbourhood pixels. Region

growth, combining and separating plus the Algorithm for watersheds are all instances.

### *D.* **Extraction of Feature**

A single of most important steps regardless of categorization challenge is feature extraction. For both training and assessment, features are crucial. This feature offers critical details about the image that will be utilised to diagnose the condition. All of the significant qualities collected from the image, such as asymmetry, border, colour, diameter, evolution, and so on, are now presented as input which is the classifier part.

Color and texture information are the most major aspects utilised to visually define and detect skin disorders. Color information is critical for distinguishing one sickness from another. Color histograms, colour correlograms, colour descriptors, and GLCM can all be used to extract these colour properties. The texture data conveys the lesions' rich visual patterns as well as spatially ordered things like brightness, colour, size and form. The texture of an image is essentially a feature of pixel intensity difference . Researchers employ techniques such as GLCM, local binary pattern, and SIFT to extract texture information from images. Depending on the disease's nature and severity, each lesion may have diverse forms and sizes in addition to colour and texture.

### *E.* **Classification**

Every picture is seen in the role of pixel grid, with one and all pixel owning its own worth. This picture matrix's smallest unit is the pixel. The classifier is a device that classifies objects. Through a classification algorithm, the photos are classified into one of the pre-defined disorders. A pre-trained ResNet network model is used to identify and classify facial skin disorders. A fixed-size image is sent into the ResNet. The picture has been enhanced using a sequence layers of convolutional, with the filtration utilised having a limited receptive field. Max pooling in a predefined size f window takes care of the size reduction. A SoftMax classifier is employed after each layer has 4096 nodes and is fully linked. The Adam optimizer is addressed in this paper for model training. The output of the convolution and pooling processes is used to extract the image's primary features. The Completely Linked based on the training dataset, layer utilises these characteristics to assign the input image to various classes. The Adam optimizer is used to put together our model. Our self use Eighty percent of our data set for training for training, plus the remaining 20% of the dataset is used for validation.

### V. **Conclusion**

All things considered, we wanted to renew this framework for the task's use.A new automated face skin disease diagnostic method based on machine learning is given in this study.A Convolutional Neural Network that has been pre-trained is used to forecast illnesses. The ResNet model was utilised.A database that we built comprising numerous pictures was used to train and evaluate the model.It delivers the maximum possible accuracy and effectively classifies the face skin pictures submitted for testing.This is accomplished by using the ResNet's various operations, such as Convolution, Max Pooling, and so on, until the picture flattens out into a vector.These are the vectors that can be used for classification since they include the information needed to determine high-level characteristics.

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# DESIGN AND FUNCTIONAL VERIFICATION OF DIGITAL CIRCUITS AND APB PROTOCOL USING VERILOG

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## ABSTRACT

*Thedigital circuits are the logic circuits to carry out the logical operations. They are made up of logical gates which perform the function of Boolean logic. These logic gates are integrated to form a digital circuit which is followed by functional verification. Functional verification is the task of verifying the correctness of the design according to the design specifications by assuming the specifications are correct. It is the most challenging step in Integrated circuit (IC) design cycle. In this paper, we presented an overview of verilog and the methodology used for designing and verifying the digital circuits using Verilog. As a case study multiplexer, comparator and Advanced Peripheral Bus (APB) are considered. All the designs are captured using Verilog and functional verification is carried out using synopsis tool.*

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*Keywords: APB protocol, Comparator, Functional Verification, Multiplexer, Synopsys, Verilog.*

## 1. Introduction

Digital circuit is a branch of electronics which deals with the digital signals to perform various tasks to fulfill the requirements. These circuits are designed using logic gates on a single chip. The circuits which are designed using the logic gates perform their specific logical operation. This representation helps the circuit to switch from one state to another from avoiding the precise outputs.

The major issues the designers facewhile integrating both digital and analog circuits on the same circuit board are –

- Prevention of the contamination of the analog signal due to the switching noise in digital part.

- Interfacing the digital circuit with analog input voltage.

The conversion of analog to digital is a problem when compared to digital to analog conversion.

Verilog is aHardware Description Language (HDL).Invention of Verilog is by the Gateway Design Automationin 1984.Verilog helps to describe the digital systems. The programmer is allowed to design a digital design at Gate level, Behavioral level, Switch level, Register Transfer Level using Verilog.Field Programmable gate arrays (FPGAs) is a reconfigurable logic which is more popular in recent year due to its improvement in speed andpower against digital signal processing (DSP)and microprocessor result also there will be a significant reduction in manufacturing time and cost over Application specific integrated circuits (ASIC) [1]. Two approaches are there for designing - Bottom-Up approach and Top-down approach.In First approach the design is performed using the gate level with the help of standard gates like AND,OR,NOT,NOR EXOR gates.In second approach, structured system design is used which allows high level designing and Register Transfer Level (RTL) coding [2].RTL Verification is one of the initial steps which ensures that the design is logically correct and without timing errors. The APB protocol is the part of theAdvanced micro controller bus architecture(AMBA) family which can be interfaced with lower bandwidth peripherals [3].The RTL Verification of the APB Protocol is discussed in this paper using Verilog Hardware description language [4].

Due to the increase in the complexity of implementation of the circuit in the Integrated circuit (IC) the verification has become more complex. So to overcome the complexity and to reduce the verification time, Verilog, System Verilog [5],and Universal Verification Methodology(UVM) [6] is used.

## 2. Literature Survey

In paper [2], author had discussed the need of industrial security which requires more attention to avoid damage from the cyber-attack. In this paper author had discussed the idea for remote controlling.The mobile phone is used to achieve the purpose and action is done with the help of Short Messaging Service (SMS). The author also included the idea of the streetlight control remotely.The Field Programmable Gate Arrays(FPGA) SPARTAN III kit is used for automation of Industrial processes and software is by Verilog with a GSM technology to send the messages to open or close devices in emergency. The data is taken from different analog sensor and to convert them to digital ADC 809 is used. The processing of program is written in verilog and then loaded into FPGAand simulation is done by Xilinx ISE suite.

In paper [4], author projected a traffic light control system design to clear the ambulance way and to do traffic management. The controller device is designed by using Verilog hardware description language (HDL) and simulation is done using XILINX ISE tool and the synthesis process is carried out on Spartan FPGA Family.

In paper [10], A 2-bit comparator module is used to design a 4-bit digital comparator with low power design and a complementary metal oxide semiconductor (CMOS) technique.The author has presented two applications of a 4-bit comparator and the low power comparator design performance is justified. A 45 nm and 90nm technologies are used to makecircuit implementation using DSCH 3.5 and Microwind 3.5 toolis used for simulation. Different designs are compared considering parameters as power consumption,speed, surface area, etc. The paper is concluded by the reduction in power consumption.The trade–off between the proposed method called GDIAVL and AVL is achieved by considering higher order bits at45nm and 90 nm technologies.

In article [11], the evaluation of 8:1 multiplexer isdonewith the help of adiabatic logic. The main factor that concerns very large scale integration(VLSI) design engineer is high power consumption. So the author presents new design in 90 nm technology using tanner tool for low power 8:1 MUXusing adiabatic logic.Normally adiabaticlogic uses multiphase clock. During clock distribution there is high power dissipation. To overcome this,author hasproposed adiabatic logic based MUX which results in better energy conservation.The paper concludes that about 29% and 36% more efficiency on energy recovery is achieved bythe comparison of 2N2N logic against CMOS logic.The results are verified at various supply voltages.

In article [15] the author has introduced AMBA APB bus architecture design. As the SOC user AMBA has chip bus.APB is the component of the AMBA bus. It has lower bandwidth and it can be connected to the lower peripheral devices such as timer keypad,UART. Theproposed design is done by theVerilog HDL and test cases are generated by Verilog test bench. The paper concludes by giving the overview of the AMBA architecture and detail of APB bus.

## 3. Overview of Verilog

Verilog and VHDL are the Hardware Description Language (HDL) used to describe hardware behavior to convert the digital blocks made up of sequential elements and combinational gates [7].Hardware description language is a language which has the same feature as that of object-orientedprogramming language which supports complicate testing procedures and also verifies the hardware. System Verilog isderived from Verilog with its verification features allowing engineers to verify the design using testbench structures and random test cases in simulation.

Verilog is a textual format language to describe the systems and electronic circuits. For the verification purpose through simulation, testing analysis, timing analysis and logicsynthesis Verilog is deliberately used.

Figure 1 shows the Application Specific Integrated Circuits (ASIC) design flow. In a practical situation, the sections can be divided into small steps, and design flow can be iterated as errors are uncovered.
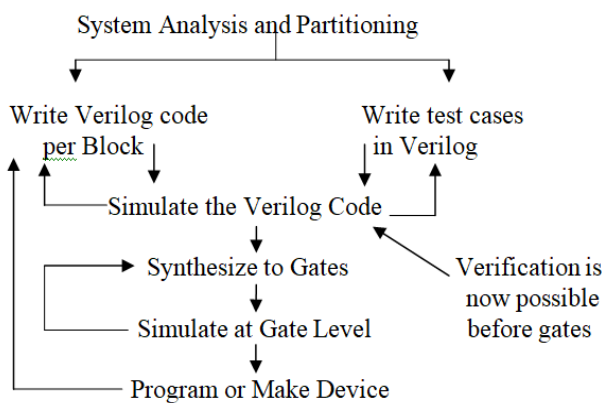
Figure 1: Design flows for ASIC.

### 3.1 System Level Verification

Once the partitioning of the overall system architecture is done, ASIC designing can be initiated by analyzing the Verilog design at the RTL stage and captures a set of verilog test cases [8]. These tasks are complementary to oneanother, and sometimes in isolation the various design teams performs the specification test to ensure that they are correctly interpreted. To use automatic logic synthesis,RTL should be synthesizable. Generation of test cases is a major task. Test case generation is a procedural approach. The final ASIC depends on the coverage of test cases.

### 3.2 RTL Verification

The simulation of the Verilog RTL isdesigned to validate the functions with respect to the specifications [9]. RTL design is faster than the gate level design. In practical, about 70-80% of the time taken is for designing and simulationat the RTLlevel and20-30% of the total time is for synthesize and verification of the gates.

### 3.3 Look-Ahead synthesis

Synthesis processes are done early in the design process, to provide area and speed accuracy. The main synthesis production run is carried outin parallel until the functional simulation is completed.

### 4. Digital Circuits and APB Protocol

### 4.1 2-Bit Comparator

Digital comparator plays an important role in arithmetic logic unit comparison operation. It is a combinational circuit which compares two digital or binary numbers to find whether a number is equal, greater or lesserthan the other

number[10]. Figure 2 shows a 2-bit comparator. Functional verification has been done for the same by applying suitable test cases.
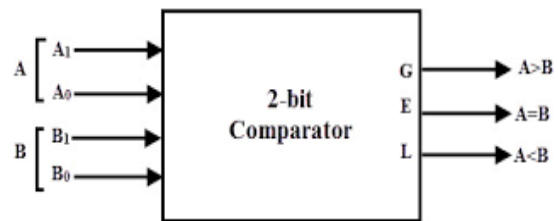


Figure 2:2-Bit Comparator.

### 4.2 8:1 Multiplexer

Multiplexer (MUX) is nothing but a data selector which selects one of the input data and passes the value on the output line[11]. The data selection at the input is based on the selector lines. Input and output are in binary format. 8:1 MUX is designed by using the hierarchy of modules Viz. by using one 2:1 MUX and two 4:1 MUX.8:1 multiplexer has $2^3=8$ input lines, 3 select lines, and one output line as shown in the Figure 3.
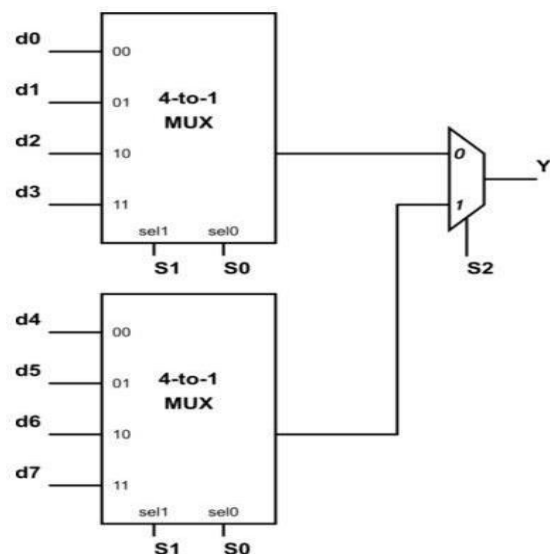


Figure 3: 8:1 Multiplexer.

### 4.3 First-In First-out (FIFO)

The FIFO is special buffer and called as queue. FIFO is a Random-Access Memory. Figure 4 shows block representation of FIFO. In this the read and write operation depends on outputs empty and full signal. In chip design, FIFO is used as the temporary storage element, forsynchronization and for data width mismatch. When FIFO is full, no additional write operations can be done until the data are

read [12]. In the same way, when FIFO is empty, there will be nothing to read from the

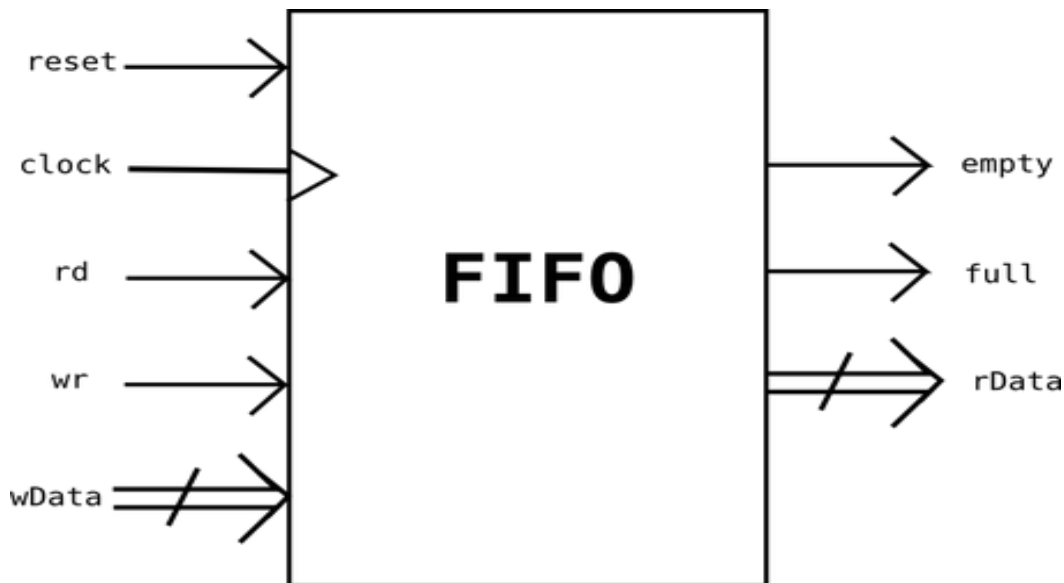memory and read operations cannot be done until some data is written into it.



Figure 4: FIFO block diagram.

### 4.4 APB Protocol

The APB is the member of the AMBA protocol family which minimizes the power consumption and reduces the interface complexity [13].Figure 5shows the block diagram of APB Protocol and Figure6shows the state diagram of APB protocol. There are 3 states, Idle, Setup, and Access states. In Idle state, at first clock cycle the PSELx and PENABLE are low, there will be no data transfer. When PSELx is asserted the bus waits in the setup state for only one clock cycle. In the next rising edge the PENABLE gets high, the access stategets asserted. During the transition from setup state to access state the write, select, write data signals must be stable. If PREADY is low then the bus remains in the access state and if it is high then the access state is exited and returns to idle state [14]. The high performance of the pipelined bus interface is not necessary for the APB.So APB is an unpipelined protocol.In APB all signal transitions are associated with the rising edge clock which the APB integration into any design flow.APB interface can be done with AMBA advanced high bus-lite and AMBA advanced extensible Interface.
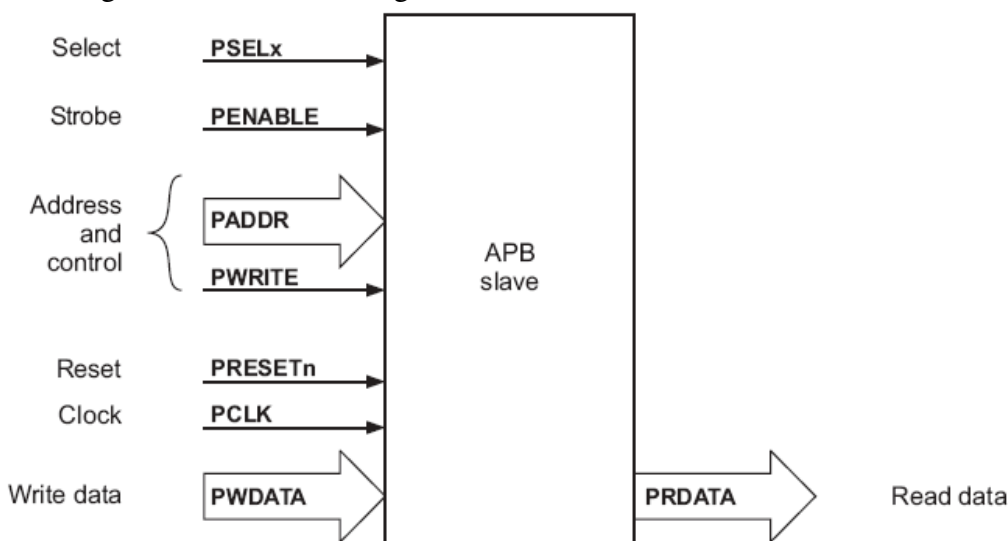


Figure5: APB Protocol [15].
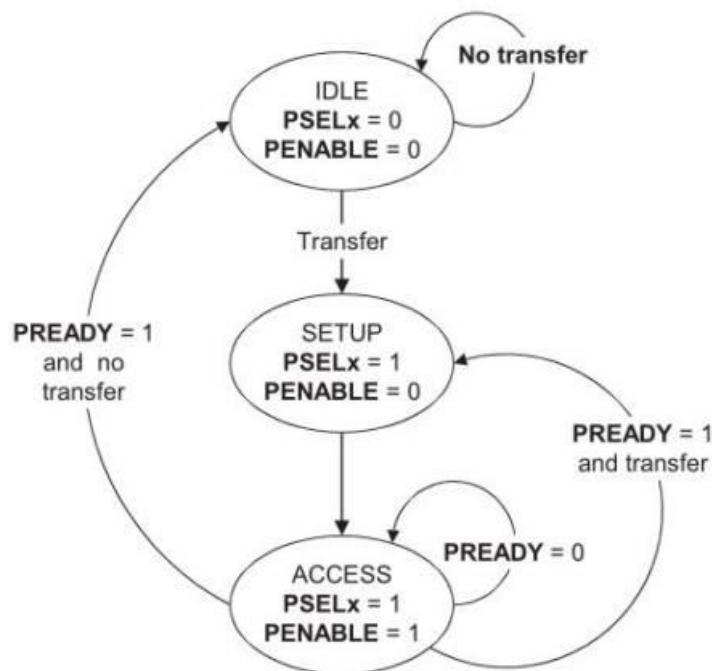
Figure 6: APB Protocol state diagram.

### 5. Results and Discussion

In this section, the design and verification of comparator, MUX, First-in first-out, APB Protocol is carried out. The terminal and respective output graph of each digital circuits and protocol is discussed.

Figure 7 and 8 shows the 2-bit comparator output in terminal and in simulation window respectively. The input data are labelled as 'a' and 'b'. when both the data are equal, then the output signal 'e' is logic '1', when 'a' is less than 'b', the signal 'l' is logic '1' and for the other case, signal 'g' is logic '1' as illustrated in Figure 8.
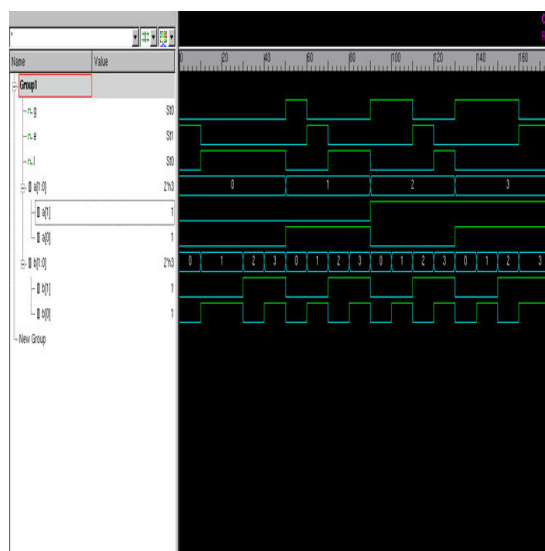


Figure8: Simulation Waveform of 2-Bit Comparator.

Figure 9 and 10 shows the output of the 8:1 MUX. Depending on the 'sel' value, output is set to one of the 8 inputs.
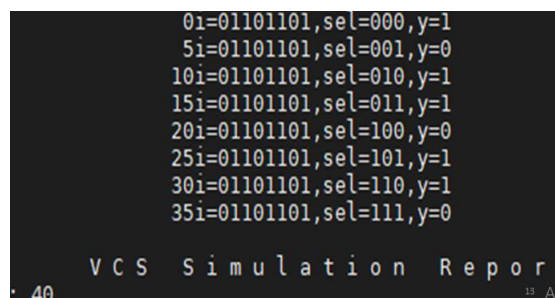


Figure 9: Terminal Output of 8:1 Multiplexer.



Figure7: Terminal Output of 2-Bit comparator.

Figure 10: Simulation waveform of 8:1 Multiplexer.

Figure 11 and 12 shows the read and write operations of First–in and First-out. When r=0 and w=1, the data is written into the memory and when r=1 and w=0, the data is read from the memory.



Figure 11: Terminal Output of First-in First-out.
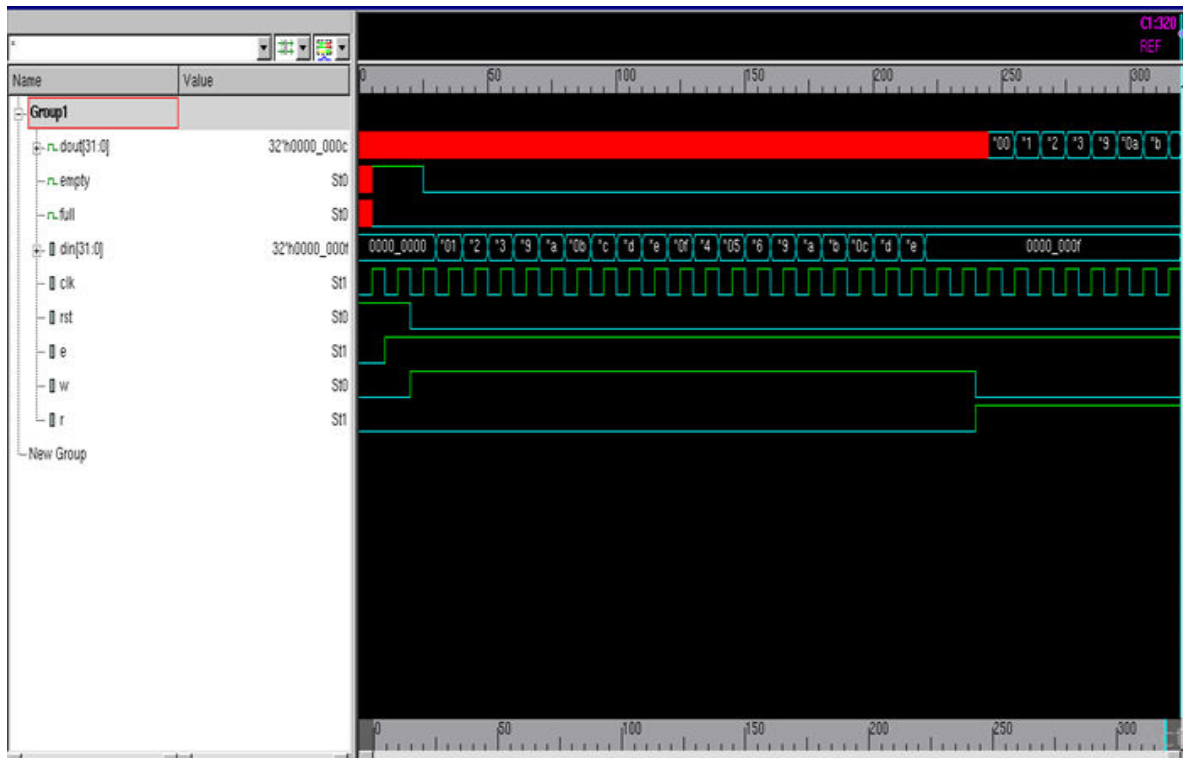
Figure 12: Simulation output of First-in First-out.

Figure 13 and 14 shows the operation of APB Protocol with no wait states .When Psel and Penable is high then only Pready is high.
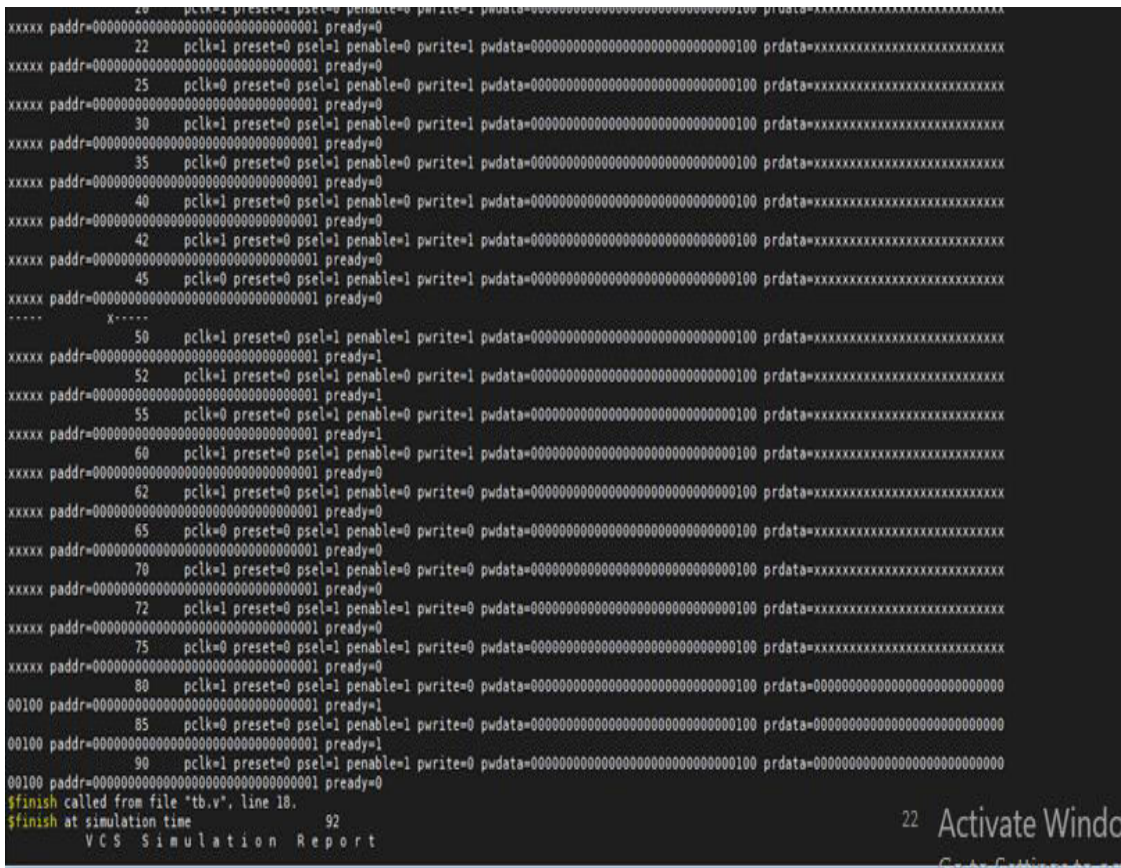


Figure 13: Terminal output of APB Protocol.
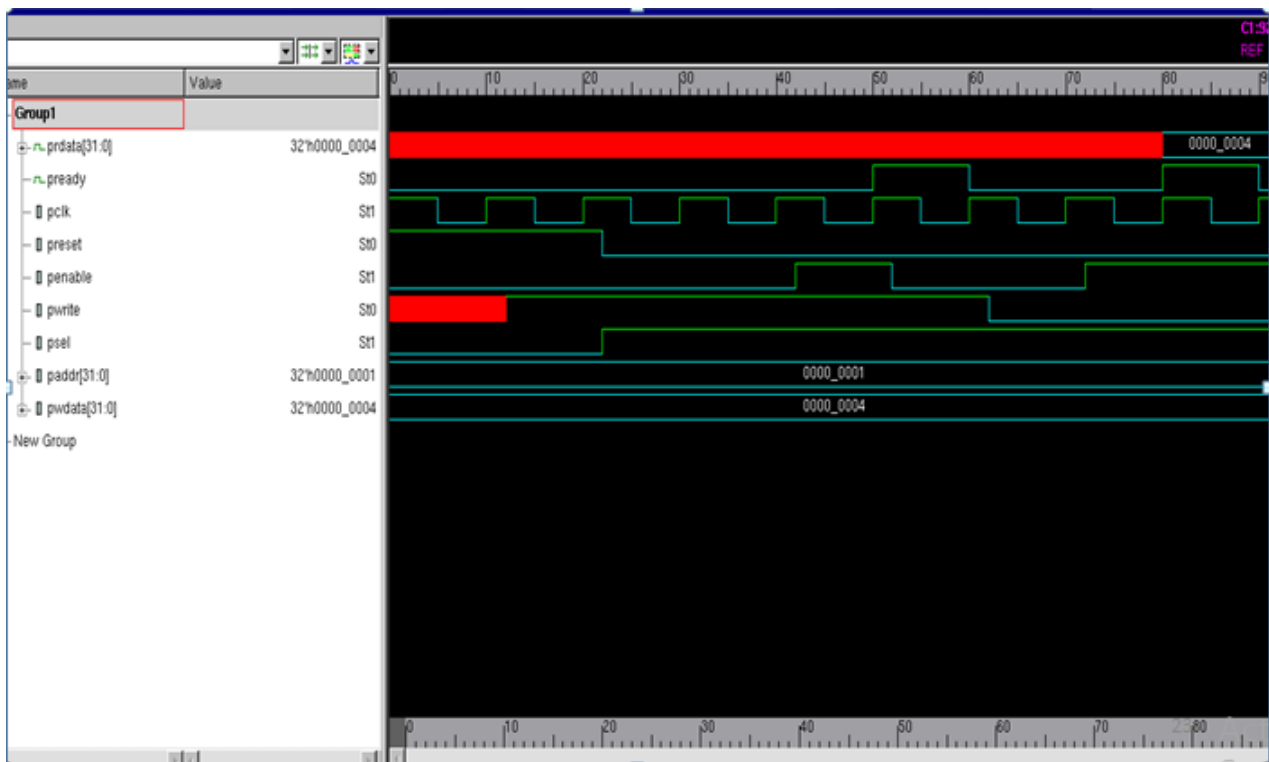
Figure 14:Simulation output of APB Protocol.

## 6. Conclusion

Digital circuits deals with the digital signals. The functionalverification of such digital circuits and APB protocol is carried out in this paper. An overview of Verilog to carryout the RTL verification and test case generation for comparator, multiplexer and APB Protocol is also discussed. The functional verification of the circuits is verified with itsgolden model. The respective terminal outputs and simulation waveforms are shown in results and discussion. Verilog is an easier and effective way for verifying the digital systems by providing proper test cases for design verification engineers.

## Acknowledgement

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# A NOVEL APPROACH FOR LOG STORAGE SYSTEM USING BLOCK-CHAIN NETWORK

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## ABSTRACT

*In recent years, Blockchain has been one of the highest investments in technology. Becoming perfect for data storage in many real-world industrial scenarios, thanks to its manipulation-resistant and decentralization properties, of blockchain. One significant scenario is weblogs, which are present in major internet companies and considered as sources of technological value and commercial profits. The HyperLeger-based Weblog storage system has been designed more effectively. Compared to other blockchain networks, HyperLeger provides the greater output and lower latency. In addition to its efficiency benefits, HyperLeger is a licensed blockchain, a perfect match for corporate software design.*

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## 1. Introduction
## 1.1 General study

Due to its six key characteristics [1] as Decentralized, Open Source, Autonomy, and Immutable Anonymity, blockchain principles are adopted in a different region. The Internet of Things (IoT) is one of the potential topics of research in which a lot of use has been developed over the last decade. As Fig-1 reveals, IoT has different applications in which several sensors, actuators, and various hardware devices are utilized to execute a smart application successfully. A design for an IoT device requires a three-levels viz. perception level, transport level, and application level. The authors have assessed the safety problem on all the levels in the paper[2]. The challenge is how to avoid attacks in three levels as various sensors and communication elements are linked to the IoT framework. Physical attacks, impersonation, routing attacks, data transit, malicious code injection, and data leakages are some of the most impressive and daunting attacks. The application must comply with various security and privacy specifications and its feasibility in terms of key security parameters such as the CIA an IoT application requires (Confidentiality, Integrity, and Availability).

Blockchain is an evolving technology that transforms many industries' landscape quickly. It is an excellent technology for many industrial engineering scenarios because of its easy-to-use, tamper-proof and decentralization qualities.

Large financial institutions continued to invest extensively in the creation of the blockchain. Tech companies are now in a rush for the next wave of disruption to profit from the blockchain. Blockchain is China's hottest investment market for venture capitalism in 2018.

In the last ten years, big data have drawn much traction. Web 2.0 has allowed people to create and exchange data. Market and Internet companies have used all sorts of data science technology to create customer insight or to allow AI to generate revenue.

Big data and AI integrate mature market models around the world. But primarily, ideas were incubated in research laboratories and educational institutions about how to incorporate the strength of blockchain and big data. Until commercial blockchain plus large data applications are made available there is still a long way to go.

Logs are essential data tools for businesses and public entities. The principle of data

governance that promotes the proper use of data during its life cycle is the efficient and safe use of logs.

Because of high latency and poor throughput, however, tens of thousands of TPS that are usually seen in Nginx servers couldnot be maintained. Blockchains are unlikely to replace a mature logging and analysis engine such as Elastic Search in real time. Blockchain can be a storage option for audit logs in customer and statecompanies despite technological limitations. These logs are produced at lowfrequencies but require high protection and must be tamper-resistant. In the traditional way of securing the surveillance videos,

- Lot of security issues which are not addressed or atleast the proof of security aren't been provided

- Scalability of the solution is not possible and is applicable only to a limited number of nodes

- Lot of costs incurred in the third party apps/middlewares for integration with the solution provided

- Centralized architecture makes it computationally intensive thus resulting in inefficient use of server memory and time.
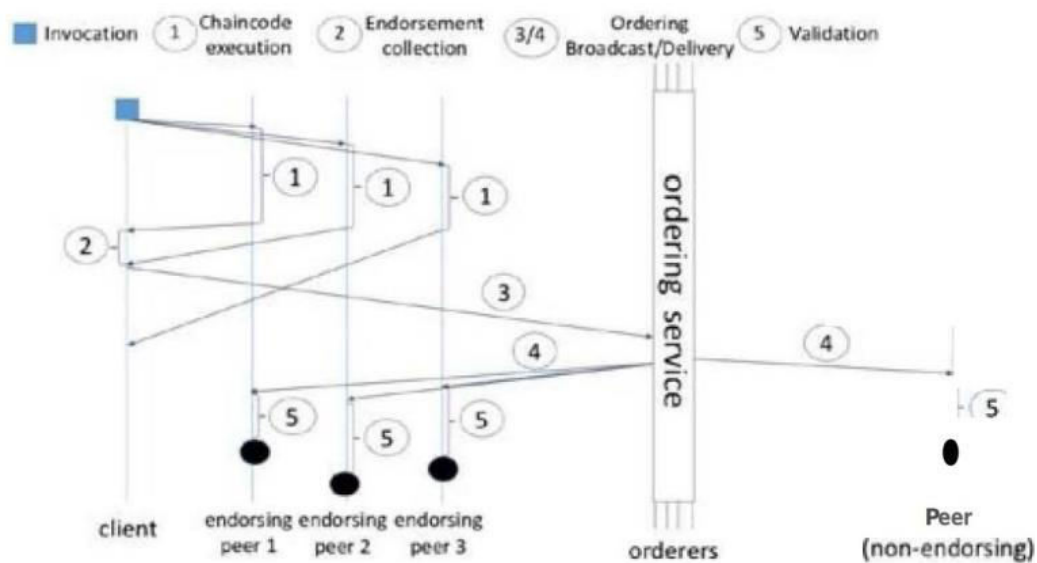


Fig 1: Block Diagram of the Proposed Method.

We present an audit log storage technique we have built in this project. We havebuilt our framework with one of the most tried and tested Hyper Leger Fabric blockchain frames. The audit log storage technique can act as a precursor for more commercially available solutions for broader industry audiences.

- The solution is powered by blockchain and hence the security is proven and very strong against all the possible attacks

- Scalable to any number of given nodes and can be used over commodity

  hardware

- No costs incurred for third party apps/ middleware since the needs for them have been eliminated

- Computationally lightweight making the effective use of server memory and time

## 2. Related Works

Hadoop distributed file system(HDFS) was developed for large-scale file management in Qiucheng Ban 2017. HDFS will benefit even less from low usage and memory efficiency for a large number of smaller files, including genomic data and weblog data. An asynchronous algorithm of combination based on the Task Queue monitoring (MTQM) and a Hash Index pre-fixing strategy is proposed.

Uploading and integrating small files are asynchronous by following the task queue dependent on the merging of smaller files with the client. By using a prefetching and caching method, small files can be accessed easily.

Test results show that this paper's approach can increase storage efficiency and access to small files and efficiently reduce the Name Node's metadata storage area.

William Pourmajidi, 2019, Logs provide crucial details on the quality and digital proof of the services delivered through the cloud. We, therefore, claim that, without the intervention of a trustworthy party, the essential existence of logs demands immutability and verification mechanism. This paper proposes a log system based on a blockchain known as Log chain that can be combined with existing public and private block chains.

We build Log chain as a Service (LCaaS) to validate the mechanism by integrating it with the public blockchain network Ethereum. We show the solution to be scalable (capable of processing 100 log files per second) and fast (capable of "selling" a log file in an average of 23 seconds).

Sungwoo Lee, 2019, Overhead waste collection systems for log-structured filesystems have suffered as they lack space. To solve the issue, earlier research advised threaded logging, which re-uses canceled blocks without a procedure of cleaning. Threaded logging, therefore, happens spontaneously, which can reduce the output of subsequent read actions, as the canceled blocks are distinct. The efficiency and output of the two logging policies.

Cloud Storage Broker (CSB) offers cloud storage service with various Cloud Service Providers (CSPs), guaranteeing the quality of service (QoS) as well as data accessibility and safety through - requirement for the personal and business data storage service. Muhammad IH Sukmana 2018.

CSB is however challenged by the monitoring of cloud-based storage in many CSPs due to the lack of consistent cloud service logging formats that require each CSP to adapt its layout. A unified logging system is proposed, which CSB can use to track the use of cloud storage through several CSPs.

We compile and normalize cloud storage log files from three separate CSPs in our suggested log format that can be used for further study. We demonstrate that our work makes a coherent view suited to data navigation, surveillance, and analysis.

S. Big data are the central theme in business, science, and society as a whole in Suganya, 2018. Big data analysis is not conventional descriptive data analysis but a predictive analysis. Hadoop is the most popular platform for social media big data analytics such as Google, Facebook, Yahoo, Amazon, and so on. For the storage at high speed of massive, unstructured real-time data and streams, Hadoop effectively uses Distributed File System.

Data storage in Hadoop has played an important role, but data security has been neglected and very little important. We also proposed an analysis of algorithms or processes.

## 3. Methodology

### 3.1 Various divisions in the project

**Users Profile Operations Here**, End-users can edit their profiles in a variety of ways. To begin, users must create a new account in order to have access to the site. The users can then log in to their accounts using their registered email ID and password to access the portal's numerous divisions. Users can then opt to update their profile by entering new values in the fields they gave during the registration process, or they can change their password by entering both their old and new passwords. If a user no longer wishes to utilise our portal, they can choose to remove their accounts. The user can also logout of the site to ensure that the session that was created for them at login has ended.

**Blockchain implementation** Here, we implement the core Distributed Ledger network (Blockchain Architecture). We also create an interface for the users wherethey can set up the blockchain node by entering its IP address. Users can add as many nodes as they want. More nodes, better the security.

### Prototype Application to generate logs

Here, we implement the sample prototype application which communicates with the end

users to provide various services. As and when the end-users keep using this prototype application on regular basis, this application will start generating log files that will contain useful/ confidential information which needs to be secured. This application will be provided with a good user interface so that the users can find it easy to use across the devices of their choice.

### Blockchain Service Implementation

Here, we provide a couple of services w.r.t blockchain. The first service is called the 'Log Files Write' service which will be used by the prototype application to write the log files to the blockchain network. The second service is called the 'Log Files Read' service which allows the authorized users to download the log files from the blockchain network. For further processing

### Log Files Analysis Application implementation

Here, we implement the Authorization mechanism to the Blockchain data. The authorized users can then read the log files from the Blockchain network using the previous module and can perform various analyses on them.

### 3.2. General Description

### 3.2.1 Product Perspective

- Accepting each registration input from the user and creating them in MySQL DB

- The ability for the product admin to configure the blockchain nodes in terms of adding and removing them at the runtime.

- The ability for the product admin to manage the access rights of the users to grant/revoke the access on the log files stored in the blockchain

- To design an efficient user interface module for the admins to perform initial configuration

- To design and implement the surveillance application to effectively capture and store the log files on the blockchain

- To design and develop the Notification Module which alerts the user in case of an undesired condition

### 3.2.2 Product Functions

The product must be independent of the underlying data node architecture (it should work on any number of data nodes)

The product will be deployed on a fully functional application server like Apache

Tomcat or WildFly Application Server All the modules will be implemented as a dynamic web application.

### 3.2.3 User Characteristics

In this project, a little configuration is required for the setup of the application in the Eclipse box. The user also needs to install Apache Tomcat/ WildFly server to host all the user portals to serve the clients. The input provided by the users should be from the web browsers where the users will be the patient's personal information and the patient's health record. The appropriate portal must be accessed only by the appropriate users belonging to the correct role

### 3.2.4 Assumptions and Dependencies

JDK must be set up on the machine where the three subcomponents will run.Host machines are required to support application servers such as JBoss or Apache Tomcat. No firewall or other engines shall be installed prohibiting remote portal requests. On no cluster should there be any problems with permission. All cluster requests from the interface layer should be allowed by the host functional framework.

### 4. Modules Explanation

### 4.1 Software and hardware modules Requirements

### Functional Requirements

- Build a blockchain infrastructure that objectively indicates whether the video management system is handled correctly.

- Limit unauthorized drip and internal manager viewing.

- Log files must be securely encrypted and saved, and when exporting the log files licenses are applied and exported safely.

• Provide a way to perform the blockchain integrity check to ensure the data is secured. Provide an ability for the customer to increase the number of nodes to as many as they wish.

#### Non-Functional Requirements

• Should the different browsers available be easier to use?

• The application response time should represent the observations in real-time.

• In none of the test cases, the algorithm could crash.

• No safety issues on the data combined should be expressed.

• Each user's activity should be separated from the other user's activities

### 5    Results and Discussion

We are using two separate consensus mechanisms to measure the overall gas consumption in Figure 5.1. For the proposed scheme, two intelligent contracts are planned. One is an IPFS contract, the other is a VN contract. We infer from the experimental study that in terms of gas consumption, the PoA consensus process is more effective than PoW.
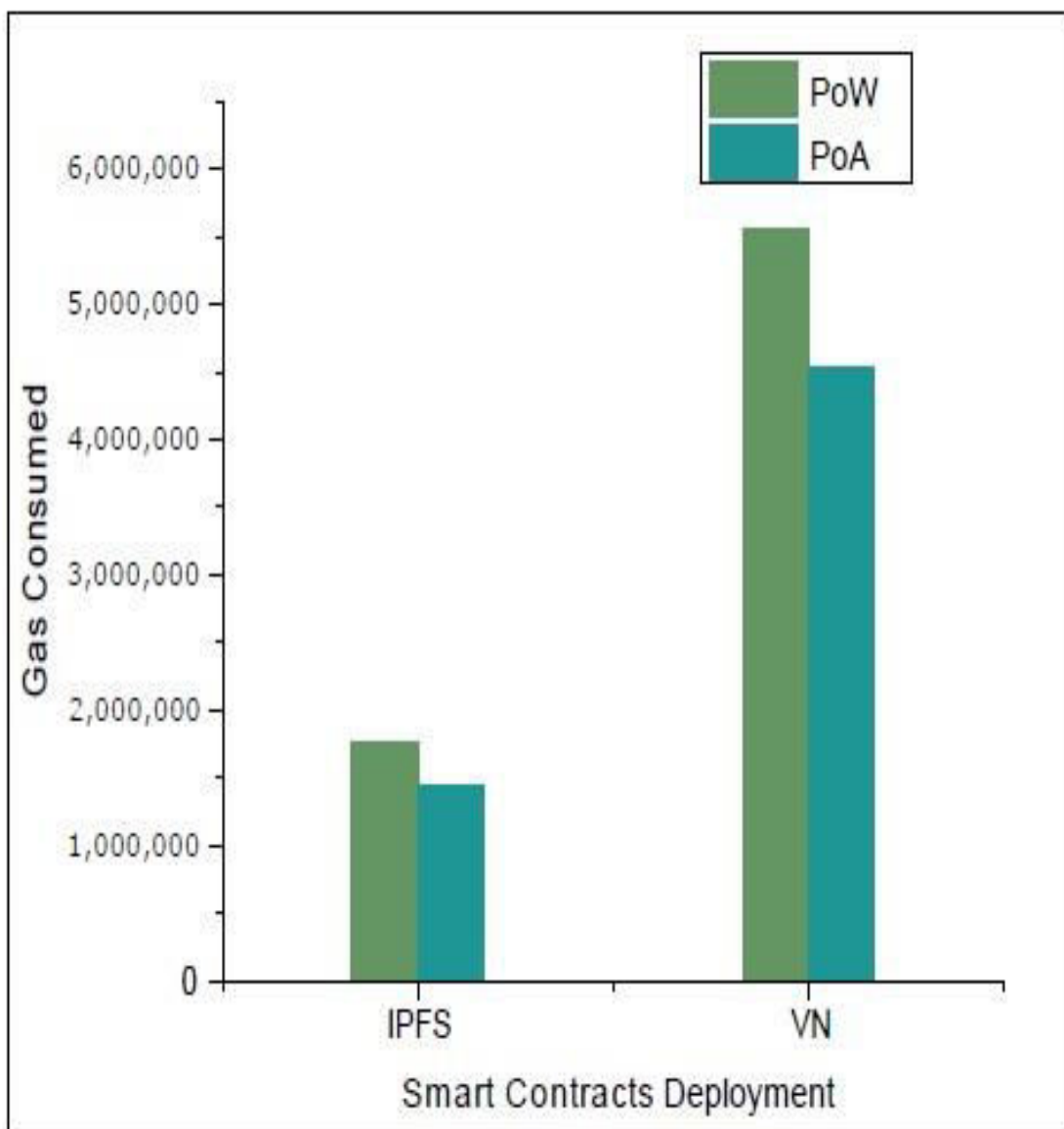


Figure 5.1. Smart Contracts Deployment Cost.Figure 5.2 shows the gas consumption of key IPFS functions. It is noted that the Add Data feature absorbs greater gas than other functions, and it is based on the file size and network conditions to be uploaded
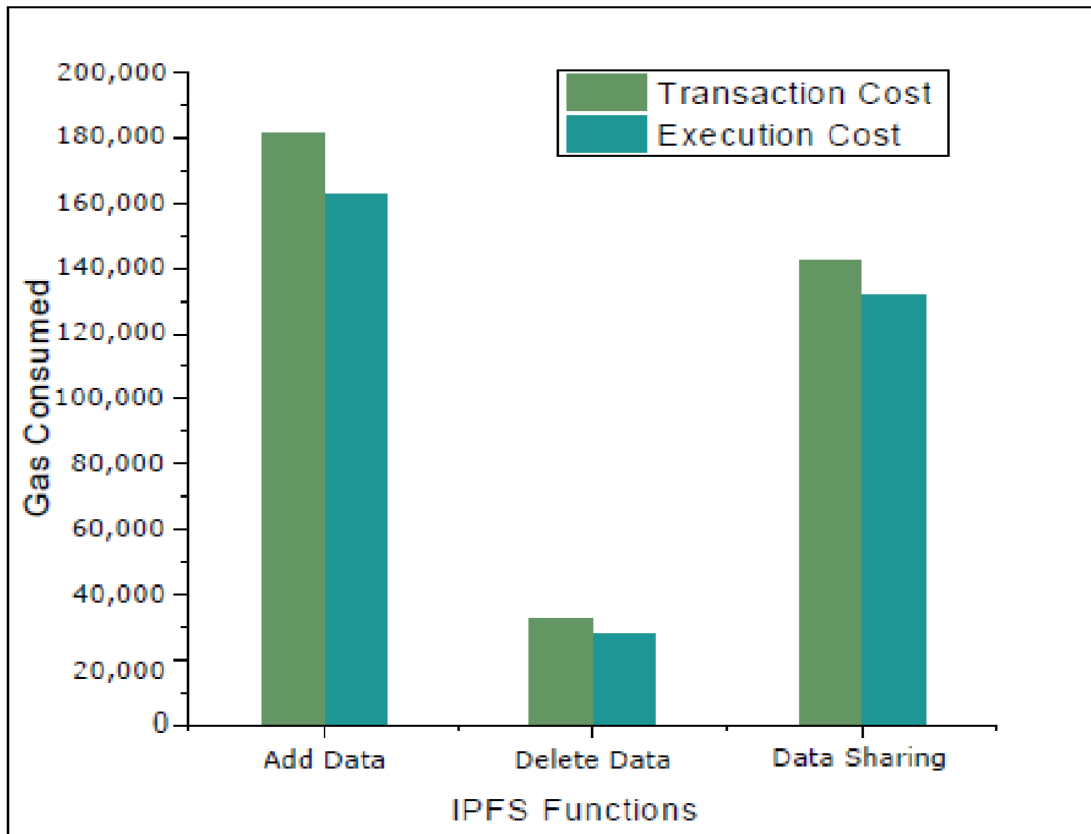
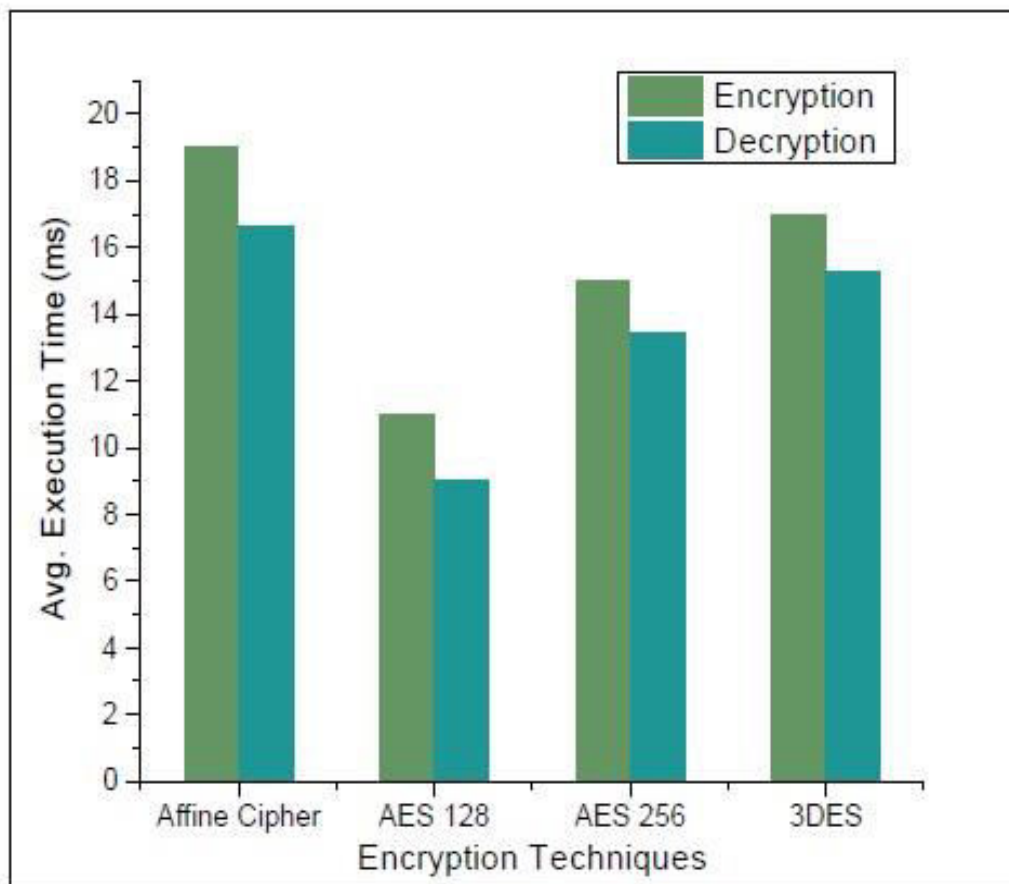Figure 5.2. Gas Usage For IPFS Functions.



Figure 5.3. Comparison of Encryption/Decryption Algorithms.

A distinction is made in Figure 5.3 of various cryptographic mechanisms. This comparison is aimed primarily at evaluating algorithm efficiency and determining which encryption algorithm is appropriate for the method we propose. An encryption process from the blockchain is performed. Average runtime is taken as a performance parameter for an algorithm to test its performance. Encryption time is theentire time needed to translate plain text into cipher text and system which is viewed as technical sources, are a significant scenario significance and commercial revenues in most of the important internet companies. The proposed project illustrates the designdepends upon two main factors (to be generated). Any vehicle communicates in encrypted form in our proposed system with other vehicles.



Figure 5.4. Security Analysis Of Proposed System.

Critical security research has shown that the system that has been proposed is effective and safe against several dangers, including Parity Multisig Bug 2. However, a weakness, called Integer Overflow, still faces the proposed method.

It has a limited effect, as integer overflow happens when the input value exceeds the integer power. The suggested framework is designed to support intelligent vehicles and is therefore protected from many vulnerabilities across all parameters. Figure 5.4 shows the analysis report that our system is safe against various vulnerabilities and is effective.

## Conclusion and Future Work

In recent years, Blockchain has been one of the highest investments in technology. Because of its exploitation and decentralization functionalities, blockchain has turned out to be an ideal utility for data storage that is utilized in several real-world a weblog storage system based on HyperLeger. In the Future, this solution should be integrated with the big data environment to make it work on log files of larger size.

## Acknowledgments

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# FOOD ORDERING ASSISTANT WITH DISH RECOGNITION AND RECOMMENDATION SYSTEM

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## ABSTRACT

*Technology driven, fully digital solutions have had a great impact on various industries such as health-care, travel, education, and entertainment. A lot of these industries have adapted to making efficient use of mobile applications in their various capacities to facilitate better services in this modern age. The application of modern technologies have been extremely profitable to many businesses in the above mentioned sectors and have helped them to take their respective businesses to the next level. In particular, restaurant businesses have shown promising results in their use of technological advancements in the way they carry out daily tasks like inventory management, order token displays and electronic vending machines. In order to provide a community around food and promote our idea of a fully digital order placement application, we propose a user-friendly mobile application that provides a contact-less order placement endpoint with a corresponding restaurant admin dashboard to fulfill those orders. Index Terms: Dish recognition, dish recommendation, FastAI, mobile applications, Recommendation System.*

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## 1. Introduction

The Covid-19 outbreak began in December 2019 in Wuhan, China and gradually spread across the whole world becoming one of the most devastating pandemics in human history. The lasting lockdowns in many countries saw businesses around the world take massive hits. The hospitality industry suffered heavy losses due to a lack of patrons owing to the lockdowns.

The conventional methods employed at restaurants involve a lot of interaction between the restaurant staff and the customers. In the conventional way of food ordering an individual has to engage in direct communication with the restaurant staff. Not only does this increase the chances of transmitting the coronavirus but it is also known to be a sometimes highly inefficient process. This inefficiency could either be because of a language barrier or due to unavailability of restaurant staff. A language barrier is introduced when a person does not know the local language and when two people fail to speak a common language inefficiency in communicating the order can be introduced. Due to a large number of patrons there may be certain durations of time when no staff

member is available, causing further delays in the order placement process.

The conventional method could be inefficient; sometimes it is dangerous for both the restaurant side as well as the customers. The transmission of the virus could be because of the contact while ordering or during the billing procedure. The current billing processes that patrons use is usually through cards or through cash. In both ways there is a high chance of transmitting the coronavirus.

With an in-restaurant food ordering system we plan to make a highly efficient and highly secure dining experience for the users which overcomes the aforementioned drawbacks and provides users with a more enhanced dining experience which is in line with the requirements for the current scenario.

Due to the massive losses endured by the restaurant businesses, it is of utmost importance for owners to cut costs wherever possible. One major source of expenditure for restaurant owners is the salaries of staff members. Given the current situation, owners would want to efficiently run their restaurants with the minimal number of staff members. By using the proposed system, they would require a significantly less number of staff members as

the need for staff for taking down orders is completely eliminated, making staff necessary only for the order serving process.

In order to maintain social distancing norms and avoid contracting the virus, we have proposed an automated personal digital system which serves as an in-restaurant food ordering application in order to regulate human interaction at restaurants. There was a need for a technology-driven solution in order to solve this issue. The proposed solution is an attempt to enable restaurant owners to provide the same traditional dining experience to the restaurant patrons whilst using a minimal number of staff members. Not only will the mobile application be able to provide an easy-to-use platform to users, it will also allow them to quickly browse through the restaurant menu and place their order from the comfort of their smartphone. The market currently lacks any good service that provides an in-restaurant food ordering system, and it is this niche sector of the market that we aim to address. Apart from food ordering, users can also share their culinary experiences in a blog section of the app. Another feature of the app includes a food classification section where recipes and other cuisine related information of dishes can be viewed by users.

Through the proposed system we aim to provide the users with a complete community that revolves around food with an assurance that they can order and pay without any contact with the restaurant staff. This system also accommodates the restaurant end to do various tasks to enhance the dining experience of their customers.

## 2. Related Works

Popular services like Swiggy and Zomato provide services like home delivery and table booking. They even provide services to make orders remotely and then pick up the order from their restaurants, but none of them provide an in-restaurant ordering system. We felt the market lacked a good product to provide this kind of a service which has become the need of the hour, given the pandemic.

The system proposed in this research paper, is somewhat unique but is inspired by a lot many

different standalone applications. Few restaurants show their menus in PDF format on QR Code scanning. However, we felt that they can use the QR Code scanning procedure to do more. Also, the current market does not have any service that specifically assists users in making in-restaurant orders.

The services that the proposed system provides guarantees availability and security to the users. The most important aspect of this system is to provide a seamless in-restaurant dining experience along the lines of the pre-corona era, where the patrons didn't have to worry about catching a virus.

## 3. Overview

The proposed solution is a complete application service and has flavors of various concepts of Deep Learning and Database Management System. The system introduces two types of end users i.e. Customers and Restaurant admin.

### 3.1 Restaurant Admin

While providing services a restaurant admin has to take care of a lot of things that could make the customers have a great experience while dining at the Restaurant. Usually when it comes to restaurant food ordering customers feel a lack of transparency into whether their food is being prepared or how much time more, they will have to wait before they get their order.

### 3.2 Customer End

The customer end has a variety of services namely:

### (1) Inrestaurant Food Ordering System

The main feature of this system is to enable customers to use the application for food ordering within the restaurant itself. Hence, a native mobile application was developed to enable all users having various devices, maybe IOS or Android.

### (2) Blogging System

The blogging system enables different users to showcase their skills and spread their culinary knowledge. The core idea is to make a community that revolves around food by enabling a place where people can share their

recipes and make blogs on the application and other users can use this section to explore new dishes shared by other users.

### (3) Dish Recognition

This section enables any user to take an image of the dish they are having and using a Deep Learning model they get a classification result of the name of the dish they are having. Furthermore, they can read through the blogs related to that particular dish posted by other users and know more about it.

### 4. Architecture Diagram

The system architecture (in Fig 1) has two sections showing a very conventional client-server approach of developing an application. The Client and Server ends are completely independent of each other and hence made to be available easily using various cloud services like Amazon's Elastic Load Balancer (ELB). The details of the two sections are as follows:

### 4.1 Client End

The client end has been further divided as Restaurant admin and as Customers. For Restaurant admin we have developed a web application that has been developed using ReactJS and the native mobile application is developed using React Native. Various node libraries like Axios, Redux Toolkit etc. helped us hit the server endpoints.

### 4.2 Server End

The server endpoints are developed using node js and few API calls are made directly to the Flask endpoint that has a hosted deep learning model for food classification. Different services related to authentication using JSON Web Tokens and Blog services is a part of this section. In the end the data storage is the most important part of this application for which we have used MongoDB.
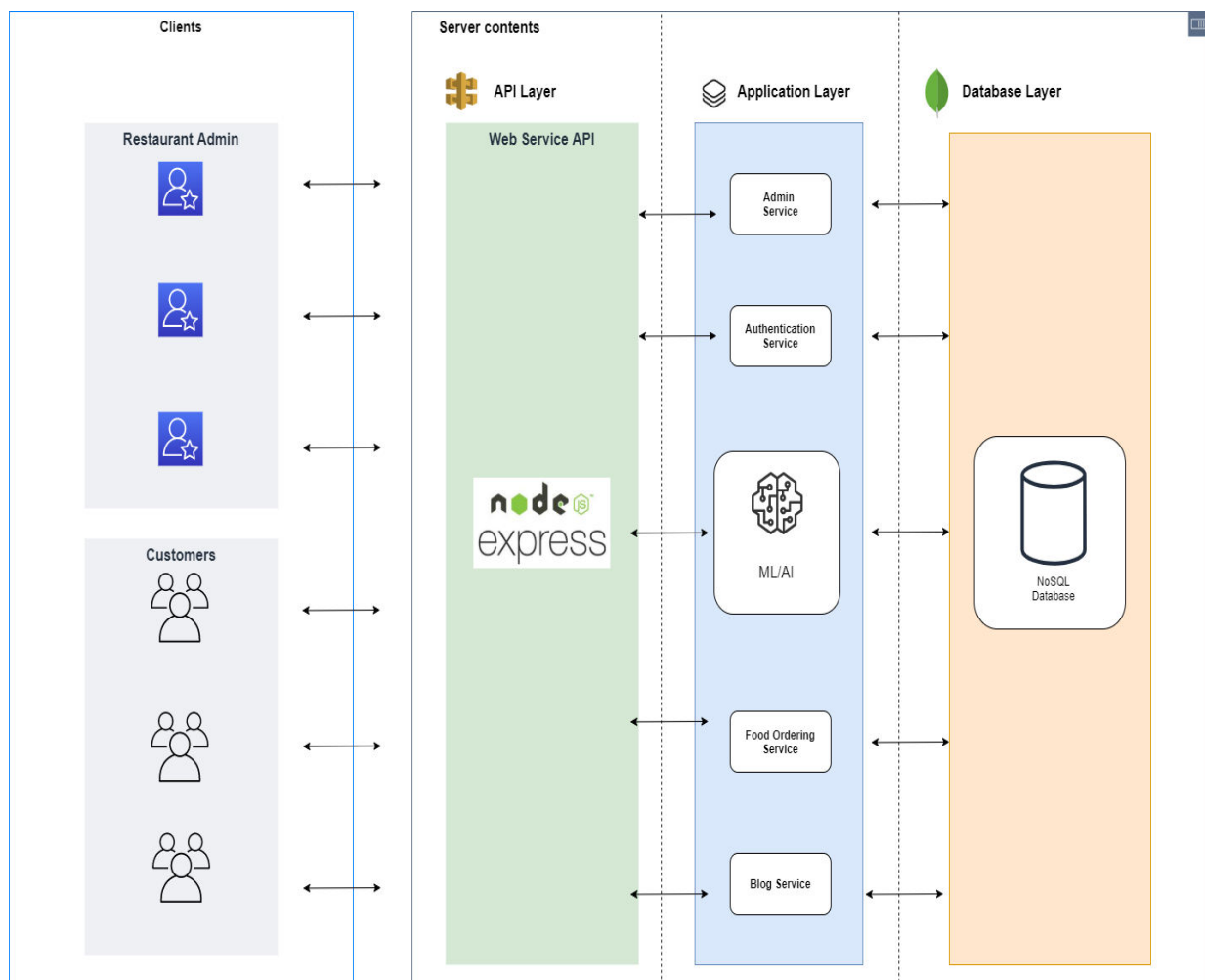


Figure 1. Architecture Diagram

As the complete architecture explains one load balancer can help balance the load throughout the application making it available to the users

every single time they wish to use this application.
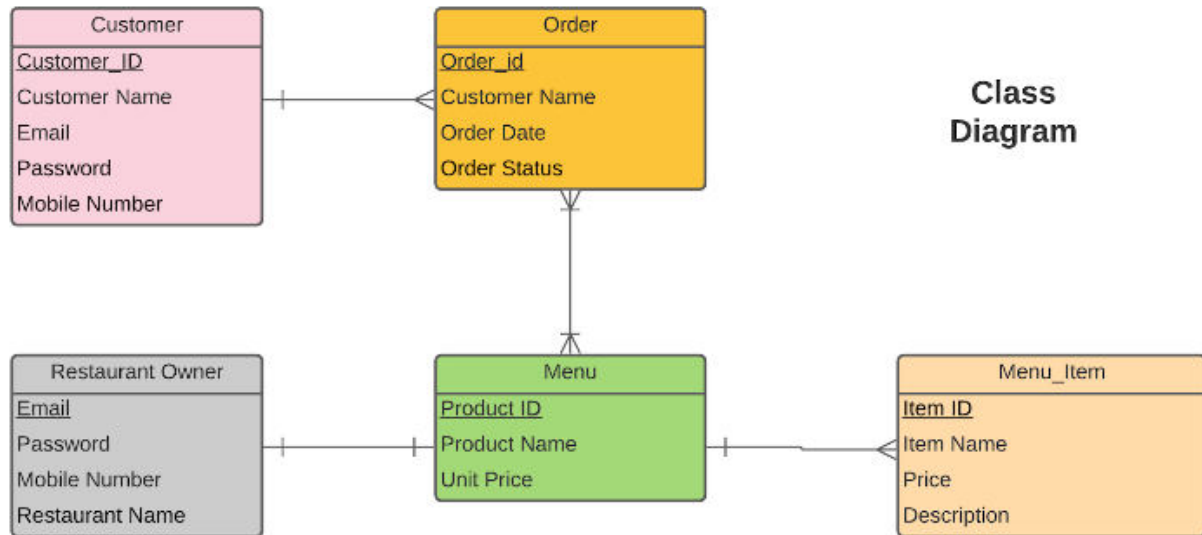
## 5. Class Diagram



Figure 2. Class Diagram

The class diagram is one of the most important sections of any application as it defines the use cases and relationships between each and everything in the system. As we can see (in Fig II) the objects in the class are simple and easy to explain. It consists of the following objects:

(a) Customer: The main object in our system is a customer who uses the system and as a result generates data, in our case, "Order". One customer can have many orders hence it has one to many relationship.

(b) Orders: Any order in the system made by a customer has to be associated with a restaurant. However, there could be more than one order associated with one of the many restaurants registered within the system. Hence, a many to many relationship is established between the two objects.

(c) Menu: The menus in the system contain various dishes termed as Menu Item (in Fig 2) hence we have a one to many

relationship of Menu with the items it contains. As fig 2 depicts there could be only one menu for one restaurant. Therefore, we have a one-to-one relationship between Restaurant and the menu.

## 6. Flow Diagrams

### 6.1 Customer End

The customer end consists of a mobile application to perform all the activities involving food ordering from the restaurant or searching for blog posts. The first activity for a user is to register in the system using a simple sign up form. On creating an account, the customers can login to their accounts and begin using it's features. The customers can scan the QR code present on the restaurant table and begin browsing through the menu. They can pick the items they like and place an order. The app also provides a payment gateway to ensure a seamless contact-less dining experience.
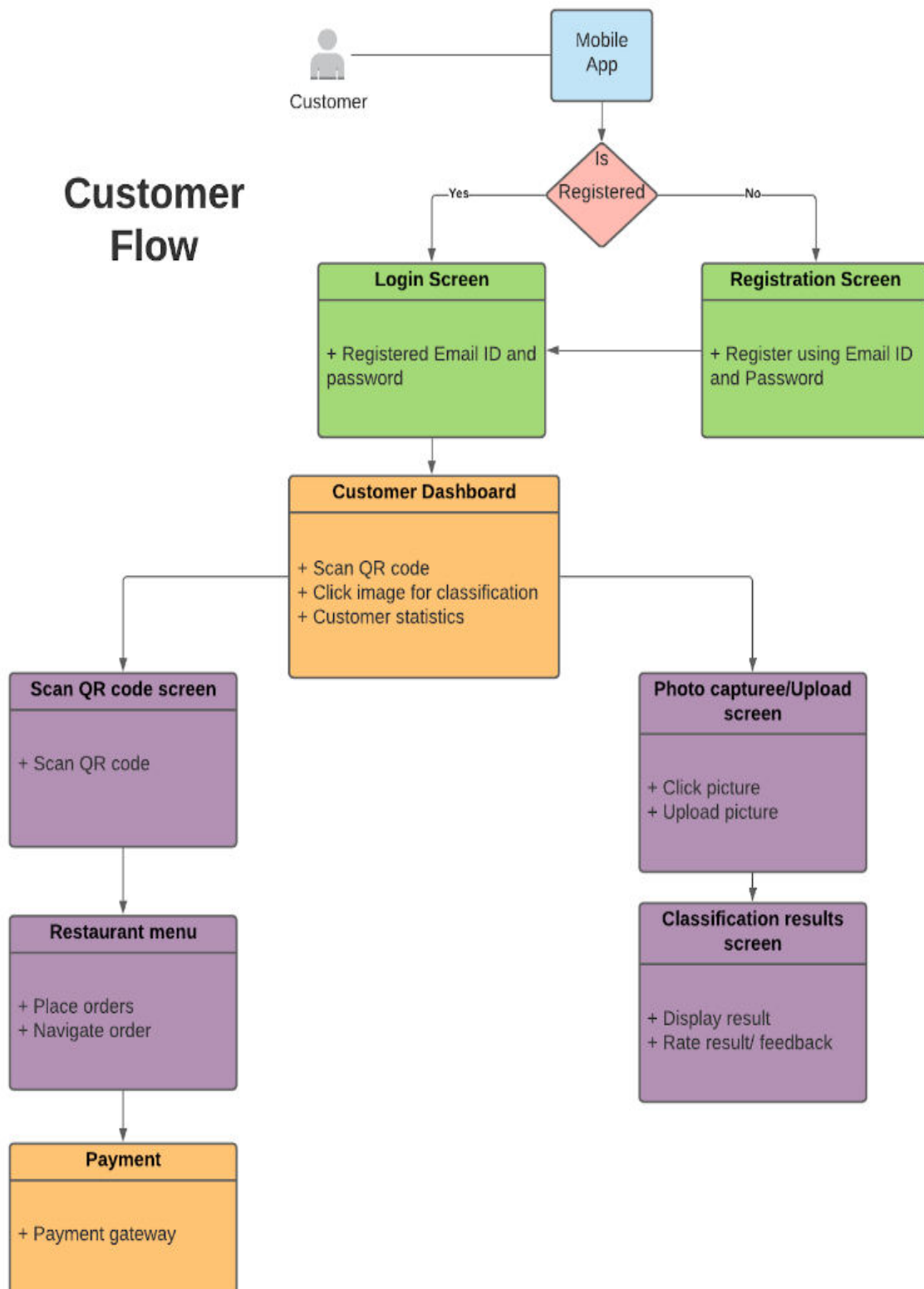
Figure 3. Flow Diagram for Customer End

In the 'Dissect My Plate' section of the app, users can click and upload a photo of the dish they're having which in turn is sent to our flask server which has a food classification model. Based on the dish detected, users can view more details about it and know more about the cuisine it belongs to.

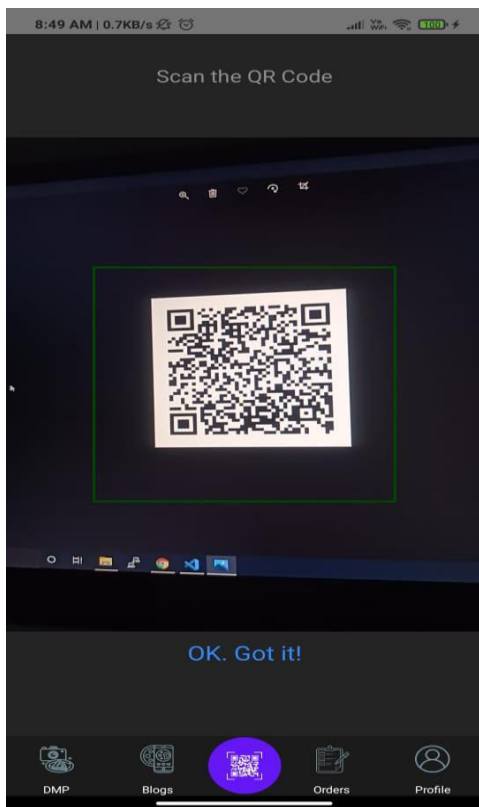Screenshots of the System Designed are as follows:
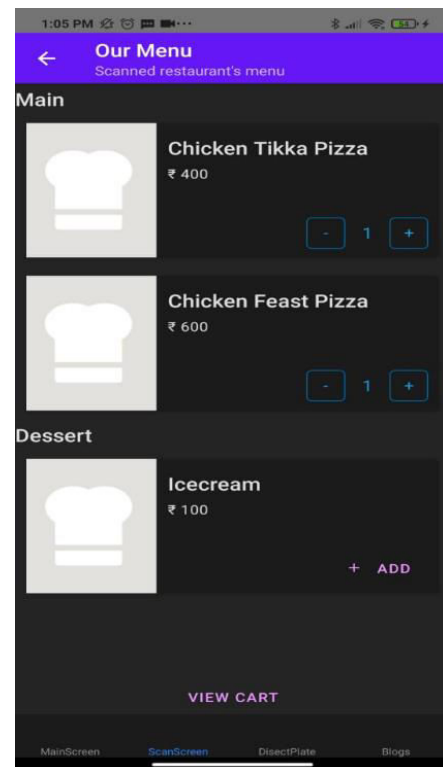
Figure 4: User Scan Screen



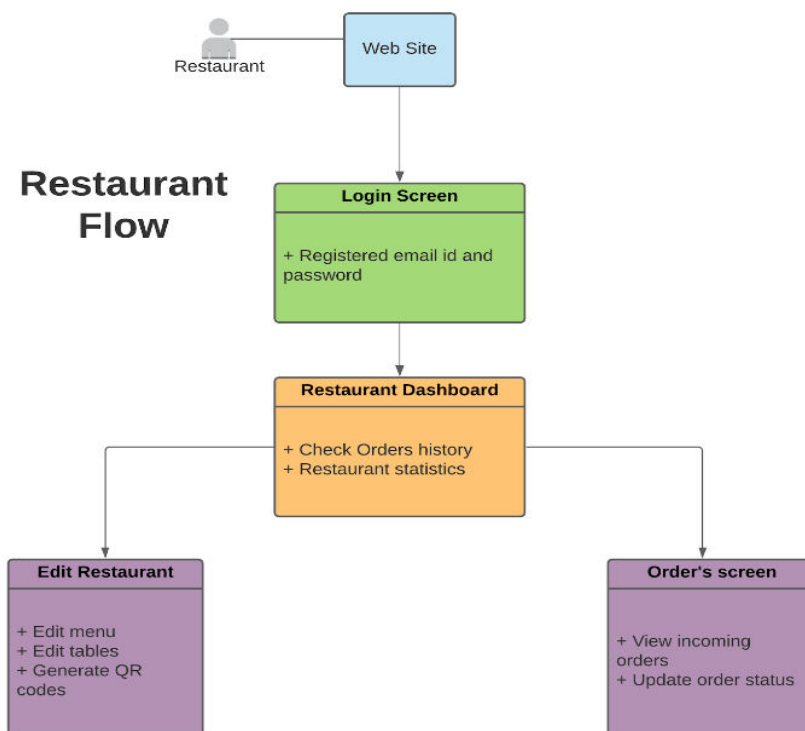Figure 5: Menu Screen after scanning QR Code

**6.2 Restaurant End**



Figure 6: Flow Diagram of Restaurant End

The restaurant end provides a web application that acts as the dashboard for managing all restaurant-related data, including the tables, menu and incoming orders.After logging in to

the dashboard, restaurant admins are provided with the 'Menu' section where they can add or remove items to the list of dishes on offer for their customers. In the 'Manage Tables' section, restaurant admins can add or remove tables depending upon the number of tables they have in the restaurant and generate the corresponding QR code for each table containing the table number and the restaurant ID. These QR codes can be later printed and placed on the respective tables for the customers, who'll be scanning it and placing orders.The 'Orders' section displays the latest orders made by the customers present in the restaurant in real-time. The restaurant staff can use this section to update the progress of the food items in order to keep the customers updated with the preparation process.

Screenshots of the system designed are as follows:
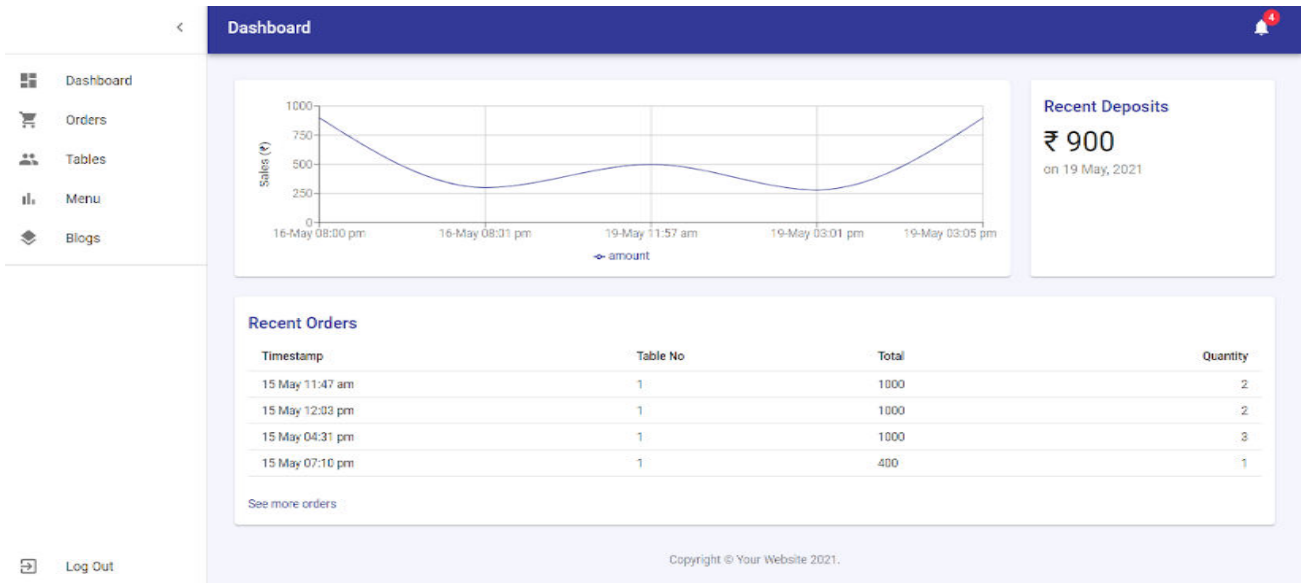


Figure 7: Screenshot of Restaurant Admin Dashboard

## 6.3 Dish Recognition
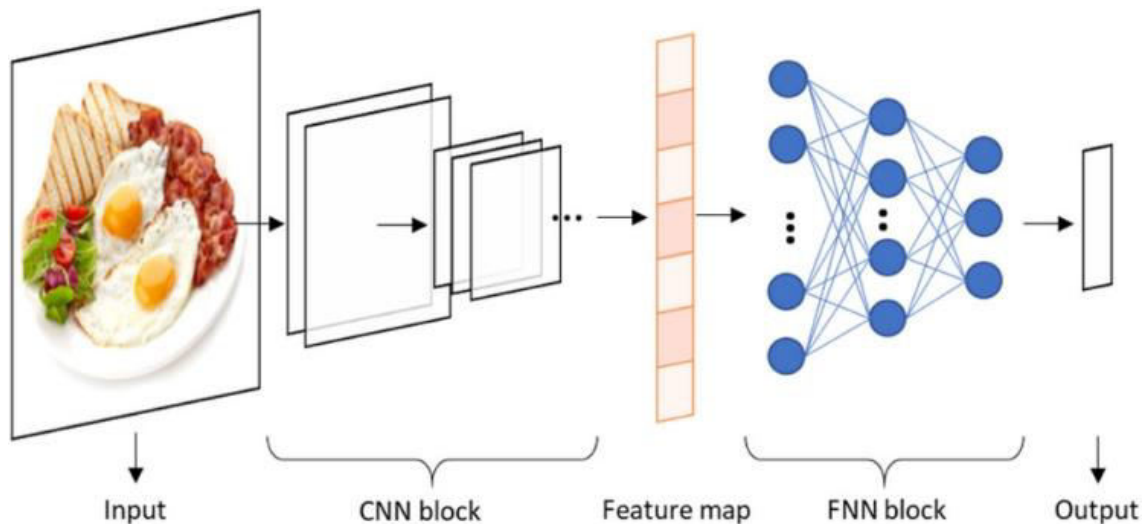


Fig 8: CNN Architecture

The client-side application comes with a feature to click food images and get food classification results. The classification model used to do this task is trained using deep learning and convolutional neural networks in particular. We have trained two models - one model to classify whether an image is a "food image" or a "non-food image", another model to classify food images into classes. We have used the food-5k and the food-101 xdatasets which are available to the public on kaggle. We pre-process the datasets and prepare the

training and testing data for our deep learning model. After pre-processing the dataset, we define the model architecture. We have used the method of transfer learning which is a research problem in machine learning that focuses on storing knowledge gained when solving one problem and applying that knowledge to another problem. For our use case, we have used the resnet-32 pretrained model and applied transfer learning in order to do image classification for our system. We have used fastai as our deep learning framework. Fastai is a deep learning library which provides users high-level components; which , with a good understanding of underlying deep learning concepts, can help the user train and test models quickly and with ease. We have used fastai extensively from training the model to making predictions. The models are deployed using a Flask server on Heroku platform and requests to the server are sent using REST api calls.

## 7.  Results and Conclusion

The proposed system could be a great replacement to the current conventional method of food ordering. We propose an enhanced and efficient way to make orders. The entire system is developed in isolated sections of web app, mobile app and backend servers which ensures light-weight app builds, failure prevention and availability. The services provided are hosted on AWS EC2 instances which can be replicated to be made highly available by setting up an Elastic Load Balancer. The average time for the response on Amazon EC2 instances varies from 50 - 100 ms.

The use of this mobile application has the potential to completely place an order under a minute. The system is developed in such a way that the requests from front end to backend are completed in a very short time. The NoSQL database used ensures quick responses to queries (<100ms).

## 8.  Future Scope

The application can be further enhanced by improving it's real time capabilities using premium features of the cloud services used. Using the analytics and various data analysis techniques we can also take care of the peak hours and prepare the system well for it. Even though the system is built using the industrial standards of Software Development, there could be changes required in the system designed in the future. Another feature under development is a module which takes recipe ingredients as an input and returns a list of recipes which use these ingredients. This can make the user experience a lot more interactive and fulfilling.

## Acknowledgments

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# IOT AND ARTIFICIAL INTELLIGENCE BASED SMART HEALTHCARE SYSTEM FOR IDENTIFICATION OF DISEASE

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## ABSTRACT

*The rapid changes in the Internet of things, artificial Intelligence and cloud computing converted ordinary health care system into advanced health care system.  This paper shows that how many advanced techniques such as AI and IoT are used in diagnosing the disease and converting them into smart healthcare systems .The main objective of this unit is to make a best smart system for diagnosing the problems in the body related to heart and  hypoglycaemia using latest advanced techniques . The Present system uses the memory named cascaded long short term which is based on the algorithm termed Crow Search Optimization for making the model. By this experiment , the model  present in this system gives the   maximum accuracies of 96.16% and 97.26% in detecting the diseases related to heart and hypoglycaemia .This model is very reasonable for making the system which is used for diagnosing the disease.*
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*Keywords:Merging, Artificial Intelligence ,Cloud Computing, Smart healthcare system,  disease detection, IoT.*

## Introduction

Present medical sector started adopting modern methods in  technology in the present days to improve latest applications and make advancements in the treatment process. Latest techniques and research based theory are the major entities for producing more outcomes in the output. Also, advancements in medical sector  is thought to be  uncomplicated, polished, and manage applications.The present research paper tells new AI and IoT techniques to make advancements in diagnosing the disease based on heart . The projected Internet of things and Artificial Intelligence merging techniques handles on the optimization algorithm named crow search  with the Memory named Cascaded Long Short Termfor diagnosing the disease.The model named

Cascaded Long Short Term Memory is organised  to measure both 'bias' and 'weights' specifications of the given model. Also, the technique named I forest is used in  paper to abolish the exception.Subscription to this research paper is explained briefly here

- Preparing an outline and improving innovative techniques in IoT and AI for detecting a disease for the smart healthcare systems.

- Proposed an advanced technique model named cascaded long short term for detecting the disease based on heart and hypoglycaemia

- Integrated process for detection of disease uses a technique named iForest to improve the results in this research.



Figure 1: Representation of IoT applications

## Linked Analysis

Lots of researches are organised earlier to improve the arrangement that recognizes health indicators ,physical variables to approach several accidents and incidents.

Mustlag et al**.** related an sensor network named Cellular shaft is used to identify the pulse rate and action of users, whenever they require. In this research, the junction is connected to the internet and it sends an warning message to the family members whenever the changes occurs in our body such as cardiac changes .

Villa Rubia et al**.**proposed system to observe unhealthy people from the place there live by using the technique named electrocardiography. In this module composition, an sentient combined medical management is improved using an well organised method for detecting the section. A set of definite devices using IoT was used to encapsulate lecture and depection of image signals of the patients in home.

Kaur and Jasuja , the researchers to inspect the application of the method named Bluemix cloud to set down data based on psychology and authorise the remote ingress by medical practitioners .The reflection outcomes are envisioned , refined regarding Internet of things conditions.

Alwen and Rao , made a research for analysing fever using integrated model that frequently identifies the health conditions of patients.

In Satija et al. , projected a contemporaneous ECG telemetry based on IoT. In this research, analytics have identified the effective model based on varied activities.

Pham et al. made a model in which biodegradable sensors, smartwatch-based sensors and optitrack cameras are engaged to collect audio signals , image and video and to collect particular clobbers.

In writings , an innovative model was projected which comprises of a technique named pathology using deep learning techniques.In this method pathogens can be identified by the signals named electroencephalogram. In this method ,the smart headset with the EEG captures the signals and it is transmitted to a mobile edge which contains of computing server. The server in this model modifies the signal and sends that modified signal to the cloud.

Uddin made a proposal to identify an to observe different people using network named Long Short-term Memory-Recurrent Neural which were applied upon graphics processing unit acceleration and local fog servers.

Queralta et al. projected a model to make a solution for fall forecast based on the network with the memory named Long Short-term Recurrent optics which was in the top level .
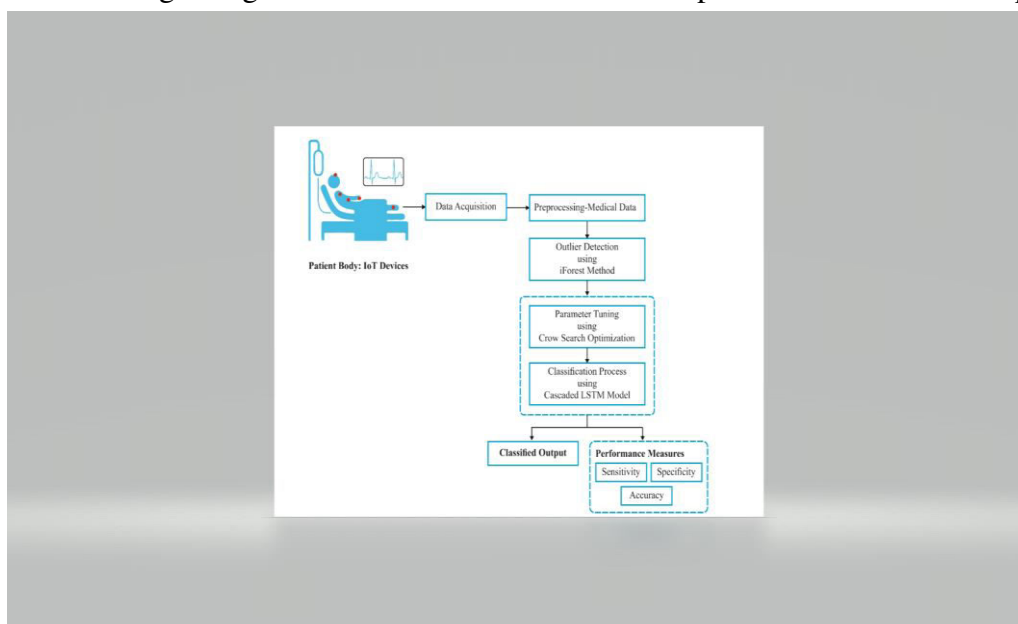


Figure2: Functioning Activity of CSO-CLSTM model

## Present Smart Medical Management Analysis Model

The inserted sensors are engaged to process with considerable data processing to analyse and differentiate between ordinary and irregular pulse rates. The ideas are encapsulated with effective equipment for instantaneous smartphones which can be taken anywhere while travelling. Also, inserted Electrocardiograph and febricity detectors are highly used to record the information for collecting the data regarding heart rate. When data is received to less-ability headset connection ,the smartphones receives signals too tells us the information whether the patient condition is normal or abnormal . The clone program performs well for the detection of diseases related to hypoglycaemia and heart. Initially, The present IoT gadgets collects the data and records and convert them into adaptable testimony. Instalization is made about some steps such as class labeling ,information change and arrangement conversion. Then the technique named iforest is used to get necessary information and remove unnecessary information which is in the disease suffering person information. Later on followed by the model named cascaded long short term which is used to identify the presence or absence of the disease in the body.

### • Iforest-Based Outlier Removal Process

Processed health information is sent into iForest, a method with fine elaboration and total attention. Reason being irregularities were 'less , diverse', it is slowly apt confinement. In case of random tree which is based on data, the information is taken uptoconfinment. Unconsidered distribution leads to make lengths of the outputs to different values. Here, it is approved to make the length of the output to considered values. The technique iforest is composed of number of trees named isolation trees. Every isolation Tree considered as a primary Branch. followed accomplishment involved in evaluation of the process is as considered.

- Select some points of samples called subsamples from the data we have collected and place them at the edge of the tree.

- Mark aspect and make a edge point 'p' from the present edge data. From the data we have collected and the data gives us the maximum and minimum edge points through the information provided.

### • DIAGNOSISing the disease using Crow search optimization
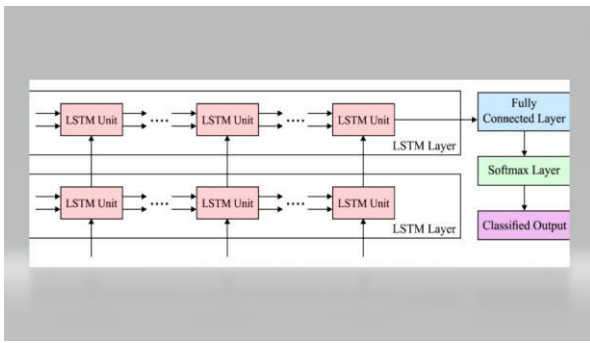
After removing the exceptions in the medical management information, the model named Crow Search Optimization is used in classifying the data .The network named recurrent neural are the special standard Networks called Artificial Neurals using the time series of large scope composition values can be developed. The primary concept of Recurrent neural network is including time delay part as well as observation comments, where the data from primary level is applied in next level. The construction of recurent neural networks contains of input layer, also called as succession layer, which registers input as a sequecnce of vectors {x, . . . ,x , . . . ,x} with article for every time step; Here, information continues with a series of unseen start {a , . . . ,a , . . . ,a }as well as the conclusion vector {yˆ , . . . ,yˆ , . . . ,yˆ} for Z timesteps. A first start up 0h0i is shown as a points .Start up also last forecast at period z is imagined

$$A^{<Z>} = g ( Wa [a^{<z-1>} ,x^{<z>}+ba) \quad (1)$$

$$yˆ^{<Z>} = g(Wy[.a^{(z)}+ by]) \quad (2)$$

$$\Gamma_f = \sigma \left( W_f \cdot \left[ a^{<z-1>}, x^{<z>} \right] + b_f \right) \quad (3)$$

$$\Gamma_u = \sigma \left( W_u \cdot \left[ a^{<z-1>}, x^{<z>} \right] + b_u \right) \quad (4)$$

**Structure of CLSTM**

$$\Gamma_0 = \sigma \left( W_0 \cdot \left[ a^{<z-1>}, x^{<z>} \right] + b_0 \right) \qquad (5)$$

$$\tilde{C}^{<z>} = \tanh \left( W_c \cdot \left[ a^{<z-1>}, x^{<z>} \right] + b_c \right) \qquad (6)$$

$$\tilde{C}^{<t>} = \Gamma_u * \tilde{C}^{<z>} + \Gamma_f * \tilde{C}^{<z-1>} \quad (7) \qquad (7)$$

$$a^{<z>} = \Gamma_0 * \tanh \left( C^{<z>} \right) \qquad (8)$$

$$\tilde{y}_j^{(i)} = \frac{\hat{c}^{(i)}}{\sum_{j=1} \hat{c}^{(i)}} \qquad (9)$$

$$J(W, b) = -\frac{1}{M} \sum_{i=1}^{M} \sum_{j=1}^{C} y_j^{(i)} \cdot \log \left( \hat{y}_j^{(i)} \right) \qquad (10)$$

**C. Variableelobaration OF tonnage AND tilt by Crow search optimization**

Crow Search optimization is used in this paper to reduce tonnage and tilt quantities of representation.
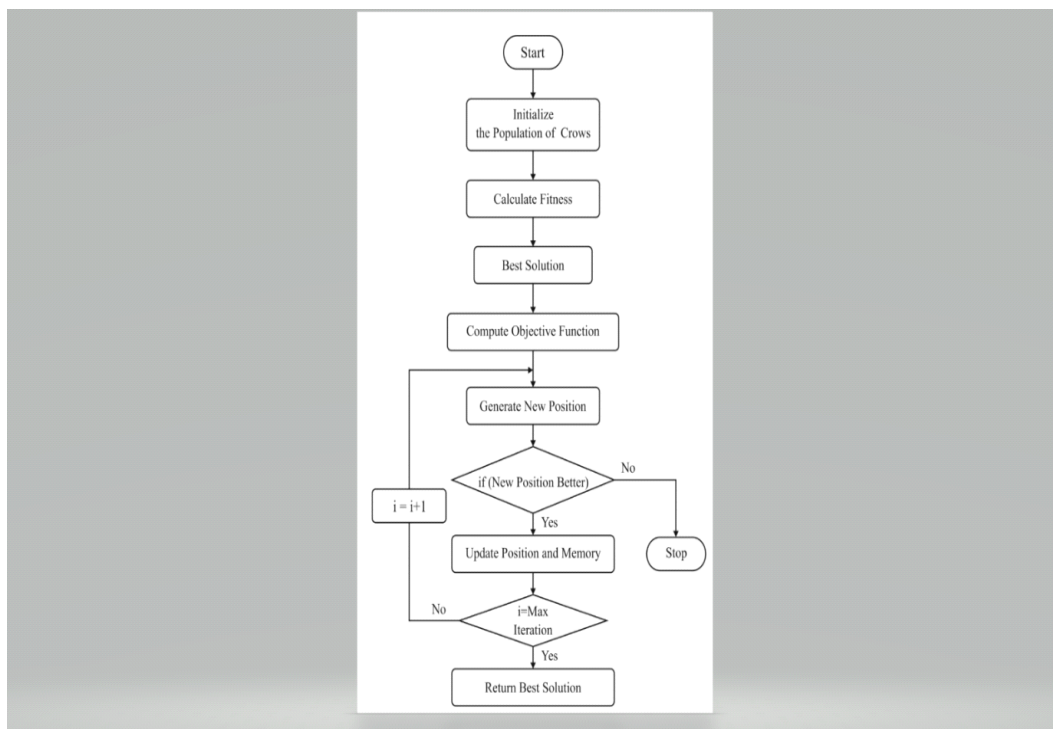
Flowchart of CSO algorithm.

$$V^{u,iter} \ (p = 1, 2, \ldots, C; iter = 1, 2, \ldots,) \ iter_{max} \quad (11)$$

$$V^{u,iter+1} = V^{u,iter} + k_j \times fll^{u,iter} \times \left( S^{v,iter} - V^{u,iter} \right) \quad (12)$$

Where the variables in the equation represents number of loops of higher count.

$$V^{u,iter+1} = \begin{cases} V^{u,iter} + k_j \times fll^{u,iter} \times \left( S^{v,iter} - V^{u,iter} \right) k_j \\ \geq AWP^{v,iter} \\ a \ random \ location \ other \ \text{wise} \end{cases} \quad (13)$$

## Results

- **Information ON HEART DISEASE DIAGNOSIS:**

Tabular information for identifying the values of sensitivity ,specificity ,and accuracy.

Acuity(%)(%)

| Number of measures | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| 1000 | 91.34 | 91.34 | 92.34 | 92.34 | 92.34 |
| 3000 | 87 | 89.09 | 87.98 | 87.54 | 97.09 |
| 5000 | 89 | 89.98 | 89.56 | 89.09 | 95.87 |
| 7000 | 87 | 87.09 | 87.87 | 87.87 | 95.98 |
| 9000 | 88 | 88.87 | 88.98 | 88.65 | 93.09 |

Precession(%)

| Taken measures | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| 1000 | 91.34 | 89.34 | 92.34 | 92.34 | 95.34 |
| 3000 | 87.98 | 86.09 | 85.98 | 83.54 | 98.09 |
| 5000 | 89.87 | 85.98 | 88.56 | 83.09 | 96.87 |
| 7000 | 87.77 | 86.09 | 84.87 | 84.87 | 94.98 |
| 9000 | 88.54 | 89.87 | 85.98 | 85.65 | 91.09 |

Perfectness(%)

| Taken measures | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| 1000 | 85.34 | 88.34 | 92.34 | 91.34 | 95.34 |
| 3000 | 86.98 | 84.09 | 84.98 | 86.54 | 96.09 |
| 5000 | 85.87 | 86.98 | 84.56 | 86.09 | 98.87 |
| 7000 | 84.77 | 85.09 | 85.87 | 87.87 | 94.98 |
| 9000 | 84.54 | 81.87 | 86.98 | 87.65 | 92.09 |

**Table1: Investigation of present and past dates in diagnosing heart disease**

The given tables shows us the sensitivity,specificity,and accuracy of the prposed system and the existing system on diagnosing the diseases related to heart.

| Procedings | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| Sensitivity | 91.76 | 86.76 | 84.76 | 89.54 | 94.09 |
| Specifcity | 88.89 | 89.09 | 87.09 | 86.09 | 93.87 |
| Accuracy | 86.09 | 89.09 | 87.87 | 86.09 | 92.08 |

**Table2:The standard work analysis of present and the suggested Crow Search Optimization method on heart disease datafile.**

This table shows the comparision between the model proposed in this research and the other measures which were used in diagnosing the heart diseases.The proposed model Crow Search Optimization shows more sensitivity ,specificity and accuracy compared to the other measures.

Graph1:Values in percentage on taken measures

B. Results On Hypoglycaemia Dataset

Sensitivity(%)

| Procedings | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| 1000 | 91.34 | 90.34 | 89.34 | 92.34 | 95.34 |
| 3000 | 84 | 80.09 | 85.98 | 86.54 | 98.09 |
| 5000 | 85 | 88.98 | 86.56 | 84.09 | 96.87 |
| 7000 | 78 | 87.09 | 86.87 | 84.87 | 94.98 |
| 9000 | 87 | 86.87 | 89.98 | 80.65 | 91.09 |

Precession(%)

| Number of measures | KNN | NB-A | SVM | J48 | CSO-CLSTM |
|---|---|---|---|---|---|
| 1000 | 91.34 | 90.34 | 89.34 | 92.34 | 95.34 |
| 3000 | 84 | 80.09 | 85.98 | 86.54 | 98.09 |
| 5000 | 85 | 88.98 | 86.56 | 84.09 | 96.87 |
| 7000 | 78 | 87.09 | 86.87 | 84.87 | 94.98 |
| 9000 | 87 | 86.87 | 89.98 | 80.65 | 91.09 |

Perfectness(%)

| Procedings | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| 1000 | 91.34 | 90.34 | 88.34 | 91.34 | 94.34 |
| 3000 | 89.09 | 80.09 | 88.98 | 85.54 | 97.09 |
| 5000 | 87.78 | 88.98 | 83.56 | 89.09 | 95.87 |
| 7000 | 78.56 | 87.09 | 87.87 | 83.87 | 96.98 |
| 9000 | 87.76 | 84.87 | 88.98 | 81.65 | 97.09 |

## Table3: Investigation of present and past dates in diagnosing on HYPOGLYCAEMIA disease dataset

The given tables shows us the sensitivity,specificity,and accuracy of the prposed system and the existing system on diagnosing the diseases related to HYPOGLYCAEMIA.

| Procedings | k-nearest neighbours | Nota Bene-A | Support vector machine | Johnson solid48 | Crow Search Optimization algorithm-based Cascaded Long Short Term Memory |
|---|---|---|---|---|---|
| Sensitivity | 89.76 | 86.76 | 84.76 | 89.54 | 94.09 |
| Specifcity | 88.89 | 89.09 | 87.09 | 85.78 | 93.87 |
| Accuracy | 86.09 | 89.87 | 87.87 | 86.09 | 92.08 |

## Table4:The standard work analysis of present and the suggested Crow Search Optimization method on HYPOGLYCAEMIA disease datafile.

This table shows the comparision between the model proposed in this research and the other measures which were used in diagnosing the hypoglycaemiadiseases.The proposed model Crow Search Optimization shows more sensitivity ,specificity and accuracy compared to the other measures.

Graph2: Values in percentage on taken measures

### Culmination

present paper work  presented effective Internet of Things and Artificial Intelligence based disease diagnosis model for health management. IoT devices collects the data from the source where as the AI devices utilizes the data to detect the disease from the information collected. The Crow search optimization model provides a maximum efficiency on hypoglycaemia disease and heart disease diagnoses respectively. Here authorises capability of the model used in this paper.

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# IOT-BASED MONITORING AND CONTROLLING OF AUTOMATIC WATER DISPENSER WITH FACE MASK DETECTION

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## ABSTRACT

*The study aimed to investigate the water quality parameters along with the usage of a face mask detector to prevent contagious diseases. Water dispensers are usually placed at schools, offices, hospitals, bus stations, railway stations, etc., due to inappropriate usage, these water dispensers are becoming the source of contact for diseases spreading through saliva droplets, sneeze, and cough. In the traditional type of water dispensers, a person needs to come in contact with the dispenser to fetch the water and this may lead to the spreading of diseases very rapidly. This paper presents the automatic dispenser without any physical contact and will be operated only using a face mask and bottle detector by this configuration we can also prevent water loss by the predefined quantity, also this helps the admin to monitor the automatic water dispenser by using internet of things (IoT). By adopting this method one can get quality and hygienic water. Also, this creates awareness among society. This system prevents the spreading of contagious diseases likeSARS-CoV-2.*

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*Keywords: Automatic Water Dispenser, Face Mask Detection, Internet of Things (IoT), Severe Acute Respiratory Syndrome Corona Virus-2(SARS-COV-2), Water Quality.*

## 1. Introduction

Water may be a vital resource needed to sustain life. It is one of the important substances on earth that is essential for humans, plants, and animals. All of our cells, mainly muscle cells, receive vital nutrients from the water and bring oxygen to our brain. Water scarcity is the demand for lack of fresh water. This might be due to climate changes, natural calamities, increased human consumption, etc. The availability of safe drinking water is a global challenge due to two factors, (i) Quality of water and (ii) Quantity of water. The crisis of hygienic water is a challenge that is being faced by mankind. This can be overcome by the usage of water dispensers.

A water dispenser is used as a refrigerating unit that cools or heats the water. Water dispenser plays a vital role in hospitals, restaurants, schools, offices, public places, etc., for storing and using clean water. This equipment supplies quality water for drinking along with an adequate amount of power of hydrogen(pH), turbidity and includes physical and chemical properties of water. The advantages of a water

dispenser include, it tastes better than normal water, better for a sugar-free diet, saves money and space, makes it easy to drink more water. The traditional water non-automatic water dispenser is shown in below Figure 1.

Water has become a crucial factor that is a route for many contagious diseases that can spread very quickly and be fatal. If the source of contaminations is known, the problem will decrease by spreading awareness among people and by using simple methods which can prevent diseases. One such problem is an ill-health person encountering the water dispenser with a bare hand and without a mask might be problematic.

To reduce such complications, the usage of Automatic water dispensers with face mask detection and IoT-based monitoring and controlling can be implemented. This method not only serves hygienic water to the public but also helps in controlling fatal diseases. Raspberry Pi and Arduino Uno are used as a control unit in this system and an open-source computer vision (open-source CV) python

library is used to detect the face mask. pH sensor and turbidity sensors are used to monitoring the water quality parameters like pH value and turbidity.



Figure 1: Traditional non-automatic water dispenser.

## 2. Literature Review

In ref [1], the author demonstrates and designs the system using WeMos D1 mini, pH sensor, ultrasonic sensor, temperature sensor, and turbidity sensor. A built-in Wi-Fi facility is available in WeMos for sending sensor data over the internet. Water quality data gathering, data transfer, monitoring, recording, and analysis were all created and tested in the overall experimental setting. The ThingSpeak IoT platform is used to monitor sensor data. Collects the water samples from various water sources like ponds, rivers, seas, etc.

In ref [2], the author briefs the real-time water quality inquiry and reduction of wasting of using Internet of Things (IoT). Sensors are used to measure different water properties such as pH, turbidity, and temperature. Blynk App sends measured data to concerned authorities for further action to increase water accuracy and reduce water waste.

In ref [3], the author demonstrates automatic water dispenser and water level monitoring is been proposed using Node MCU and ultrasonic

sensor, smart taps in IoT environment. Smart water dispenser sends a notification to authorized persons when the level of water becomes low and smart taps helps to save water. When the authorized person receives the notification of a low water level, the android app will help users to order water cans or tanks.

In ref [4], the author explains the efficiency of the medical mask and cloth mask is determined by conducting the meta-analysis with the help of "R" software. Random effects models are used in meta-analysis. PubMed, Google Scholar, and the Cochrane Library Database are used in the effectiveness findings of different masks. A cloth facemask is not efficient to prevent respiratory infection disease. Compared to the cloth mask medical mask is more effective to prevent respiratory infection disease.

In ref [5], the author explains how to recognize face masks using a hybrid model that combines deep and classical machine learning. This face mask detector is built utilizing Python, OpenCV, TensorFlow, and Keras technologies with a dataset. A beep alert will be triggered if somebody is found without a face mask. Face mask detection is done on live video streaming with more efficient machine learning libraries.

## 3. Proposed Methodology

Our proposed "IoT-based monitoring and controlling of automatic water dispenser with face mask detection" provide the real-time status of the water dispenser. This system consists of a power supply, sensors, Arduino, water pump, and pi camera. a brief description of the block diagram is discussed as shown in Figure 2. Firstly, a power supply is connected to raspberry pi and Arduino to power up the system. The water pump is immersed in the water tank and the output of the pump is connected to the dispenser tap. pH sensor and turbidity sensor are connected to Arduino which measures the quality of water and displays the values using organic light-emitting diode display and liquid crystal display. Pi camera and Passive infrared (PIR) sensor is connected to the raspberry pi, so when a person comes close to the water dispenser, the Pi camera and PIR sensor detect the face mask by

using open CV and machine learning programs. Infra-red (IR) sensor is connected to Arduino and used to detect the bottle. Once both bottle and face mask are detected the water is dispensed with predefined quantity. Additionally, an email alert and the picture of the person will be sent to the administrator and gets stored in the database. Working model as shown in Figure 3.
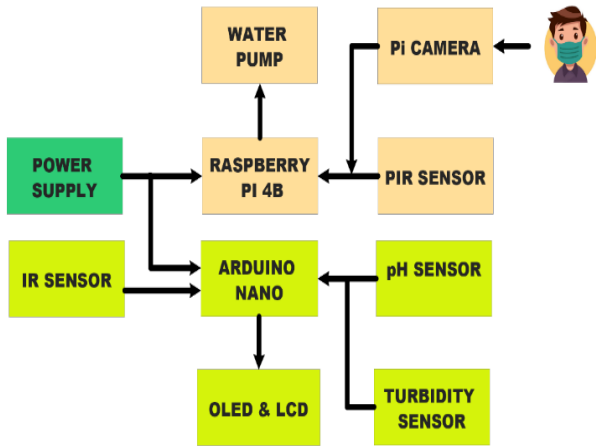


Figure2: Block diagram of the proposedmodel.



Figure 3: Diagram of the working model.

The proposed model can also be understood using the flow chart in Figure 4

1. Ph sensor and turbidity sensors sense water quality.

2. IR sensor detects the water bottle.

3. A pi camera detects the face mask with the help of OpenCV and machine learning programs.

4. PIR sensor senses the distance of the person from the dispenser, when a person within the range it helps to capture the photo using a Pi camera.

5. When both bottle and facemask are detected water, the pump is turned on and dispenses the water.

6. Once water is dispensed email alert sends admin and captures the photos of the person and stores them in the admin database.
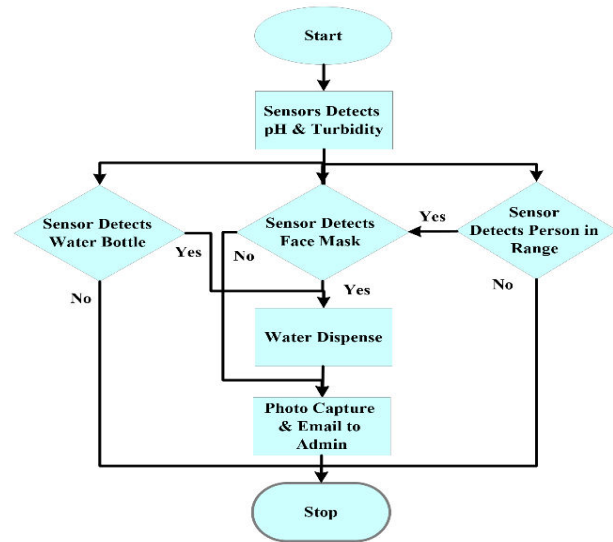


Figure 4: Flow chart of the Proposed model.

## 4. Results and Discussions

All the Electrical connections of Arduino, Raspberry Pi, and sensors modules are done as shown in figure 1. pH sensor and turbidity sensor are connected to the Arduino and controlled with the help of the 'C' language. In our project initially displays the pH and turbidity of the water.

It sends an email to the administrator along with the picture of a person who comes in contact with the dispenser to fetch the water. Sending of email is done with the help of Node MCU and Blynk app as shown in below figure 5. Blynk app having various features like a device management analytics dashboard, a rules engine, and a private cloud. These features make for a user-friendly IoT platform.

Designing a dashboard for IoT projects on the Blynk App is simple; all you have to do is sliders, graphs, and alternative widgets on the screen and arrange buttons. We may also customize the widgets to meet our needs. There

are three stages to programming a Raspberry Pi for Face Mask Detection.

The first part is used for data collection, the second is used for Recognizer training, and the third is used in face mask recognition. In this project, we are using various python directories like dataset, Imagesgather_images.py, training.py, detect_mask.py. The Dataset directory folder contains the with mask and without mask photos captured with the help of Pi camera. Imagesgather_images.py directory is a simple python script used to collect the image of a face with various angles. The training.py directory is used to accepts the input dataset and fine-tunes it. The detect_mask.py directory is used to mask detection. In the detect-mask.py directory, python code uses the trainer data to identify each face as with mask or without a mask.

Open the openthismask.py script and run it. The camera view pop-up window is generated within 2-10 seconds. Pop-up window generation in the display of the system depends on internet connection speed and processor speed. If the mask is detected, a green box with the label 'thank you mask on" will appears on the display. If the no mask is detected, a red box with the label 'No face Mask Detected' label will appear on the display.
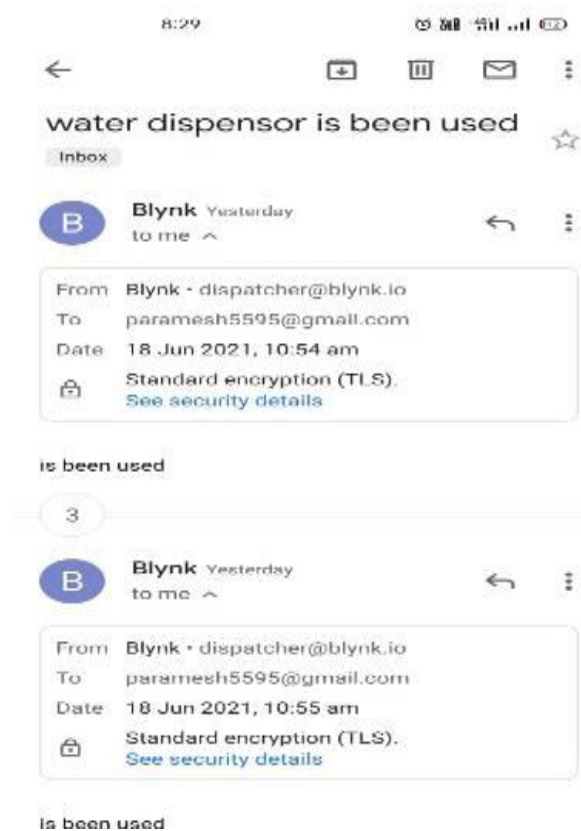


Figure 5: Email alert to admin.

When the person comes in contact with the dispenser, the facemask along with the bottle is detected using Raspberry Pi, PIR sensor, and IR sensor. The picture of the person is captured using the pi camera. Together with this picture of the person with or without facemask is captured when the person makes contact with the dispenser along with a warning as shown in Figure 6 and Figure 7. Detection of facemask is programmed using python programming language along with libraries like open-source computer vision and machine learning.
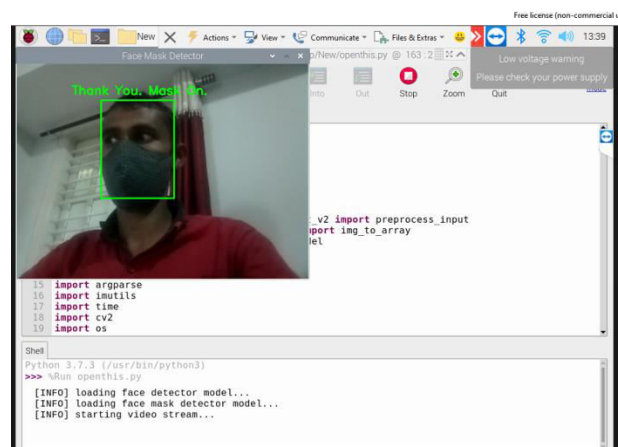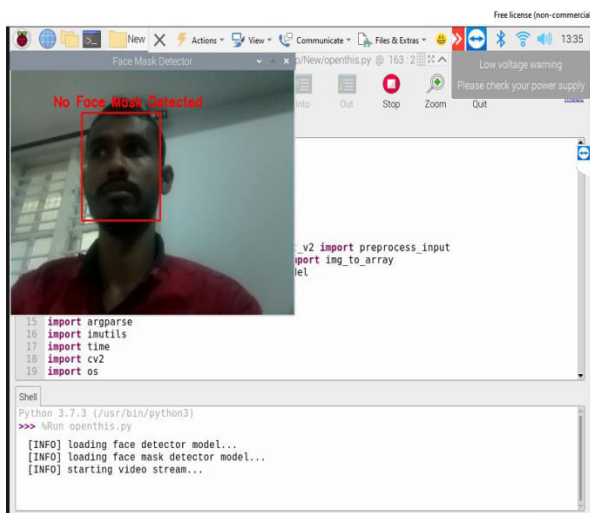


Figure 6: With face mask detection.

Figure 7: Without face mask detection.

By using Pi camera captured photos of the persons are stored in the admins database as shown in Figure 8.
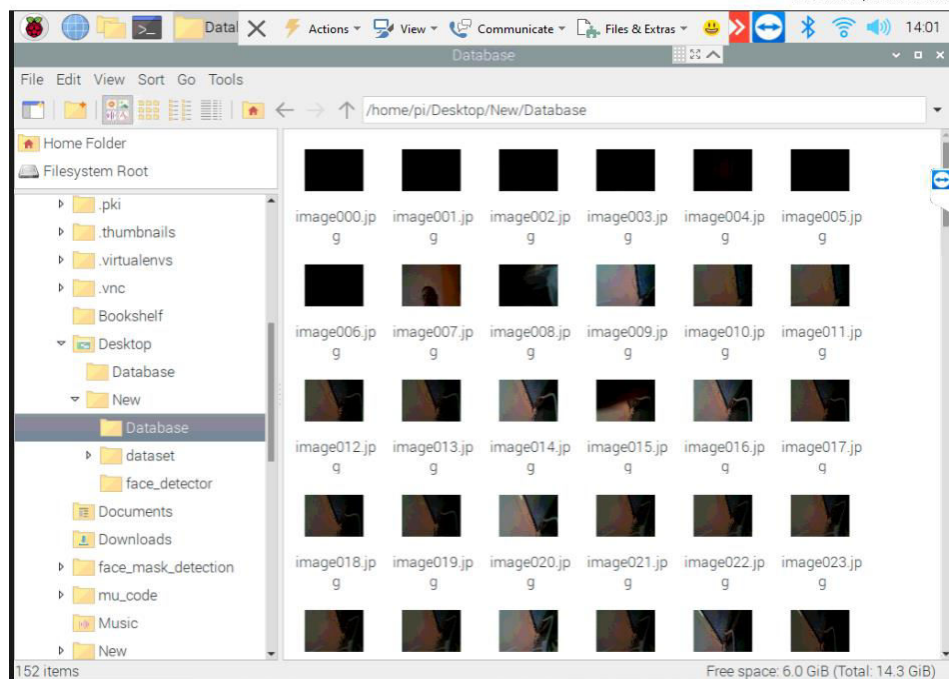


Figure 8: Captured photos in the database**.**

## 5. Conclusion and Future Scope

This system is much helpful for society to get the quality of water and also to prevent contagious diseases. This automatic dispenser provides hygienic water using many sensors which detect facemask and make certain a person is unaffected by a contagious disease like SARS COV-2. The smart system is implemented with the camera to capture the picture and sends an email alert to the administrator to monitor the dispenser. This system saves time and helps in managing the quality of water. In the future, the proposed system efficiency is increased with highly précised sensors and controllers.

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# STRESS LEVEL PREDICTION IN CORONA PATIENTS USING KNN ALGORITHM

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## ABSTRACT

*Coronavirus disease 2019 (COVID-19) is a putative coronavirus-related disease. The COVID-19 pandemic is a huge public health emergency that affects mankind. The coronavirus disease outbreak in 2019 may be distressing for people. In adults and children, fear and anxiety about a serious illness can be debilitating and culminate in intense feelings. Individuals can be affected by stress in a variety of ways. Stress is referred to as the first stage of depression. Finances, employment, relationships, and other factors can all contribute to stress. Despite the reality that many hospitals deliver mental health-related treatments for their patients, the issue remains out of control. Machine learning and image processing techniques are employed to determine stress in covid patients. The proposed system is an enhanced version of preceeding stress detection systems that did not include live detection or personal counselling, but this system includes live detection and periodic analysis of covid patients, as well as detecting physical and mental stress levels in them and providing proper stress management remedies via a survey form provided on a regular schedule. Stress Detection System helps covid patients deal with the challenges that elicit stress by providing preventative stress management solutions that focus on reducing stress and enhancing patient health.*

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## 1. Introduction

Coronavirus torture 2019 (COVID-19) is portrayed as disease achieved by a novel Covid as of now called silly cutoff respiratory issue Covid. By far most who fall got out with COVID-19 will experience delicate to arrange signs and recover without extraordinary treatment.

Stress is an unavoidable truth and can influence individuals in a mix of ways. Sooner or later for the term of conventional step by step presence, every individual experience some degree of crushing, a few group experience pressure more as habitually as possible than others and some experience issues overseeing pressure. Covid pandemic is an essential flourishing crisis a couple of nations, with over 5.31M cases and 342000 authenticated passing offered an explanation to date. The launch of Covid tainting 2019 may be disturbing for people. Fear and squeezing factor about a pollution can be overwhelming and cause convincing emotions in adults and children. Looking into this, energy framing on the COVID-19 scene fitting to mental wellbeing was recuperated through a making search out

of the PubMed enlightening combination. Spread articles were referenced by their overall subjects and summarized. Groundwork evidence suggests that appearances of tension and awfulness (16–28%) and self-no fuss pressing element (8%) are crucial mental reactions to the COVID-19 pandemic. Considering everything, subsyndromal mental success issues are an ordinary response to the COVID-19 pandemic. There is a requirement for more master investigation from other influenced countries, particularly in feeble masses.

The standard thinking about our undertaking is to perceive pressure in the Coronavirus patients using Machine learning and Image managing structures. The old crushing variable perceiving affirmation structures which hardened the live area and the individual arranging. Regardless, the proposed system contains live disclosure and fitful assessment of patients and isolating genuine correspondingly as mental impressions of anxiety in his/her by furnishing them with fitting reactions for organizing just barely

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getting factor by giving appraisal structure once in a while.

In this appraisal, the vibes of restlessness in patients are in like route seen to amass present assumptions high. Despite the way that there are various workplaces who give energetic achievement related plans to their patients regardless the issue is far from control. In this dissertation, we investigate the impact of this issue by attempting to see the crushing variable plans in Coronavirus patients. To separate pressing factor plans, we need use image planning and AI strategies. Plan pressure is applied to artificial intelligence, such as KNN classifiers. The patient's image is clicked by the camera, which fills in as information, and Picture Processing is used at the critical juncture for zone.

Pressure reshapes 50-80 percent of all certified contaminations, according to mild assessments in clinical books. The primary reason of cardiovascular disease is thought to be stress. Diabetes, ulcers, asthma, cerebral misery headaches, skin issues, epilepsy, and sexual brokenness are all linked to stress. Psychological problems such as crushing variable either create or deform these obstacles, as well as a slew of others.

Stress has three prong impacts:

- Speculative effects of crushing variable join impressions of insufficiency, shame, apprehension, enmity or disappointment. Individuals additionally feel depleted, tense, anxious, fragile, touchy, or hopeless.

- Behavioral repercussions of pressing circumstances tend to cause undeniable alterations in a person's lead. Expanded disasters, the usage of solutions or alcohol, giggling outside of the current discussion, outstanding or snappy leadership, extremely tense perspectives, as well as eating or toasting plenitude are all thought to be effects of weight loss.

- Diminishing academic limit, obstructed judgment, simpleton decisions, distractedness or perhaps extreme intriguing quality to assessment are a part of the effects of Cognitive pressing variable.

## 2. Literature Survey

I.  The appraisal builds up a system for the disclosure and assessment of stress/pressure energetic states through video-recorded facial signs. A raised exploratory show was set up to prompt careful inclination in overflowing with feeling states (evenhanded, free and focused/worrisome) through an assortment of outer and inside stressors. The assessment was spun essentially around non-intentional and semi-purposeful facial signs to quantify the tendency portrayal considerably more fair-mindedly. Highlights being researched included eye-related occasions, mouth advancement, head improvement cutoff points and heartbeat assessed through camera-based photo plethysmography. A part choice technique was utilized to pick the most strong highlights followed in response to popular demand plans segregating between pressure/strain and unbiased states concerning an accommodating state in each exploratory stage. Besides, an arranging change was proposed using self-reports to explore the relationship of facial cutoff points with a section saw extent of squeezing factor/restlessness. The outcomes showed that, particular facial prompts, gotten from eye movement, mouth action, head progressions and camera-based heart improvement accomplish uncommon precision and are reasonable as discriminative pointers of stress and fear.

II. Monitoring the enthusiastic status of an individual who is working before a PC for longer term is essential for the security of an individual. In this work an advancing non-meddling video are gotten, which recognizes the fiery status of an individual by dissecting the outward appearance. An individual tendency in every video format is recognized and the choice on the strain is made in reformist hours of the video got. A framework is utilized that awards to set up a model and inspect separates in anticipating the highlights. Theano is a python system which targets improving both the execution time and improvement

time of the quick apostatize model which is utilized here as a critical learning assessment. The exploratory outcomes show that the made framework is well on information with the nonexclusive model, considering everything.

III. Machine learning techniques are applied to investigate pressure plans in working grown-ups and to confine the fragments that emphatically pick the vibes of strain. Towards this, information from the OSMI excited flourishing investigation 2017 reactions of working experts inside the tech-business. Various Machine Learning procedures were applied to set up the model after due information cleaning and pre-dealing with. The exactness of the above models was gotten and centered modestly. Boosting had the most raised accuracy among the models executed. By utilizing Decision Trees, noticeable highlights that impact pressure were perceived as sexual bearing, family parentage and accessibility of clinical

advantages in the work environment. With these outcomes, endeavors would now have the choice to confine their way to deal with oversee decrease squeezing component and make a much satisfying work environment for their representatives.

IV. Monitoring the cautious and excited status of the driver is fundamental for the security and solace of driving. An advancing non-meddlesome checking structure is made, which sees the energized conditions of the driver by isolating outward appearances. The framework contemplates two negative essential feelings, stun and upset, as stress related notions. Exploratory outcomes show that the made framework works honorably on reenacted information even with nonexclusive models. An extra position standardization step reduces the effect of position bungle because of camera blueprint and position arrangement, and subsequently improves the exposure exactness further.
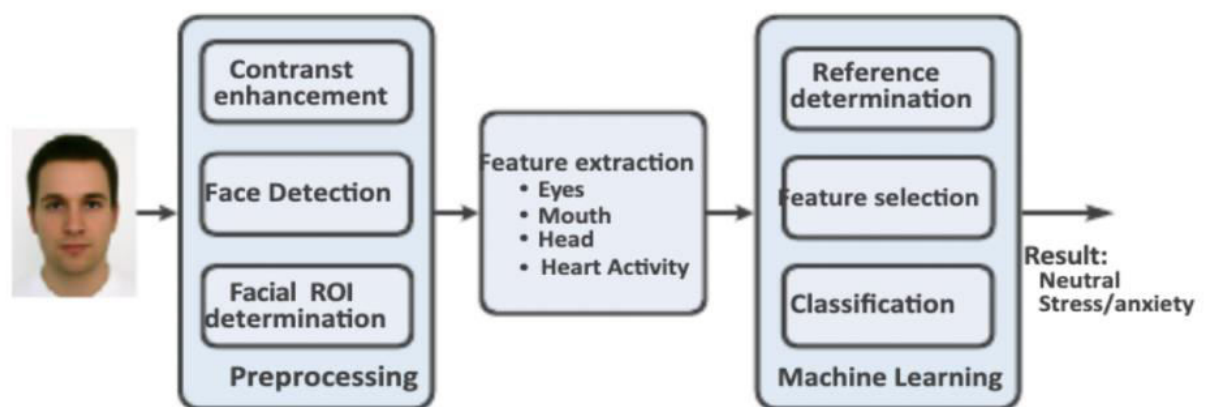
## 3. Implementation



Figure1, block diagram of Stress Detection system

### 3.1 Image Pre-Processing

Description: In mentioning to get an updated picture or to kill some solid information from it picture masterminding is used by changing over picture into cutting edge plan and playing out certain way of thinking on it. G (I, j) = α. F (I, j) + β, α > 0 and β are called as gain and penchant confines, these are used to amazing and separate the image. Here G (I, j) is yield picture pixel and F (I, j) is input picture pixel.
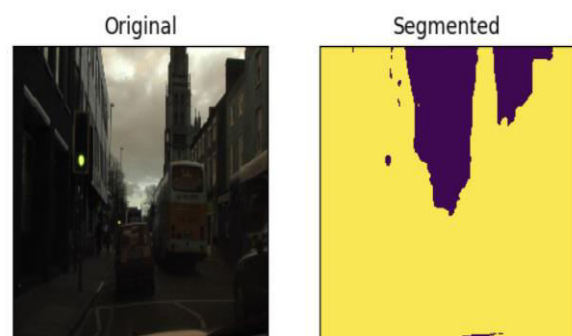
### 3.2 Pixel Change

Description: Pixel change is a technique used in the preparation of images to obtain pixel values. This tweak is meant to ensure that the image is cohesive and well-planned. The image is converted to a grayscale image, which is then translated into a high-resolution or dull-toned image. The image's edge is revealed, and it is leveraged to morph a feeble scale picture into a two-fold turn of events. If the pixel regard is more conspicuous than edge pixel regard is set to 1 despite 0.
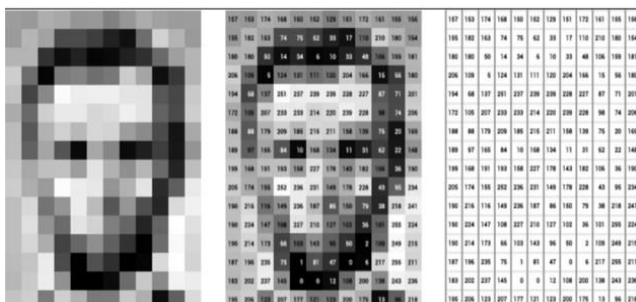


### 3.3 One hot encoding

Description: All of the hypothetical responses were assigned numerical weights prioritise. 'Certainly' is assigned a value of 1, whilst 'no' is assigned a value of 0. Using a mark encoder, all of the data was translated to numeric. To unwind into combined code, a decoder is used. Despite the fact that a one-hot state machine does not require the use of such a decoder, it is in the nth state unless the nth cycle is high.

### 3.4 Logistic Regression

Description: Logistic apostatize is a genuine model that in its principal improvement uses a concluded ability to show a twofold desperate variable, yet impressively more fantastic expansions exist. Like all break confidence approach, the chose plunge into wrongdoing is a clever evaluation. In break confidence examination, concluded apostatize is surveying the imperatives of a central model (such a twofold slip into transgression). It is used in conditions where one twofold factor is dependent on at any rate one free fragments. A chose fall away from the confidence can be called as a genuine model that uses a planned with ward variable. In slip into transgression examination, essential lose the confidence is evaluating the limitations of a chose model. Mathematically, a twofold central model has a destitute variable with two expected worth, which is tended to by a pointer variable, where the two credits are ventured "0" and "1". Essential fall away from the confidence is used in various field including AI, most clinical fields and humanistic systems. Diverse other clinical scales used to assess reality of a patient have been made using fundamental plummet into wrongdoing. Chosen break confidence may be used to expect the peril of developing a given disease (e.g. stress, diabetes, coronary affliction) considering saw credits of the patients.



Inputs: X1, X2, X3 || Weights: Θ1, Θ2, Θ3 || Outputs: Happy or Sad

### 3.5 Mini-Batch gradient Descent

Description: Gradient descent is a machine learning optimization technique that is used to estimate model parameters (coefficients and bias) for algorithms such as linear regression, logistic regression, and neural networks. We iterate through the training set repeatedly with this technique, tweaking the model parameters in accord with the gradient of error with respect to the training set.

Depending on the number of training examples considered in updating the model parameters, we have 3-types of gradient descents:

A. Batch Gradient Descent: Parameters are revived resulting to enrolling the point of bungle concerning the entire getting ready set.

B. Stochastic Gradient Descent: Parameters are revived ensuing to handling the slant of screw up concerning a lone getting ready.

C. Mini-Batch Gradient Descent: Parameters are invigorated in the wake of calculating the tendency of mix-up in regards to a subset of the arrangement set.

A subset of planning is considered; it can make lively updates in the model limits and can similarly abuse the speed related with vectorizing the code. Dependent upon the group size, the updates can be made. More modest than regular Batching is used to set the edge regard revived by tendency which makes it a generous computation.

### 3.6 KNN Classifier

Description: Similarly to backslide audit, K-Nearest Neighbor (KNN) is used for course of action. It is a coordinated learning count that is used to estimate whether or not a person need therapy. Self-governing components are to a relative event from the very known data, and KNN organizes the poor variable subject to how comparable it is.

### 3.7 IoT Platform

Description: Dataset contains a cross-section view of a hitherto set aside dataset involving multiple components, as shown by Property Extraction, which shows up as a lately arranged dataset containing only numerical data factors in light of Principal Component Analysis, with assurance changing to six head fragments, which are Condition.

### 4. Result

The Stress Detection System assists patients in adapting to concerns that are affecting a pressing factor by insulating pressure from the board game plans that are stressed over relieving pressure and enhancing patient quality of life. In this quest, we have set up a system that will take images of Coronavirus patients performing conventional stretches, and then the training study signifiers will be presented to the agent a short time latter. This will reduce the number of manual tasks and save time. This definite approach can be applied to aid in the improvement of patient pressing aspects by assuring through extremely well-organized Questionnaires.

### 5. Conclusions

The Stress Detection System is designed to foresee pressure in patients by scrutinizing snapshots of confirmed customers, assuring the structure's integrity. When the affirmative user is endorsed for a certain period of time, the image is apparently recognized. The obtained images are designed to evaluate the customer's pressing concern, which is subject to some standard changes and image-taking tools. The algorithm will then interpret the tension sensations using Machine Learning counts, culminating in more successful results.

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# RUNNING APPS ON CLOUD AND ADVANCED CLOUD SECURITY

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## ABSTRACT

*Nowadays people all are using mobiles ,pc's & tablets etc.We all storing the data and downloading apps.Running apps in internal Space(SSD,HDD,MICROSD) is not completely safe.If external device is lost or damaged, we can't able to get our data.So that why we are proposing a new cloud app acts as a mobile which can access the apps and data on cloud at instant that means all apps are run on cloud and we don't need any external storage like Sdcards, flash drive etc. In cloud all apps are available so we can download from web and all apps are secured and safe. Cloud will be protected by inbuilt powered Cloudsecurity whichprevents from cyber attacks and data breaches. So many multi-National companies using cloud storagevery vast. They are using advanced software's for their daily purpose and they will run software's on cloud only. There are many clouds already available like Amazon Ec2 providing best online services ,but cost is high .we consider that they are providing services with high performance is to be too expensive. Unbent Enterprise cloud is Linux based system having very low performance instance .So we are proposing a new cloud app which is low Cost andmore effective performance. This cloud App also works in all android/Linux/windows .So it helps all public to avoid Security problems and storage issues. It is also most scalable, durable and flexible App.*

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*Keywords: SSD, MICROSD, HDD, Ubuntu enterprise Cloud, Amazon*

## Introduction

Cloud computing is a virtual application – based software infrastructure that store the data on remote server, which can be accessed through the internet. The clouds have more scalability, flexibility, automaticupdates, and reduces IT costs. Most of the industries, companies and educational institutions are using latest cloud technology. It's time o update ourselves .previously all people are used external devices to store data like pendrives, SSD,HDD, floppy disk and many more. But generation changed people converted from external to virtual. People access their data anywhere and anytime remotely from the cloud this will be very easier to store the data and extract the data and also it protect the data. we can prevents the cyber attacks like virus, malware, Trojans, Dos attack and Ransom Ware etc. we can easily retrieved the data from the cloud.

So I am introducing a new project which helps from data lusts, security and accessibility everywhere. Nowadays all people are using mobile phones, tablets etc it contain internally Solid State Drives (SSD), MicroSDand many technology used in mobiles. But in this project we need to use SSD,MicroSD etc for internal storage without internal storage we can't run

apps because apps and app data are stored in internal storage .so we fix a new cloud in a mobile device. In cloud all major apps is previously installed if not we can download apps from cloud store(similar to play store) or download from google or any websites. We can open apps on cloud like UBUNTU (ANbox cloud) in linux.So the user want to do register cloud account using any of one using below:

- Gmail with mobile number

- Microsoft outlook with mobile number

- yahoo hot mail with mobile number

- proton mail(recommended) with number

- mobile number(required)

The requirements are mentioned above are used to register primary cloud storage.

## Existing Systems

When we research in recent papers already some are proposed a new educational environment based on cloud .Cloud systems are three types based on service models. The one **is SaaS**(Software as a service),which helps to use a software over a network without having to install the software on PC.The second one is **Paas**(Platform as a service),this platform includes the basic modules that

provide a development environment for software and applications. Without having an ones's own PC or server, this service is used over a network. And the third one is **IaaS** (Infrastructure as a Service).These are a like Amazon web service (AWS) and Eucalyptus.cloud system can be evaluated into four types: private, community, public, hybridcloud.A Private cloud is one type cloud service that is really not shared with any other organisation whereas the public cloud service provides cloud computing services among different customers, and each customer's data and applications running in the cloud remain hidden from other cloud customers. Community cloud is shared between the limited number in the organizations or employees for their collaborative work.

**Cloud –Based IOT**

Internet of things (IOT) is a collection of many devices that are connected over the internet.it'send the data and receive the data without human involved over the cloud.

Big Data separation over the cloud:

To process the data there are mainly two types:

1) Structured Data

2) Unstructured Data

Big Data is very large information it is very difficult to analyse and very complex to process using manual methods, so the data is separated by using the four principles Volume, Velocity, Variety, Veracity.these are the 4v's followed in the data separation.
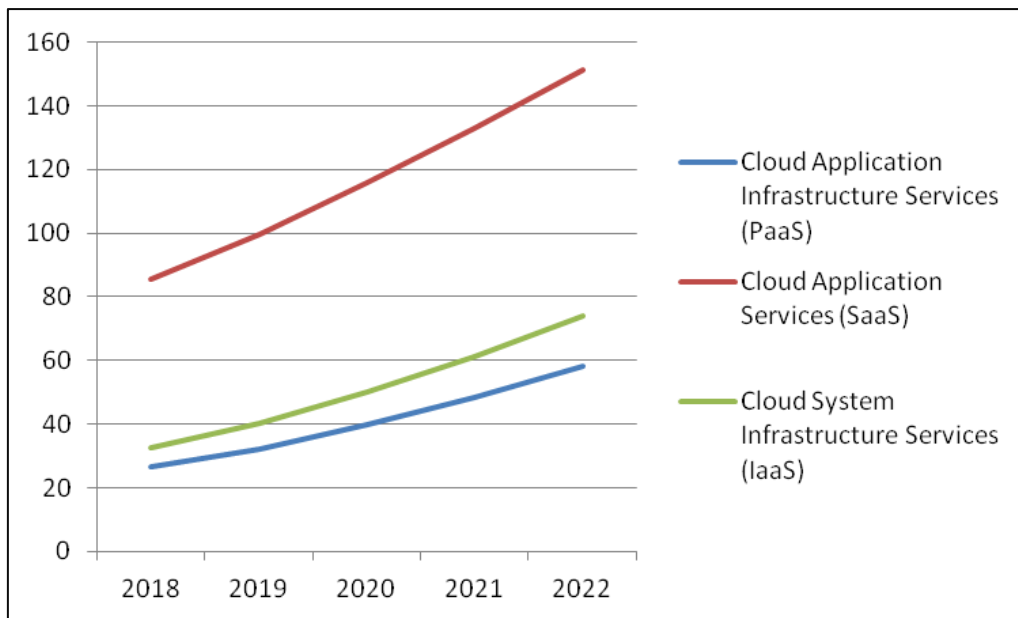


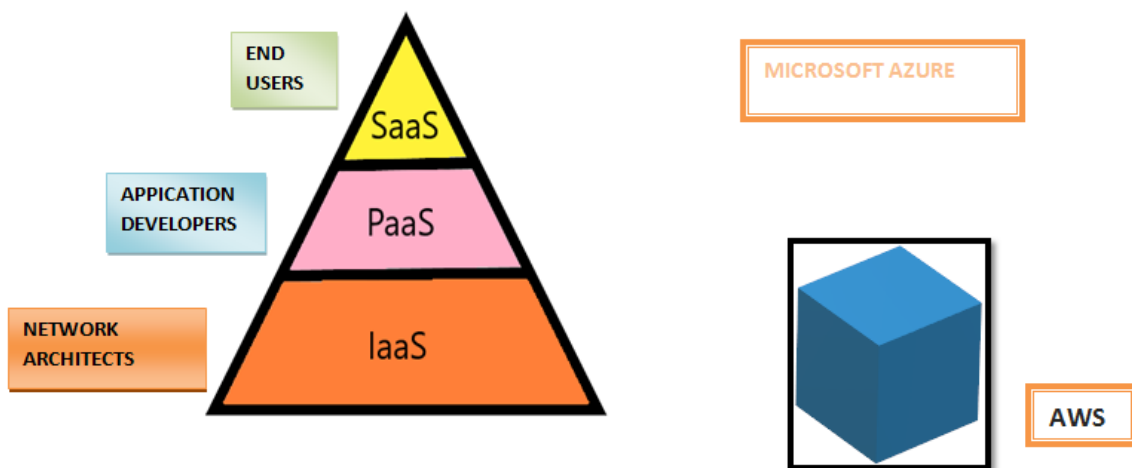Figure1.Demand of various cloud services in every year



Figure2.representation of cloud services

## Ubuntu Anboxcloud

Ubuntu is a  free and open source operating system that is used for desktop application .anbox cloud is available  in ubuntu OS that is recently launched by canonical's.Anbox cloud have built of large range canonical technologies and runs sssandroid on the Ubuntu 18.04 LTS kernel.generally we run apps in .exe extensions in laptops and PCs.mobiles apps are .apk extension which can not support on desktop.



we can run android apps on ubuntu anbox cloud without .exe extensions. It is flexible and scalable .but it doesn't work well with low internet speed and limited features in cloud. To setup a anbox cloud in ubuntu is quite difficult so that we need to linux very well. It is very easy for Linux user because they have already touched in Linuxcommands. Running anbox cloud using linux commands.
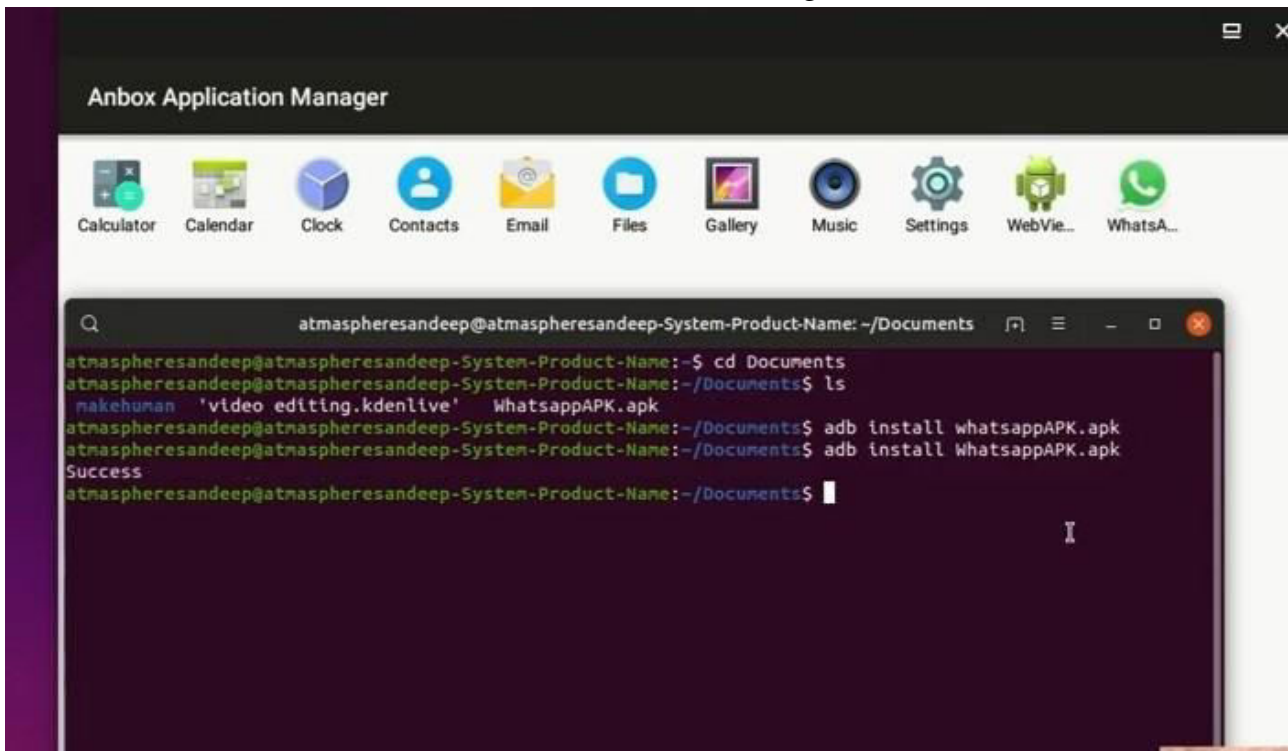


We can see the anbox application manager there are some apps installed like that we can run  apk apps as above figure.

## Proposed System

I am proposing that we need to use phone storage ,we can run all apps on cloud at instant support. you can any apps from cloud store  or Google store or any website. Cloud can protect from cyber attack, malware, viruses inbuilt cloud security.

For setuping a own personal  cloud we need some basic registration process. Cloud can be access using mobile sim .we can use Gmail or proton mail for second security (if sum is damaged or lost sum).
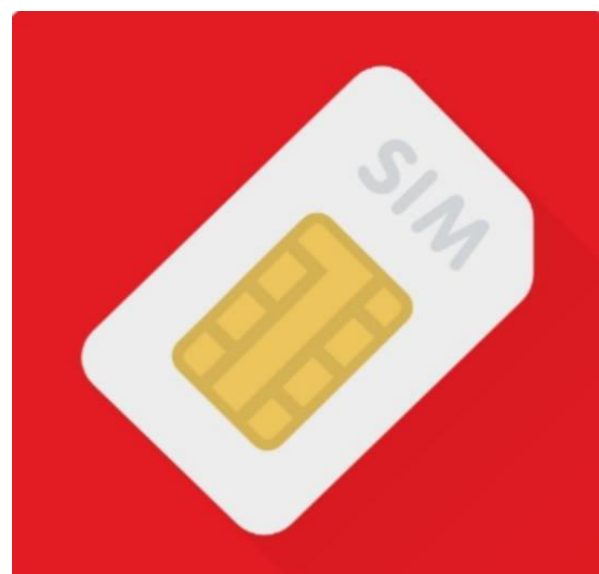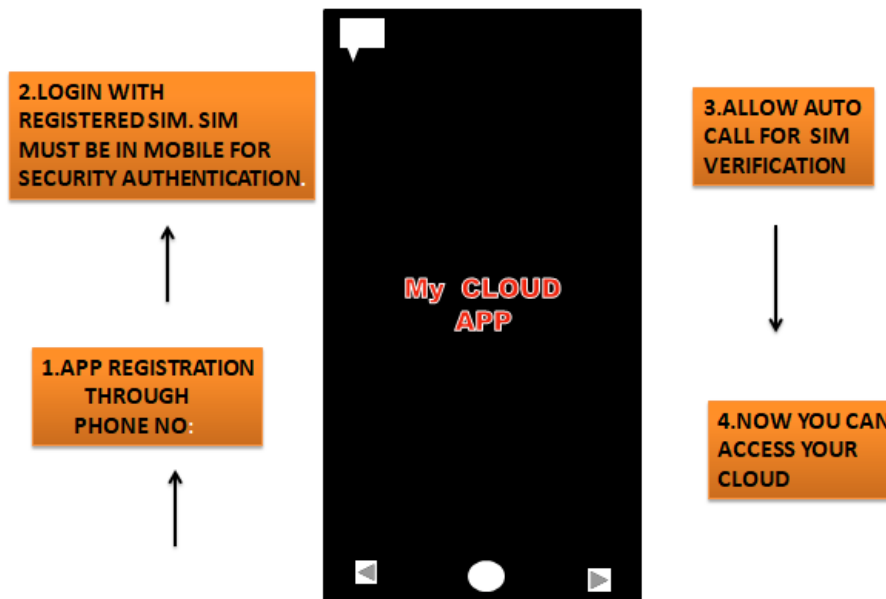
Figure3.App interface of the system

After verifying your account you can access your own personal cloud or you may it called as a virtual phone. Additionally you can run also incognito mode .and also hide apps in cloud.



**Table1.comparision of existing with proposed one**

**Benefits of Proposed System**

- Running of Virtual phone makes possible using cloud computing technology.

- Adopting advancing securities & features provided by Cloud technology.

- Any where can access the own personal phone when login with another device.

- Enabling the peer-to-peer connection while transaction the data between client & server using Block chain Technology.

- Edge Computing

- Customizing the own personal cloud.

- Spying on the mobile apps to find malfunctioning of apps /irregular action performed in device as well cloud.

- Providing VPC (virtual private cloud) its uses security groups and network access control lists,uses multiple layers of security.
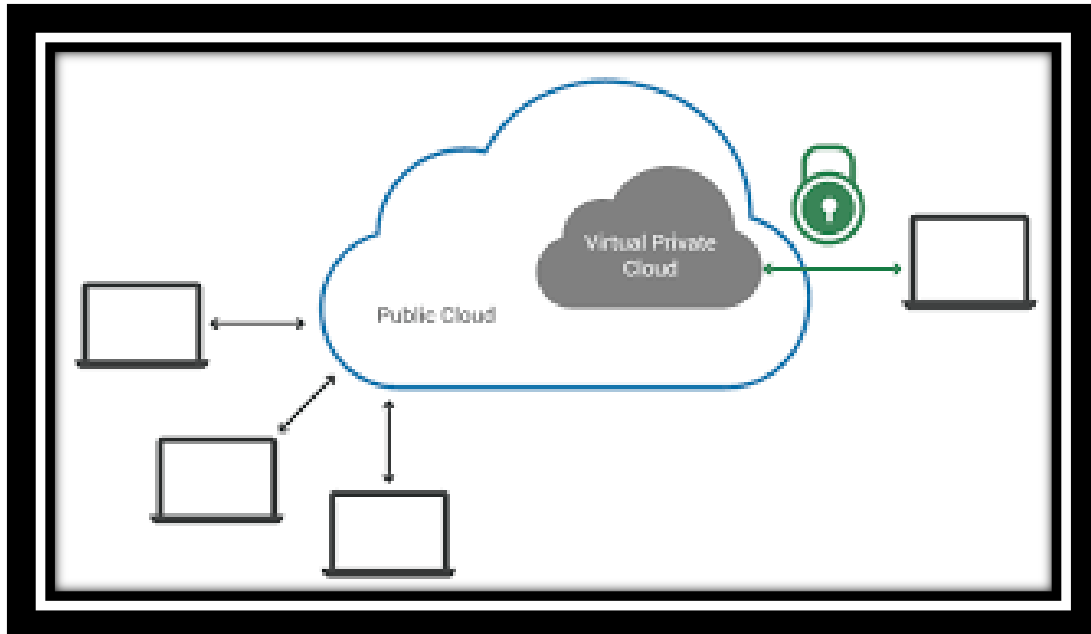


Figure4.VIRTUAL PRIVATE CLOUD

- Full control over Own personal cloud instance.

- Protecting & Preventing from malware attacks like DDos attacks using machine

  Learning and AI technology.

- information ,big data,spread sheets are stored in Cloud Manager and are encrypted in hash code (SHA 256 and MD5).

- And you can open your virtual phone on pc/laptop andcan manage your settings.

**Disavantages in Existing System**

- Information stored in internal storage is not safe and protectable.

- We have to spend more money for internal storages for downloading apps and storing data in the mobile phones.

- Protecting from malware attacks &viruses is less.

- Enabling peer-to-peer connection over internet is difficult.

- Detecting spam messages ,emails,voice calls is not possible.

- Blocking third party websites,addware &cookies is not possible.



Figure5.DDos attack on server

**Compromising Systems Using Ddos Attack**

- Protecting Personal files or company property or public information,confidential

Figure6.ADD WARE virus

- Can't customizable as you like.

- Can't protectable by spywares loaded in device even can't find in the device.

- Can't block misfunctioning apps or malware apps running the background.

- Running out of the storage in mobile phones.



Figure7.low*storage*problem on mobile

**Facing Storage Problems in your Device !!**

- If your device (mobile) is lost we can get the data back stored in the devices like pdf,documents,photos,passwords etc.

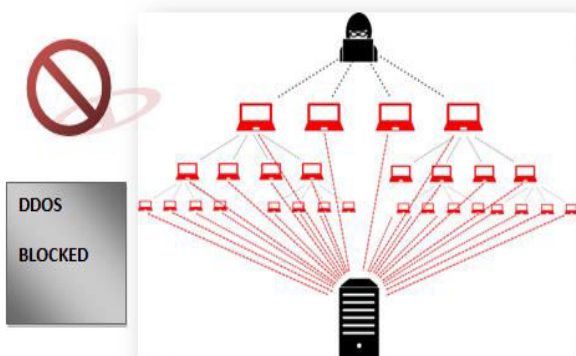- Phone may overheated due to running background apps.

- Don't have proper privacy & security .

**Conclusion**

A very common problem i.e privacy and safe we have to spend lot of money for proper privacy &security for storing the data ,apps ,api etc.To overcome the issue of common people i am proposing a virtual cloud phone to run apps very freely scalable, flexible and compactable.so we need not use much internal storages we are swifting completely to the cloud .and we can run the apps at instant same as the aws services.we have to login using phone no/e-mail.and you have to be verified by multi factor authentication then only you can login to your account.so by this new proposed system we can run virtual phone on the cloud.similarly there many platforms to run android applications .but we have improved many features like security settings,privacy management,multi factor authentication,smart Enhanced protection while browsing,antivirus security,protecting from malware ,DDos attacks ,addware etc,customizing the own personal cloud,enabling VPC connection.,data transferring with high speed.we need not depend on internal storages(SSD,HDD) because it is not completely safe.we don't known the when will we loose ourmobile .if we lost our mobile ,no doubt we lost the data. In case if you are using own personalization cloud we need not to worry we can simply login into another device without loosing single penny of data.All of your data keep safe in cloud.so we reduced hardware components,costs,and time.

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# IDENTIFICATION OF CYBERBULLYING ON TWITTER POSTS USINGDEEP LEARNING

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## ABSTRACT

*Cyber bullying is one of the detrimental effects, social media is facing nowadays. With the growing use of image sharing and text messages and comments, the severity of cyberbullying has increased many folds. Automated tools to detect these events have become important to make this platform safe and secure. Sometimes faultless images and text also convey offensive messages when posted together. In this research, we have tried to extract features of text in posts to identify different cases of cyber bullying.In this paper, using deep learning techniques we propose optimized Twitter cyberbullying detection model, a new proposal thatlabel the said challenges. Contradicting previous in this field, our model doesn't takeoutdifferent traits from tweets and pass those tweets to a classifier; on the contrary, it depicts a twitter post as a jumbled word. like this, the logic of the words is maintained, and therefore the feature separation and selection stages are frequently removed. As for the categorization stage, deep learning algorithms is going to be used, alongside a metaheuristic optimization algorithm for limitation tuning.*

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***Keywords:*** *perpetrator,Identification,metaheuristics optimization,optimization algorithm, cyberbullying, deep learning.*

## Introduction

Social networking such as, Instagram, Twitter,Facebook, andYouTube are app-based andweb-based sites that permit people to interconnect with each other by sharing images, messages, incidents, opinions etc. These media have changed the way we live and do our business by spreading our contents. Some negative effects of social media are also reported with the positive uses of these platform. One of the most negative usages of social media is cyberbullying where these media is used to irritate, scare or embarrass another user. Cyberbullying is found to have long-livedimpacts on the sufferer, causing stress and anxiety resulting in sleep disorder like Insomnia and appetite problems. In contradiction to physical bullying, the cyberbullying posts can be shared with all around the globe with a single click, making the victim more scared and stressed. The culprit in cyberbullying may remain unseen, which makes the problem bigger. The sufferer of cyberbullying are found to feel nervous and worried and in some cases they may take some wrong decisions like committing suicide. In order control cyberbullying and limiting its

widespread, many mechanisms of cyberbullying detection have been introduced.

## Background

### A. Cyberbullying

Cyberbullying is a serious issue on the social media and becomes a hugehazard to younger generation. From last few years, cyberbullying identification has been an popular topic in both academic and industries. Here, we discussed some of the possible works carried out in the cyberbullying field and background work related to our proposed model.

With this advancement of digital technologies and the global reach of this technology, numerous ethical concerns, such as cyberbullying, have become more prevalent. Teens who wish to cause harm to others utilise social media. The graph below depicts the results of a study supervised by the Cyberbullying Research Team on a sample of 4972 US school pupils aged around 12 to 17.As seen in Fig.1, almost 36.5 percent of youngsters have encountered some sort of cyberbullying in their lives. Another study done by the National Centre of Social Science (NatCen) yielded the same results. They have focused their efforts on two subsets of US

schoolchildren: those who have been recorded as routinely away from school and those who have sought home school programmes.Their choice is based on their research goal, which was to determine whether cyberbullying caused sufferers to miss school. According to the findings of this study, 17.5 percent of youngsters are routinely missing owing to unfavourable effects. These core findings highlight the fact that cyberbullying is a serious problem that affects a broad community.
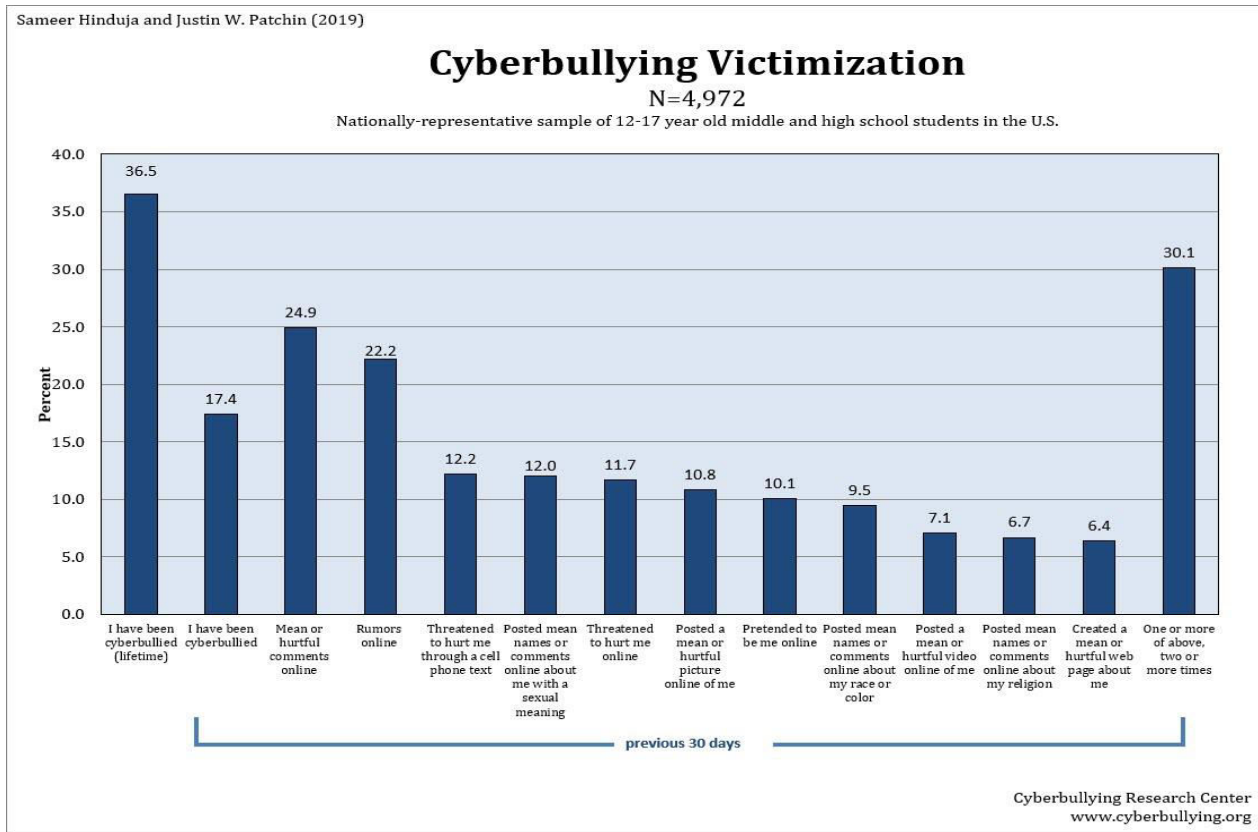


Fig.1  Victimization chart.

### B. Algorithms

### Naive Bayes Classifier

The Naive Bayes Classifier is a classification approach based on the Bayes Theorem and a confidence in predictor independence. To put it another way, this approach assumes that the availability of one feature in a class is unrelated to the availability of other features.

The technique for determining posterior probability P(c|x) from P(c), P(x), and P(x|c) is given by this theorem.The equation for same is given below:



$$P(c \mid x) = \frac{P(x \mid c)P(c)}{P(x)}$$

$$P(c \mid X) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$$

### Decision Tree Algorithm

One of the supervised learning techniques is the Decision Tree algorithm. The decision tree approach, unlike other supervised learning algorithms, may be utilised to solve regression and classification issues. By learning fundamental choice rules from past data, the objective of utilising a Choice Tree is to construct a training model that can be used to predict the class or value of the target variable. (training data). When utilising Decision Trees

to predict a record's class label, we start at the top of the tree. The values of the root attribute are compared to the values of the record's attribute values. We proceed to the next node by following the branch that corresponds to that value, based on the comparison.

## SVM Classifier

Support vector machines (SVMs) are a type of linear classifier that works on the idea of margin maximisation. They use structural risk reduction to increase the classifier's complexity in order to achieve great generalisation performance.The SVM completes the classification process by generating the hyperplane that best divides the data into two groups in a higher-dimensional space.

## Maxent Classifier

The exponential model category of probabilistic classifiers includes the Max Entropy classifier. The Max Entropy classifier, unlike the Naive Bayes classifier mentioned in the preceding article, does not require that features are conditionally independent of one another.The MaxEnt approach chooses the model with the maximum entropy among all those that fit our training data based on the Principle of Maximum Entropy. Language recognition, subject categorization, sentiment analysis, and other text classification problems may all be handled by the Max Entropy classifier.

## Literature Review

Bullying detection is a subset of event detection, which is a wider study field concerned with recognising unusual occurrences in the face of large amounts of data and noisy material. Event detection takes into account events that are defined as anything happening at a certain moment in time and can be conveyed through traditional media channels. The topic of recognising key events was addressed by researchers,their research combined text analysis with social elements of Tweet. So, they introduced MABED, a unique incident identification approach that statistically detects events by analysing tweets using criteria such as mentions and URLs. A similar study was

carried out, with the goal of categorising tweets depending on whether or not they depict real-world occurrences.

Cyberbullying identification, a subfield of event identification, has a fast increasing composition, despite the fact that studies addressing bullying date back to early 2010. where a system was created to integrate the Twitter streaming API for pile up tweet posts and categorizing them based on their content Their approach incorporated the fundamentals of behaviour analysis and bullying identification.Tweets are distributed as +ve or -ve, then as +ve with offensive content, +ve without offensive content, negative with offensive content, and negative withoutoffensive content. Naive Bayes was employed for categorization, which produced outcome in a high accuracy (70 percent).One more study provided a templatethat organisation members might use to observe social networking sites and find bullying events. The technique taken depended on capturing and saving offensive terms inside the database, then with Twitter API keys to extract tweets and compare them withthe bullying data already collected. Apart from a potential new idea in the work, this template has yet to be deployed. A wider view on bullying identification was taken, and a study evaluating the accuracy of several classification algorithms indicated that SVM performed the best with linear kernel.This paper is regarded as a citation for cyberbullying identification because it presented a completetemplate that included data-collection, pre-processing, identification, and classification. The writersanalogize SVM, Decision trees, and Nave Bayes algorithms and found that SVM had the highest accuracy.

## Proposed Approach

The proposed techniqueaims is to enhance cyberbullying identification by building on earlier work that did not seek to add semantics and necessitated difficult and time-consuming feature separation. Convolutional neural networks will be utilised to enhance the categorization of bullying and nonbullying tweets in order to reduce this gap.
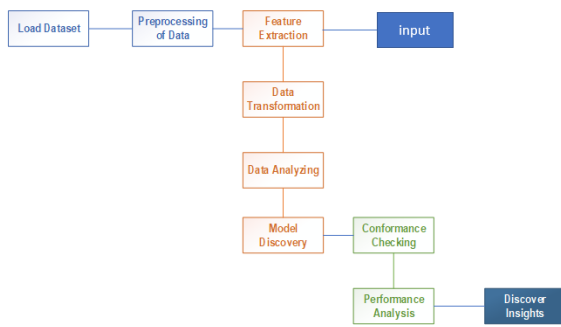
The data was collected in the first phase using the Twitter API, then a Python script was created to obtain 1000+ random tweets. The data was then cleaned to eliminate any noisy, inappropriate, or identical tweets. Thesetweets data were then divided into two groups: testing and training. To categorise tweets into (bullying-nonbullying), annotation of tweets is necessary, and a trusted data science and machine learning podium, was utilised for this job. Word embedding is used to model sentences in order to capture their meanings and commonalities. Some data applications, such as information retrieval and question answering, can benefit from vectors as characteristics. Global Vector was chosen for word embedding because it exceed other models in terms of word similarities and recognised named entities.

Tweets are represented as word vectors and then input into a machine learning model. It has been demonstrated in our studies that altering the set of parameters affects classification accuracy, thus an optimization method is required to detect optimal or near ideal principles for the parameters. The metaheuristic optimization technique was added to address this problem. The idea that a population must be defined is reinforced by metaheuristic optimization algorithms that replicate the behaviour of actual insects. In our scenario, the population is represented by a set of CNNs with random parameter values. An objective function, which is the classification

accuracy, must be provided in order to decide how populations will evolve. Finally, the metaheuristic optimization method will discover the ideal or nearly optimal collection of values to be utilised for categorization. Because cyberbullying identification is primarily a categorization issue, assessment is performed by keeping track of three metrics: accuracy, precision, and recall.

## Conclusion and Future Work

Since social networking had changing the way that people communicate, it really has exposed everyone to a variety of risks, including harassment. Despite the fact that several researchers recognised cyberbullying in social networks, the categorization of bullying and non-bullying was largely reliant on the features supplied to the classifier.We evaluated existing Twitter cyberbullying identification techniques and provided a deep learning-supported replacement classification method in the proposed methodology.Our proposed technique was developed using human-labelled training data, and word embeddings were generated for each word using the methodology. The resulting collection of word embeddings was then fed into deep learning algorithms for classification.This approach improves on the current state of cyberbullying identification by aiming to replace the arduous process of featureselection with word vectors that capture the meaning of words and CNN that categorise tweets more intelligently than standard categorised algorithms. CNN excelled in a number of text mining techniques. nevertheless, it has not been used in the context of cyberbullying identification.

In terms of future development, we'd like to modify the current strategy to allow for additional regional content. Because regional languages differ in structure and rules, complete natural language processing should be implemented.

# AN EXPERIMENTAL STUDY ON PERFORMANCE EVALUATION OF VCR ENGINE USING BIOETHANOL

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## ABSTRACT

*Ethanol blended petrol is one of the alternate fuel proved to be used for petrol engines. The ethanol blending will help the energy economy of the country and reduce vehicle emissions.present research in India has tested ethanol blended petrol (biofuel) up to 5%. The country is fast moving towards green energy and a great advantage by bioethanol blending from agricultural product with petrol will identify one of the area for economic development of the country. An experiment was conducted to optimise the CR for single cylinder 4 stroke petrol engine for different blends of ethanol with petrol. VCR engine with eddy current dynamometer setup was used for testing the blends of E5, E7.5 & E10 in different CR. The Brake power and compression ratio for petrol and different blends resulted among all the blends tested (7.5% ethanol +92.5% petrol) is on par with pure petrol in developing brake power with lower BSFC.. The Brake power and compression ratio for petrol and different blends of ethanol tested it is observed that among all the blends tested ,7.5% blend is on par with pure petrol at all compression ratio*

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*Keywords: Ethanol,CR, BP,BSFC, Bioethanol, VCR Engine.*

## Introduction

In India at present to save energy and reduce atmospheric pollution is a big challenge it can be achieved by reducing the carbon emission from engines or using alternate fuels which supports for low pollution. Ethanol blended petrol is one of the alternate fuel proved to be used for petrol engines. The ethanol blending will help the energy economy of the country and reduce vehicle emissions. The EBP is a promising programme of Govt of India with a target of 20% blending of ethanol with petrol(NBP-2018). Present ethanol production of India is approximately 426 cr litres based on molasses from sugar cane.

The present research in India has tested ethanol blended petrol (biofuel) up to 5%. The country is fast moving towards green energy and a great advantage by bioethanol blending from agricultural product with petrol will identify one of the area for economic development of the country. Recently PM directed to NITI Ayog the advancing the ethanol blending with petrol by 2025 will results in an annual saving of 5 billion dollars of India's oil import bill.Hence in this present work, an attempt was made to investigate the use of optimum ethanol blend with petrol in the performance of the VCR engine.

## Literature Review

A study was conducted at University of Khartoum Sudan indicated that the density and viscosity of ethanol gasoline blend increased with increase in ethanol and higher flash & fire point found to be higher than pure gasoline fuel.A review on ethanol form sugar cane molasses and its use has revealed that there is a need to conduct systematic study on 10% to 20% blend of ethanol with petrol for IC engines as alternate fuels. Ethanol is a best substitute as an alternative fuel for use in IC engine. It has good coherence property with gasoline fuels. Their octane rating is almost equal to pure petrol. if ethanol are blended in a small amount with gasoline in the IC engine, then there is no need to make any modification in the existing engine. A study conducted at RGPV Bhopal concluded that blending of ethanol in petrol have a good combustion properties with 10% blend and also brake thermal efficiency is better at 10% blend with least brake specific fuel consumption

An investigation on ethanol blend as a fuel in VCR gasoline engine has concluded that increase in compression ratio result in increase in brake thermal efficiency. The 10% ethanol with petrol has resulted higher brake thermal efficiency compared to other blends.

## Methodology

The Test Rig consists of a single cylinder, 4-Stroke, Air cooled, Spark ignition, Petrol driven engine. The engine to be tested for performance is coupled to an eddy current dynamometer. The test rig is provided with an air intake tank, fuel measuring system, cooling water flow rate and temperature measuring instruments. All measuring instrumentations are provided on an independent control panel separate from the engine unit. The auxiliary cylinder with piston above the main cylinder head has been provided with hand wheel and indicator for changing the compression ratio. The engine specifications are depicted in Table 1.

| VCR Test Rig Engine Specifications | |
|---|---|
| **Engine Type** | Petrol driven, 4 – stroke, single cylinder |
| **Maximum Power** | 2 KW |
| **Rated Speed** | 3000 RPM |
| **Bore** | 70 mm |
| **Stroke** | 66.7 mm |
| **Swept Volume** | 256 cm$^3$ |
| **Compression Ratio** | 2.5 to 8 ( variable) |
| **Starting of engine** | Rope start / self start |
| **Loading** | Eddy current dynamometer |
| **Cooling** | Air cooling for engine cylinder Water cooling for auxiliary head |

### Table 1. VCR Engine Specifications

The fuel tank is filled with biofuel blend. The sufficient lubricating oil and cooling water circulation is checked before starting of test rig. Select the required compression ratio and lock the hand wheel. Start the test rig and allow the engine to stabilize at its rated speed. Initially record the fuel consumption and manometer reading at no load conditions. The engine with pure petrol was allowed to run for 15 minutes to stable all initial conditions.

Load is varied from zero to full load by adjusting the variac knob mounted on the control panel for adjustment in the eddy current dynamometer. The compression ratio will be varied for set position by adjusting the knob. Different readings like mass flow rate of fuel(manometer reading). Air, inlet temperature, exhaust temperature and speed of the engine can recorded displayed on control panel. The experiments were performed with three compression ratio (4.67, 5& 5.5) with pure petrol.

The biofuel for testing was prepared from sugarcane, the steps involved in generation of bioethanol is shown in fig 1. The bioethanol was procured from sugar factory and blends are prepared in laboratory.
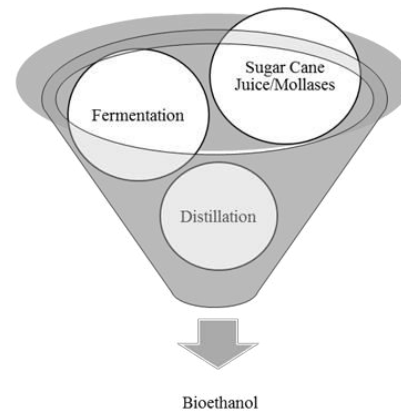


### Fig. 1Steps involved in generation of Bioethanol

After completing the experiment the testing of blends (E5, E7.5 & E10) for each set involving compression ratio and blend 5 replications were taken. After completing the experiments with each blend at CR engine was allowed to run for some time to consume the entire fuel sample in manometer. Same procedure is repeated for all the set of readings. The performance parameters were computed using standard procedure based on the observations. The results were compared with petrol will be discussed in later sections.

## 6. Results & Discussions

The comparative study of Brake specific fuel consumption at different compression ratio for three blends were studied it was observed that the 7.5% ethanol blend with petrol on par with the pure petrol. The graphs between BSFC and CR depicted in fig 1. It is observed that from fig 3 for increase in CR bsfc decreases after CR of 5.5 for all the blends tested the reason may be at higher CR knocking problems were observed for this engine. All blends of ethanol have same fuel consumption with increase in CR up to 4.67.

While studying the Brake power and compression ratio for petrol and different blends it is observed that among all the blends tested 7.5% blend is on par with pure petrol at all compression ratio. At 4.67 CR the optimum brake power of 1.5 KW for 7.5% blend and pure petrol. The other blends have developed less power at 4.67 CR. Hence 7.5% ethanol blend is the optimum to get equivalent power of pure petrol.

The performance of higher blend at different CR has developed less brake power at 4.67 CR further increase in CR has decreased the power output. For all the blends tested the brake power were reduced drastically at higher CR beyond 4.67 and also for pure petrol. Hence the CR of 4.67 for engine size 70mm bore and 66.7mm stroke has optimum power for 7.5% bioethanol and petrol. The standard condition of BSFC inversely proportional to BP. At 7.5% blend BSFC v/s
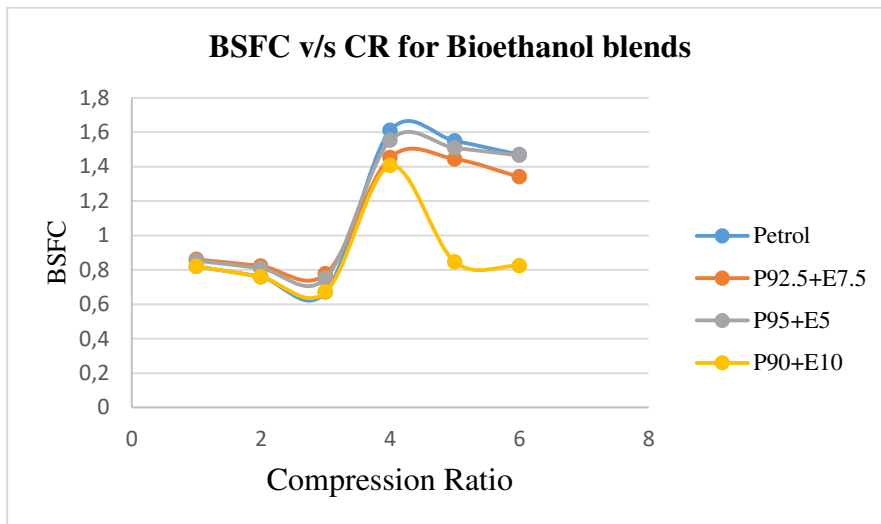


Fig 2. Comparisonof BSFC with CR for various Blends of Bioethanol
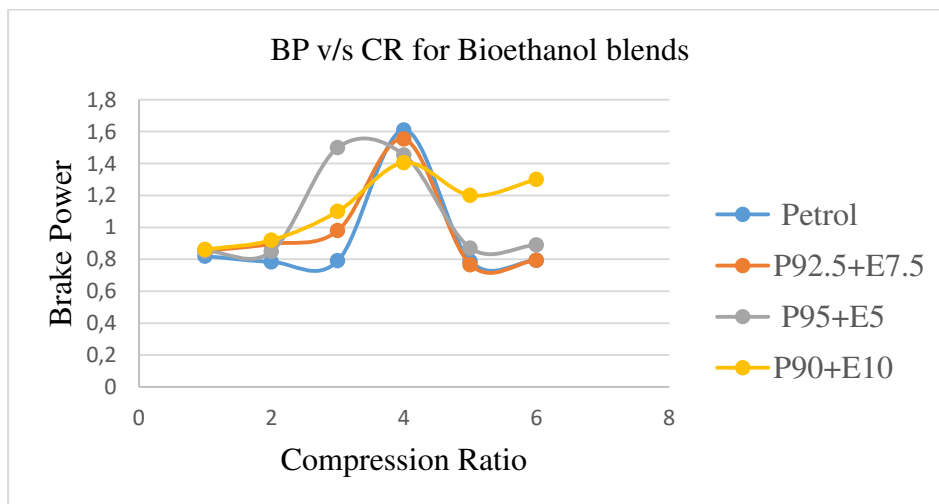


Fig 3 Comparison of BP with CR for various Blends of Bioethanol

### Concluding Remarks

Bioethanol blending with petrol can be effectively utilized for an IC Engine.The standard condition of BSFC increases with increase in BP for all fuel tested up to 4.67 CRThe performance of higher blend at different CR has developed less brake power at 4.67 CR further increase in CR has decreased the power output The 7.5% bioethanol blend is in accordance with the petrol in terms of BP and BSFC.The Brake power and compression ratio for petrol and different blends of ethanol tested it is observed that among all the blends tested, 7.5% blend is on par with pure petrol at all compression ratio.

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# PREY REPELLENT USING CNN

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## ABSTRACT

*Now a days security is the essential thing to all human beings. Business people who need to secure their properties and things. In Military to monitor terrorist attacks and in securing future plans. Farmers are facing major issues in the time of harvesting the crops. Attacks of Wild animals being the major problems which disturb the crops and also, they attack villages and threaten to village safety not only villages they are attacking the towns also. reduce this issue many people come up with the solutions in term of security. The proposed system has convolutional neural network algorithm to recognize human, animal or any other by the sound detection, Face recognize, ultrasonic signals is work with the combination of infrared PIR sensor and ultrasonic signal, based microcontroller. Which monitor the prey and send the alert message to owner mobile phone or to the guard by making sounds. According to the command given by the device will act. observed that the proposed method will work with 95% of the accuracy, less complex and compatible to use over other IOT devices. By occurring the sudden change in the surrounding the owner will get the alert.*

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*Keyword: Sensors, wearable IOT devices, CNN algorithm, machine learning.*

### 1. Introduction

Among various sectors, actions are taken in security playing an important role. Every sector has their security needs against the prey. As per the Agriculture purpose the farmers need to save their crops or grains from animals and birds. Traditionally, the people in villages are making the sounds to getting away the animals or birds by drums and other tools. Human-Wild conflict is the major problem in worldwide this conflict takes the lives of both the human and the animal life. wild animals are attacking the villages and towns the people losing the safety. The existing methods are electrical fencing which is very less efficient. It is being harmful to the human being and innocent animals and also there is possibility for animals that they will resist it. Robberies in the houses and business places are due to negligence of the guard or any other reasons.

In the past days the villagers used to spend high amount on the man power for agriculture purpose, but now a days people are mainly focusing on the machinery results to minimization of human requirement, save time, and money of the farmer. the machinery is giving many opportunities to many people. The main aim of this project is to focus on energy efficient, cost efficient, eco-friendly, humane prey repellent system that can be used farmers, business people, normal household, military, security needed places.

According to the farmers and other need to repel the prey or to catch the prey when it is arrived, So the work only focused on alert the owner in some cases. Among the electric fences and animals which are very in efficient and harmful. Although the farmers are using them to save crops due to unavailability of the new ideas. The autonomous prey repellent system will be designed by using wireless sensor networks with the corporation of pattern recognition algorithm. Some techniques are used in the system to increase its life time. The electromagnetic devices and high frequency devices are the devices which run the device popularly High-frequency devices transmit the sound waves higher than the 20,000HZ. Because some animals are good at listening the sounds of high frequency humans can't hear that much sound. This type of devices is designed to emit the high frequency signals within the range of frequency to target the prey for to scare them. The sound frequencies repel them away without disturbing the environment area, human beings and non-targeting animals. The electromagnetic device is used to emit the electromagnetic waves devices are harmless and user-friendly with low cost, with high efficiency and no threat to innocent animals.

Now a days wireless sensor networks is getting fame highly which is used almost in every application. Because WSN devices has many advantages based on the situation, but also it

has limitation when comparing with wired network such as routing, scalability, power supply, battery consumption, data integrity, device failure etc. In all limitations the device is need to give the max output.

WSN are using in the agriculture as

-> To detect the nitrogen, methane, potassium, carbon and other dangerous gases.

-> To monitor the growth of the plant.

-> To check the soil and water PH levels.

The prey repellent system can use in many fields as per that field such as the military purpose to secure the private places like the alarm will rang and make a notified alarm to the higher officials when an un authorized person enter into the camp or room. To find the terrorist or Naxalite when they enter the area where the sensor arranged range in the forest or in the border. In the museum places to secure the art pieces when the device with the sound detector and with the ultrasonic due to the sudden change in the environment due the even sudden small sound also the sound detector will detect and make the alarm on to alert the guard The behavioral information is needed thing for to develop the device based on the behavioral of the animal or bird the system will respond according to it. The animals and birds have the capability of learn skills from the environment mainly the animal boars are attacked on the crops at night time. They damage the crops for the food by flashing the lights continuously with the sounds the animal will repel. farmer need to awake every night and need to watch out the night every day. The system which identifies the animals will flash light on it which provides ecofriendly and saves the time of the farmer.

## 2. Literature Review

**P.N. Karunanayake et al,suggested** While pesticides may control insects and rodents, bigger pests such as wild boars, warthogs, pigs and birds are unable to control them because they are necessary for workers to prevent them from growing. Farms face many difficulties, like a loss of profits, the need to protect the crops from pests, and the use of illegal and inhumane pesticide control mechanisms because of the lack of advanced technology involved.**Yeongseo et al,(2021) suggested** Every year, agricultural damage is caused by wild boars. As a result, research continues on systems for repelling wild boars and most systems are detected by sensors to objects with body temperature and repell them with actions like light and sound. The problems of this system operate irrespective of wild boars and people, which can lead to a major electrical fence accident. Furthermore, Wild boars can be modified for this repelling action if the same repelling action repeats. The adjustment problem can be addressed by random sounds as a solution to these two issues and YOLO V4 can solve differentiation.**Hardiki Patil et al,(2021) suggested**The system is designed to protect human and animal housing on the outskirts of the forest area through the creation of an automatic system for detecting the intrusion of wild animals and forest repellents without harm; thus minimising the dangerous implications of conflict.**S Mohandass et al(,2020) suggested** This system provides for the precise location of the area of the malfunction(s) so that the authorities take action. This paper describes the implementation and innovative quality of the project proposed. The image analysis method, based on the Convolutionary Neural Network (CNN), is used to classify the detected animal. **D.K. Chaturvedi et al,(2021) suggested**The project is aimed at designing an e-pest repellent. A device like this can be very helpful in order to counter the multiple issues of ants, insects, pests and rats Unlike the other reactive dye, the device is durable, inexpensive and does not reduce contamination. We have a microcontroller to produce a sound sweep as well as an audio amplification LCD assembly. The e-pest repellent is made smart by ANN.

## 3. Device Construction

In the day time the sparrow damaged the crop fields for food generally the farmers are use the drums and whistle to make the sounds to scare and repel the birds

Device Construction:

Two units run the system is

1.source

2.sensor

Each unit has the ability to communicate each other and execute the operation which is given by the source.

## Source Node

The source node has the following components

- High frequency speaker
- Signal receiver
- Arduino board
- Battery
- Solar panel
- Real time clock
- PIR Sensor
- LED light
- Solar charge controller
- Ultrasonic detector
- LCD panel



Figure: Used to detect animals and makes sounds

The birds are damage the fields mainly during the day time only therefore they will repel by the high frequency sound speakers only. There no need of led lights in day time. At night time animals will attack the crops such as elephants, buffalos, etc. therefore both the sound speakers and the lights will be used to repel the animals from the area until the night gone. During day time the light system will be open switch state for to save the energy and power of the device. The device contains the solar panels to power up. Day time the system will run by the solar energy and the night time it will be run by the stored energy. In times of the rains or cloudy

condition the device will be run by the normal battery which is provided to it.

SENSOR:

General sensor consisting of the following.

- Battery
- Transmitter
- Battery level indicator
- Pulse generator
- PIR sensor



Figure:   Sensor

Sensor are always be in an active state all the time and being attentive in the sudden change in the environment area or with the moment of something. The three PIR sensor are connected to the head of the source which cover the whole 360degree angle of the area
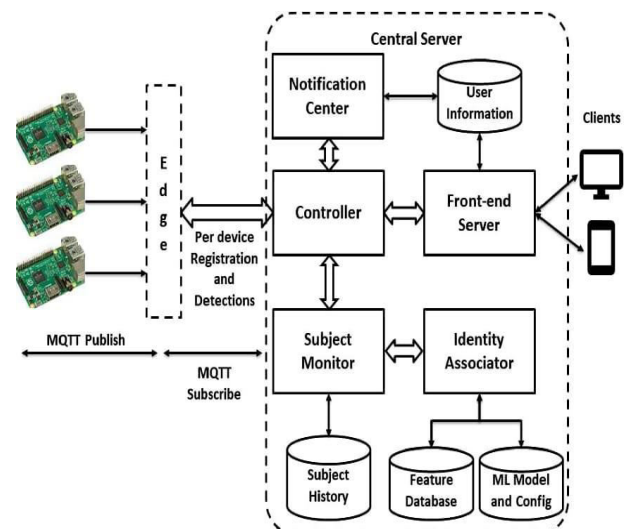


Figure : Block diagram

## 4. Operation of the Device

Sensor are placed specified area within the range. The sensors will be in the specified location, each sensor allotted with its own IP address individually. The data of the IP address of the sensors will be fed in the source then the source will know the direction of the prey as per the IP address. When a sudden movement occur in the area the sensor will react to the change in the environment, it sends a signal packet to the source to know the presence of the pest by the getting of the packet the source will turn on the light or the sound speaker which will target the direction on which place the sudden moment is occur. The light will glow continuously until the prey getting out of the area with the sound of more than the 20,000HZ of the frequency to repel the prey out of the area during the night time if the prey didn't move out of the area to the making sounds and flashing lights until the 5 min from the starting of the alarm. by the continuous receiving of the packet, the source will immediately send a notification alert to the mobile which it has access number to know the prey didn't moving out then the owner will clear out the prey. Normally the sensor in all directions will send a signal periodically with this signal the source will understand that there is any damaged sensor in the guard or any new sensor is in the foam. When it knows or detect that there is a damaged signal it will send an alert to the ID assigned phone number

A real time is inserted in the source based on that the source is know the day time and night time in a day. Based on that the lighting system will be operated as per our timings it will take the timings from 6:00AM to 6:00PM is the morning section and from 6:00 PM to 6:00AM as the night section.

### 4.1 Pattern Identification

When the sensor is failed, the sensor has to replace with the new one but it takes some time. Between this time there is a possibility of the attack of the animal in that time so it will damage the fields to reduce the damage source will trained with the history of the device which identifies the average of time of arrival of the animal with the pattern

This pattern identification is mainly focused to:

-> Automatic functioning of the system to identify the prey.

-> With the past experience the source will identifies the time of the arrival of the animal to repel it from the area.

-> The source will focus mostly on the line where the sensor node is failed and maintain the system to be run smoothly until the new sensor will be replace by it.

By the information received from the sensor to the source it will get train the system will calculate the information of the animal arrival direction and time. the pattern will store in the source when the sensor is get failed then it will be leads to continuous making the sounds and lights is activated continuously. Then the source based on the pattern will deactivate it. Due to the high consumption of the energy by the light to save the energy of the system.

When the wild animal entered to the range of the area, source will note the information and by the time of the sensor defect, it will inform the user by the notification alert and the source will follow the operation of the pattern, then it will turn on the lighting system to repel prey it will manage the main motive of the technique is to repel the animal even the sensor failed

## 5. User Interface

The device or system has two user interface one is communicated with source node and other interact with all the sensors The interface with the source is just only connected with the user phone for to alert. And other interface is graphical user interface which is used to analyze the data from the users. The alerts which are given to the user from the source will be in different situations such as

1. Defect of the sensors.

2. Uncontrolable prey behavior

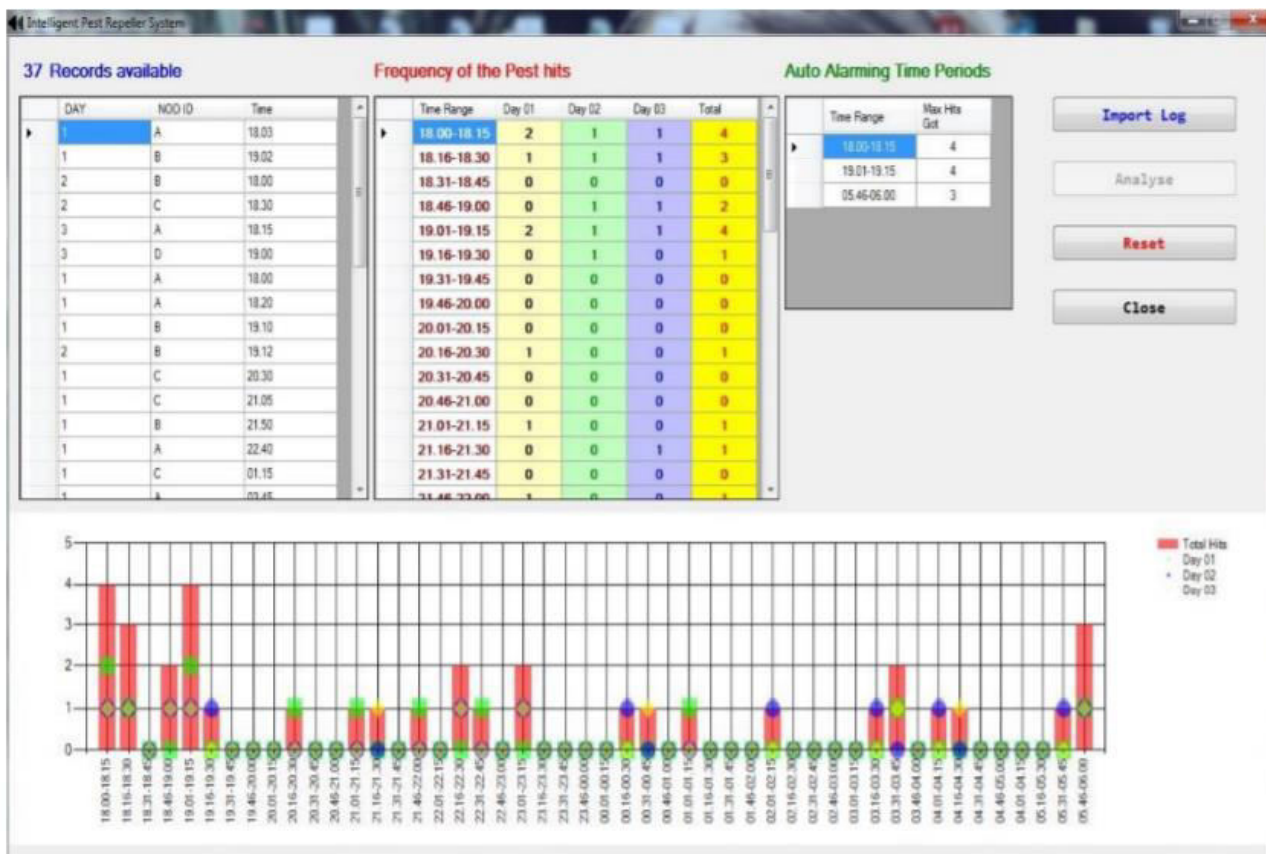3. Detection of battery failure or specification of low level of battery.

Figure : Analysis of data collected

As the update to system, we can use the face recognize by trained the algorithm with different photos of animals. When the animal is entered in the area with the facial recognition the device will find out the type of the animal is just entered and make the sounds as per that animal to repel it. For example, when an elephant is entered into the area it will terrified by the bee sound so the device will make a sound of bees to scared the elephant. By the recognize of the type of animal the speaker sound and the actions can be decided. we can use this type of facial recognition in security of houses in times of any suspicious person is entered into the house the system will blast an alarm in the watchman room and also send a notification alert to the mobile of the user so that unknown person just entered the house then the user will alert to secure the safety. normally the animals are contrast variations not all of them are being same structure. To detect animal, it has a special feature such as body structure, skin, geckos etc. based on the past data, animal detection will be, find out. Based on the patch based, local feature, decision tree, fuzzy logic, genetic algorithm, generalized linear models, convenient machine learning techniques are helpful in the detection of the species. Most popularly the CNN network is the best chosen one for the image recognition, classification and detection. Sometimes a combination of the known tech will give a better result in the work for the segmentation and classification of images of the camera CNN for extracting the features, Least Absolute shrinkage and Selection Operator for selecting feature, artificial neural network as CN
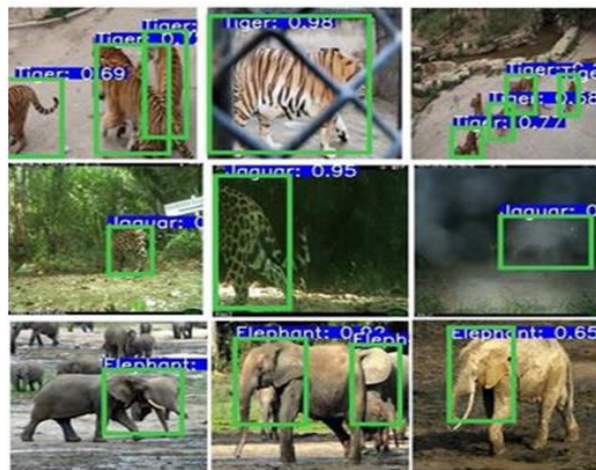


Figure: Image recognition pattern

Processing of the of the image feature extraction and matching depends mostly on the animal pose. to managing as per this process simple process called, motion method was proposed. It will allow the camera to look the animal in motion format as the segment visual objects by box
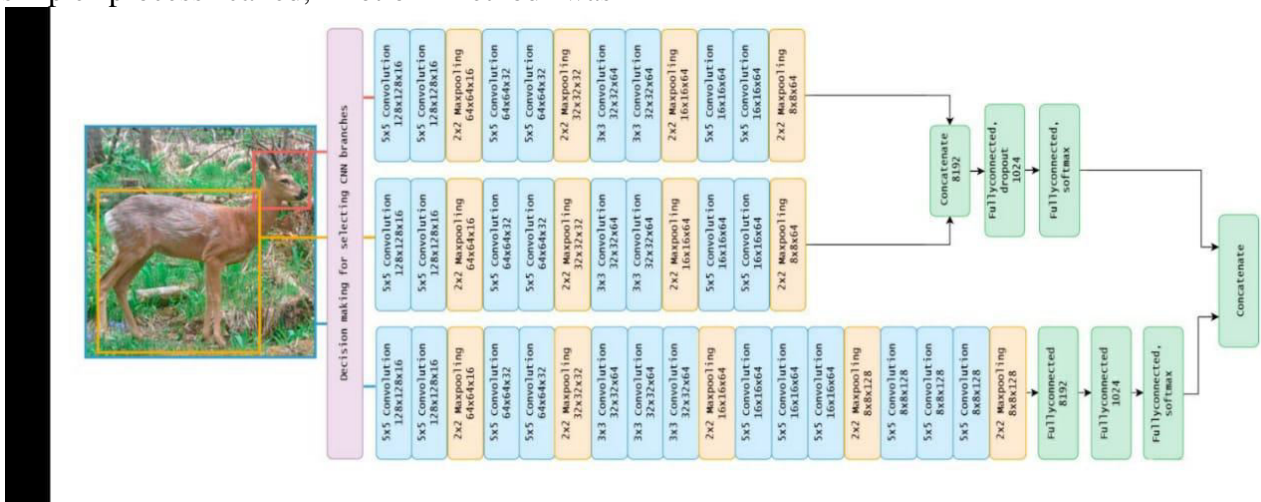


Figure : CNN image recognition process

Cloud based data upload system used for the storage of the data to refer the happening of the things. The daily status information activities in the cloud will be configured at any time through internet connection with the cloud by the user, which also can be arrange as the requirement.

## 6. Conclusion

The main focus of this study is on autonomous, efficient and intelligent pest repellent systems in various agricultural disciplines, but mainly on paddy fields. The system consists of integrated hardware and a smart system that operates using pattern recognition algorithms.

This work is mainly focusing on the efficient, low cost, user friendly, ecofriendly device which will give hope safety to the user as per his need from the prey which is animal or bird or human being. The device analyzed the prey give an SMS alert and visualizing analysis report to user by the CNN.

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# PERFORMANCE ENHANCEMENT FOR PREDICTION OF CHRONIC KIDNEY DISEASES USING ML TECHNIQUE

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## ABSTRACT

*Chronic kidney disease (CKD) it is a disease in which there is a gradual loss of kidney function over a period of years. Forecast of this kidney disease the most important problems in medical fields and area of specialization. So, we are using machine learning techniques to determine the patient's kidney condition that will be helpful to the doctors in prediction of chronic kidney disease and for better treatment.*

*The early detection strategy of the disease remains important, particularly in developing countries, where the diseases are generally diagnosed in late stages. Finding a solution for above-mentioned problems and riding out from disadvantages became a strong motive to conduct this study. Classification methods are also used to identify the dominant attributes.*

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## Introduction

Chronic kidney disease (CKD) it is a disease in which there is a gradual loss of kidney function over a period of years. Forecast of this disease is one of the most important problems in medical fields and area of specialization. So we are using machine learning techniques to determine the patient's kidney condition that will be helpful to the doctors in prediction of chronic kidney disease and hence better treatment. In this research study, the effects of using clinical features to classify patients with CKD by using vector machines algorithm is investigated. There are different ways for comparison between algorithms for the dataset collected from standard repository.The CKD dataset is based on clinical history, physical examinations, and laboratory tests. They establish an agreement between a client and a provider that they are both working to keep the project on a schedule. According to the Business Analysis Body of Knowledge definition reach the same goal. High-quality, detailed requirements also help mitigate financial risks and requirements are a usable representation analysis, specification, validation, and management. In this article, we'll discuss the main types of a need. Creating requirements is a hard task, of requirements for software products and provide a number of recommendations for their use.

## Proposed System

Disease Severity had not considered mess data had not properly pre-processed. It is not an integrated model. Time taking Process. Does not decrement any inconsistent dataIn the system, KNN imputation has been used to fill in the missing values, which select several complete samples with the most similar values to process the missing data for each incomplete sample. Missing values are seen in real-life medical situation , because patients can miss some values for various reasons. After effort filling out the incomplete data set, six machine learning algorithms (logistic regression, random forest, support vector machine , k-nearest neighbour, naive Bayes classifier and feed forward neural network) are used to establish models. In the system, each categorical (nominal) variable is coded to check the process in a computer. For the values of RBC and PC, normal and abnormal are coded as 1 and 0, respectively . For the values of HTN, DM, CAD, PE and ANE, yes and no were coded . For the value of appet, good and poor were coded as 1 and 0, respectively. Although the original data description has three variables sg, al and su as categorical relationship. It is also known as analysis of variance(ANOVA). When analysis between one feature and target variable is done, we ignore the some other features. And it is also called 'univariate'. Each feature has its individual test score. Finally, all the test scores compared, and the features with the top scores will be selected. The confusion matrix commonly is used to evaluate the classifier, which measures the quality of the classification process. In addition, there are also various standard evaluation measures for correct and incorrect classification results of the classifier. The most common measure to evaluate the performance is accuracy. It is defined as the proportion of the total number of instances that were correctly classified. Better estimation results than standard system identification methods. Complex nonlinear physiologically based model, Significant improvements over the proprietary methods. Excellent Prediction Accuracy . Can be applicable to more complicated clinical data for disease diagnosis.

### Related Work

A UML diagram is a diagram based on the Unified Modeling Language with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system. Mainly, UML it used as a general-purpose modeling language in the field of software engineering. An architecture diagram is a graphical representation of a set of concepts, that are part of an architecture, including their principles, elements and components. it has now found its way into the documentation of several business processes or workflows. For example, activity diagrams, a type of UML diagram, can be used as a replacement for flowcharts. They provide both a more standardized way of modelling workflows as well as a wider range of features to improve readability and efficiency.

The Dragon1 open EA There are the architecture diagrams, as a software architecture diagram, system architecture diagram, application architecture diagram, security architecture diagram, etc.

For system developers, we need system architecture diagrams to understand, clarify, and communicate ideas about the system structure and the user requirements that the system must support. It's a basic framework can be used at the system planning phase helping partners understand the architecture, discuss changes, and communicate intentions clearly.
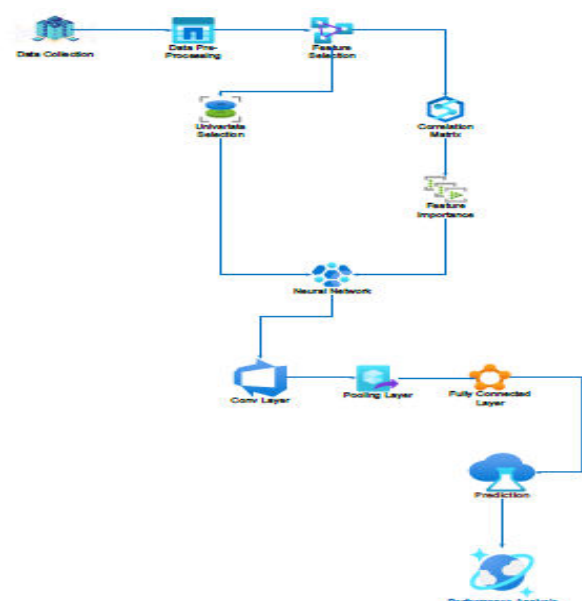
## Literature Survey

- Early Prediction of Chronic Kidney Disease Using Machine Learning Supported by Predictive Analytics Ahmed J. Aljaaf, DhiyaAl-Jumeily, Hussein M. Haglan, Mohamed Alloghani, Thar Baker, AbirJ. Hussain, Jamila Mustafina 2018, Chronic Kidney Disease is a serious life long condition that induced by either kidney pathology or reduced kidney functions. Early prediction and proper treatments can possibly stop,or slow the progression of this chronic disease to end-stage, where dialysis or kidney transplantation is the only way to save patient's life. In this study,we examine the ability of sever almachine-learning methods for early prediction of Chronic Kidney Disease.

- Chronic Kidney Disease is a serious life long condition that induced by either kidney pathology or reduced kidney functions. Early prediction and proper treatments can possibly stop,or slow the progression of this chronic disease to end-stage,where dialysis or kidney transplantation is the only way to save patient'slife. In this study,we examine the ability of sever almachine-learning methods for early prediction of Chronic Kidney Disease. Error Minimized Extreme Learning Machine With Growth of Hidden Nodes and Incremental Learning GuoruiFeng, Guang-Bin Huang, QingpingLin, and Robert Gay 2009 , One of the open problems in neural network research is how to automatically determine network architectures for given applications. In this brief,we propose as impleand efficient approach to automatically determine the number of hiddennodes in generalized single-hidden-layer feed for ward networks(SLFNs) which need not beneural a like.This approach referred to aserror minimized extreme learning machine(EM-ELM)can add randomhiddennodes to SLFNs one by one or group by group (with varying group size). During the growth of the networks,the out put weights are updated incrementally. Morphological Pattern Spectrum Based Image Manipulation Detection.NayanaNayak,NidhiHegdeP,Anu sha,PanchamiNayak,Venugopala.P.S,Takes hiKumaki.Nov2017,.This paper proposes an image histogram,based image manipulation detection method in android.

- The method consists of using amathematical morphological based algorithm to extract pictorial feature in formation, from an original digital image.This will be use ful in situations where it is important to find evidence of specificevents such as investigation of crimesorsimply image comparison. The morphological pattern spectrum was implemented in android platform using Java and Open CV. Analysiso, manipulated images in dicated that the proposed detection method was able to clearly identify the differences from the original images. The results show that the proposed techniqueh as sufficient ability to distinguish the very slight Semi-Supervised and Unsupervised Extreme Learning Machines GaoHuang, ShijiSong, JatinderN. D. Gupta, and Cheng Wu AUG 2014, This paper combines the recurrent neural networks and the wave lettrans form sinorder to predict the shareprices. The model has 3 stages,First the wave lettrans form is applied to eliminatenoise by decomposing the stock price time series. Then through SRCS the input features are constructed using RNN, which usess ever altechnical indications and has asimplearchitecture. At last the RNN weights are optimized under aparameter space design by the proposed Algorithm.

- Tracking People in Dense Crowd susing Super voxels ShotaTakayama,TeppeiSuzuki,Yoshimitsu Aoki,ShoIsobe, MakotoMasuda.October 2018, The demand for people tracking in dense crowds is increasing, but it is a challenging problem in the computer vision field. "Crowd tracking" is extremely difficult because of hard occlusions, various motions and posture changes.In particular, we need to handle occlusions for more robust tracking. This paper discusses robust crowd tracking based on a

combination of supervoxelsand optical flow tracking.The SLIC based super voxelalgorithm adaptively estimates the boundary between a person and a background.Therefore,the combination of supervoxelsand optical flow tracking becomes a highly reliable approach for crowd tracking.In tracking experiments, high performance is achieved for the UCF crowd data set.

## Algorithm

K-NN working can be explained on the basis of the below algorithm:

- **Step-1:** Select the number K of the neighbors

- **Step-2:** Calculate the Euclidean distance of **K number of neighbors**

- **Step-3:** Take the K nearest neighbors as per the calculated Euclidean distance.

- **Step-4:** Among these k neighbors, count the number of the data points in each category.

- **Step-5:** Assign the new data points to that category for which the number of the neighbor is maximum.

- **Step-6:** Our model is ready.

## K-Nearest Neighbor (KNN) Algorithm for Machine Learning

- K-Nearest Neighbor is one of the simplest Machine Learning algorithms based on Supervised Learning technique.

- K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories.

- K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.

- K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems.

- K-NN is a **non-parametric algorithm**, which means it does not make any assumption on underlying data.

- It is also called a **lazy learner algorithm** because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset.

- KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data.

- **Example:** Suppose, we have an image of a creature that looks similar to cat and dog, but we want to know either it is a cat or dog. So for this identification, we can use the KNN algorithm, as it works on a similarity measure. Our KNN model will find the similar features of the new data set to the cats and dogs images and based on the most similar features it will put it in either cat or dog category

## Preliminaries

In this section, we describe the preliminaries before establishing the models,,including the description of the data set and the operating environment,the imputation of missing values and extraction of the Feature vector

- data import and prepossessing

When the data collected is real world data, and then it will contain missing values. This way we lead to more genuine  data and better prediction results.

This change in the prediction accuracy. An efficient way to handle missing values is to use mean, average of the observed attribute or value.

In this step we transform the given real data into required format. In this step we convert the Nominal data into numerical data of the form 0 and 1(yes/1 or No/0). Now the resultant csv file comprises of all the integer and decimal values for different CKD related attributes.

We use the following representation to collect the dataset

age - age

bp - blood pressure

sg - specific

al - albumin

su - sugar

rbc - red blood cells

pc - pus cell

pcc - pus cell clumps

ba - bacteria

bgr - blood glucose random

bu - blood urea

sc - serum creatinine

sod - sodium

pot - potassium

hemo - hemoglobin

pcv - packed cell volume

wc - white blood cell count

rc - red blood cell count

htn - hypertension

dm - diabetes mellitus

cad - coronary artery disease

appet – appetite

pe - pedal edema

ane - anemia

class – class

- **Data Augmentation**

Feature selection and Data cleaning are supposed to be the very first thing to do in model designing. In this paper we will apply two feature selection algorithms to obtain important features according to those. The most popular method is Pearson Correlation.The main purpose of pooling is to subsample the nearby pixels Then we would run our classification algorithms on the attributes are deemed important and relevant by both the selection algorithms .Correlation matrix/ feature importance: On a dataset, the set of correlation values between each pair of its attributes is arranged in the form of a matrix which is called as correlation matrix .Correlation is a statistical term which refers to the estimate of closeness or extent of relation two variables are having with each other, which is a linear relationship. There are many methods of correlation calculation., they are summarized and replaced by summarized characteristics in the results at a place. This Pooling reduces dimensionality and invariance of rotary transformations and translation. Many pooling functions are available; hence it is one of the most common is max pooling, where the output is the maximum value of the rectangle pixel field. The weighted average is another form based on the distance from the centre pixel. Pooling helps to make the image invariant to small modifications of the input translation.

- **Model Building**

To measure the performance of our algorithms we will use tree different evaluation functions. In these functions TP refers to cases that were positive and were predicted positive by the algorithms. TN as negative cases predicted negative. On the other hand, specificity is the mean proportion of true negative which are identified correctly. FP are cases predicted positive but were actually negative. FN represents cases that were predicted negative but were actually positive .Accuracy: It is defined as the ratio of correctly predicted observation(true negative + true positive) to the total observations Another evaluation metric is sensitivity, is the mean proportion of actual true positives that are correctly identified.

- **Model Performance**

The confusion matrix commonly is used to evaluate the classifier, which measures the quality of the classification process. In addition, there are also various standard evaluation measures for correct and incorrect classification results of the classifier. The most common measure to evaluate the performance is accuracy. It is defined as the proportion of the total number of instances that were correctly classified.

## Conclusion

A UML diagram is a diagram based on the UML (Unified Modeling Language) with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.

Mainly, UML has been used as a general-purpose modeling language in the field of software engineering. However, it has now found its way into the documentation of several business processes or workflows. For example, activity diagrams, a type of UML diagram, can be used as a replacement for flowcharts. They provide both a more standardized way of modeling workflows as well as a wider range of features to improve readability and efficiency.

## Acknowlegment

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# SPECTRAL EFFICIENCY OF M-ARY PSK MODULATION USING NEW BLIND BINARY EXTENDED M-ARY PSK LDPC ENCODER IDENTIFICATIONA

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## ABSTRACT

*Communication systems are evolving in the direction of spectral efficiency enhancement with guaranteed communication consistency employing channel coding techniques. For higher M values, the performance of M-ary PSK modulation over an AWGN channel is presented in this study. In this study, we use an irregular LDPC channel coding technique to replicate the performance of M-ary PSK modulation for higher orders of modulation and attain better SNR than uncoded M-ary Phase Shift Keying for different M values and different coding rates. And BER performance of encoded MPSK signal detection over EGK fading channels are studied.*

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*Index Terms:* LDPC, MAN, TDMP, WiMAX.

## I. Introduction

Wireless data traffic has risen rapidly with the introduction of a wide range of wireless devices capable of high-speed multimedia streaming, such as smart phones and tablets [1],[2]. The average data rate per unit bandwidth, or spectral efficiency, becomes extremely significant. In Spain, for example, it is projected to bid 1.5 billion EUR on 310 MHz in 4G radio frequencies [3]. Congestion difficulties will certainly plague wireless networks in the following days, despite the huge quantity of data traffic[4]. As a result, increasing bandwidth efficiency or spectral efficiency is critical for future wireless communication systems.

Channel coding began with Claude Shannon's fundamental paper work of wireless communications [5]. Over the subsequent decades, researchers focused on developing realistic coding methods that might approach the Shannon channel capacity on additive white Gaussian noise channels. However, until the invention of Turbo codes and LDPC codes, this aim was difficult and impossible to achieve. The parallel-concatenated convolutional codes are another name for turbo codes (PCCC)[6]. Through concatenation and interleaving, these codes prevent the mismatch of pattern and randomization.

Turbo codes[7,8] provide exceptional efficiency in additive white Guassian noise and flat-fading carriers for relatively low bit error rate, but incur from increased latency and poor performance at extremely low bit error rate. Low density parity check coder enables parallel processing decoder, is more tolerant of high code rates, has a reduced error rate, and outperforms interleaves in bursts.

A single LDPC can outperform a group of channels [9]. High speed, greater data transmission, lower signal to noise ratio, low bit error rate, optimal bandwidth utilization, and effective error correction and detection techniques are the never-ending needs of wireless technology. The proposed work uses Turbo codes (concatenated convolution coder) and LDPC codes to get the improved Spectral efficiency and Bit Error Rate for M-ary PSK.

Recent research studies of communication systems have shown strong characteristics of high level modulation, such as M-ary quadrature amplitude modulation (M-QAM), and the majority of relevant research is simulation-based. A simulation model for studying various M-ary QAM modulation methods is provided in this work. The primary objective of this research is to design a high spectral efficiency modulation approach by integrating low complexity [10] LDPC codes with spectral efficient modulation techniques.

We first develop and simulate the MPSK-LDPC and MQAM-LDPC schemes for M values, then to optimize spectrum efficiency by combining an MQAM-LDPC with multiple access methods.

## 1.1    Objectives

One of the never ending demands of wireless communication systems is faster speeds with the available spectrum. Error correcting codes, modulation techniques, and multiple access techniques plays an important role in achieving high spectral efficiency. The goal of our research is to create a high spectral efficiency modulation technique by combining low complexity LDPC codes with a bandwidth efficient modulation technique in the following stages.

• To develop and simulate MPSK-LDPC systems and MQAM-LDPC for different values of M (M= 8, 16, 32, 64,128,256) to achieve improvement in spectral efficiency.

• To develop and simulate MQAM-LDPC systems for different values of M (M= 8, 16, 32, 64,128,256) to achieve improvement in spectral efficiency.

• To develop and simulate combined M-QAM-LDPC with multiple access techniques to reach the goal of higher spectral efficiency.

## 1.2 General Block Diagram of a Digital Wireless Communication System

The general Block Diagram of a wireless communication system is shown in Figure1.2.1 as follows.

### 1.2.1  Formatting, Source Encoding and Decoding

The raw data is formatted to become digital symbols. Following that, the digital symbols are encoded. The goal is to reduce duplication by compressing the data in some way. Source coding converts analogue source signals to digital signals using any of the following methods.

• Character Coding

• Sampling

• Quantization
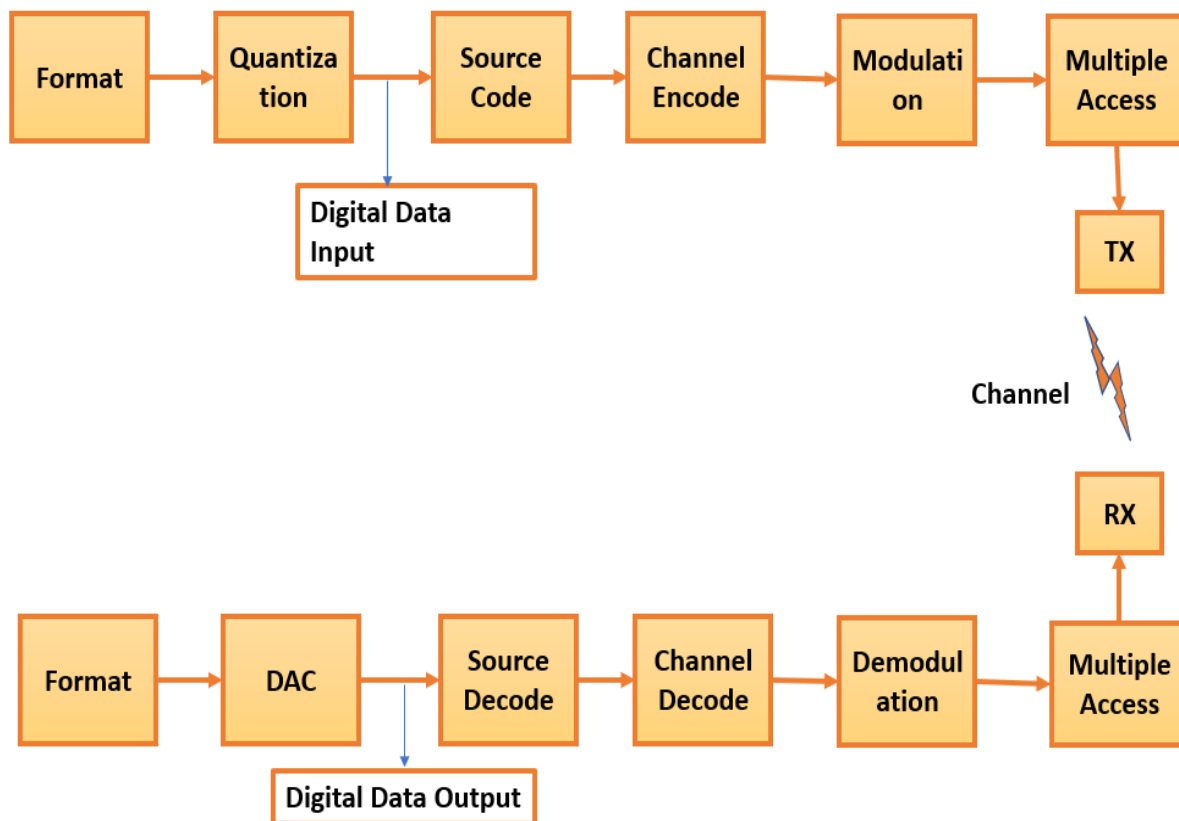
• PCM

• Differential PCM

• Block Coding



Fig.1.2.1: General Block Diagram of Digital Wireless Communication System.

Character coding is a means of transforming text data to qubits. In a broad sense, we can assign existing sets of unique numeric data and convert those numbers to binary. Based on their values, these binary numbers can be transformed back to original characters. Decoding is the process of reversing the coding that was used in the source. Bernoulli coders, Random Number Generators, and so on are examples of source coders.

Fig.1.2.1: General Block Diagram of Digital Wireless Communication System.

## 1.2.2 Channel Coding and Decoding

Channel encoders and decoders are used at the transceivers to add redundancies to the bit stream, allowing error detection and correction. Coders that are commonly used include Block Codes, Convolutional Coders, Turbo Coders, Trellis Coded Modulation(TCM), and LDPC.

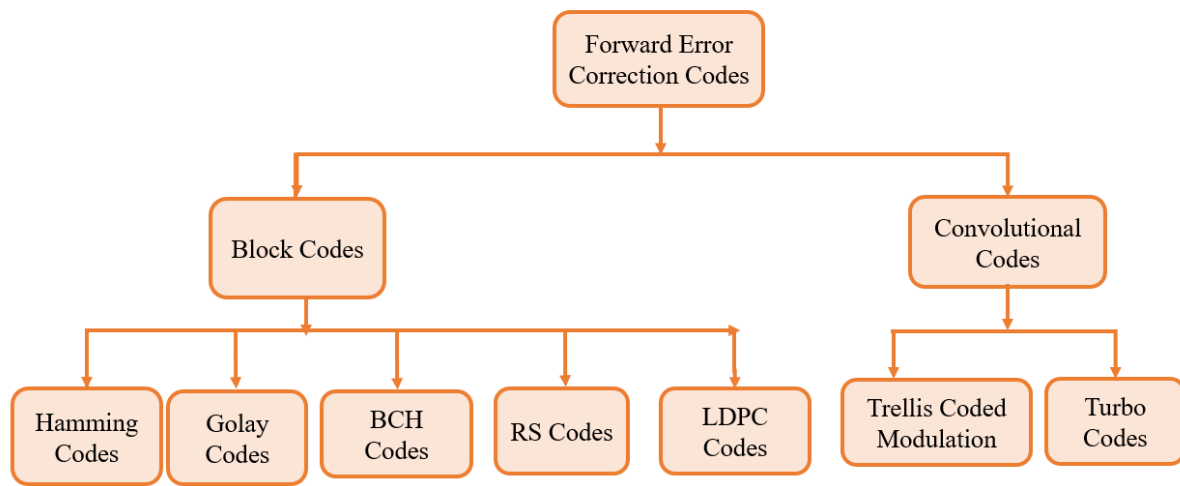The Fig.1.2.2 shows the classification of channel Coders.



Fig.1.2.2: classification of channel Coders.

Forward error correction (FEC)[9] codes are used when a duplex line is not practical, where the entire decision about the received data to accept or reject depends on the receiver since the receiver doesn't have the real-time contact with the transmitter. FEC approach impose a significant strain on the network by introducing redundant data and delay. Another significant drawback is the reduced rate of information. These techniques, on the other hand, eliminate the need to vary power. Thus, reduced error rate for the same power is obtained. Instead of focusing the complexity of transmitter, the focus is now on the receiver.

A block of bits is used in block codes. A bunch of bits are taken, and then a coded component is added to form a larger block using a predetermined algorithm. At the receiver, this block is checked. The receiver then decides whether or not the received sequence is valid. The block codes are expressed in the form: (n, k). The code takes k information bits and uses the code generator matrix to produce (n-k)

parity bits. Most block codes are systematic in that the information bits are kept the same and parity bits are added to the front or back of the information sequence.[11]

Hamming code is a block code that can detect and repair single-bit faults while detecting up to two simultaneous bit errors. It was invented by R.W. Hamming for the purpose of error correction. The source encodes the message using this coding method by inserting redundant bits into the message. Extra bits are generated and injected at certain locations in the message to facilitate error detection and correction. When the destination receives this message, it does recalculations in order to detect faults and determine which bit position is incorrect[12]

A binary Golay code is a kind of linear error-correcting code. There are two binary Golay codes that are very similar. In finite group theory, the extended binary Golay code, G24 (also known as the "Golay code") stores 12 bits

of data in a 24-bit word in such a way that any 3-bit errors are corrected and any 7-bit errors are detected. The perfect binary Golay code, G23, has code words of length 23 and is obtained by eliminating one coordinate location from the extended binary Golay code (conversely, the extended binary Golay code is obtained from the perfect binary Golay code by adding a parity bit).

The BCH codes, also known as Bose–Chaudhuri–Hocquenghem codes, are a type of cyclic error-correcting code that is built using polynomials over a finite field in coding theory. BCH codes were created by French mathematician Alexis Hocquenghem in 1959, and Raj Bose and D. K. Ray-Chaudhuri independently in 1960.

One of the most important characteristics of BCH codes is that the number of symbol errors that the code can fix may be precisely controlled during code construction. It is feasible to create binary BCH codes that can fix multiple bit faults in particular. Another benefit of BCH codes is their simplicity. Any polynomial that is a multiple of the generator polynomial is a valid BCH codeword. Hence BCH encoding is merely the process of finding some polynomial that has the generator as a factor. BCH decoding algorithm's sole concern is to find the valid codeword with the minimal Hamming distance to the received codeword. Therefore, the BCH code may be implemented either as a systematic code or not, depends on implementor.

**Reed–Solomon(RS) codes** were introduced by Irving S. Reed and Gustave Solomon in 1960. RS codes operate on a block of data treated as a set of finite-field elements called symbols. These codes are able to detect and correct multiple symbol errors.

Convolutional codes are error detecting codes used to reliably transmit digital data over unreliable communication channel system. These are well suited for large data streams, more energy efficient than block codes and find their applications in areas like deep space communication, satellite and terrestrial digital video broadcasting. But their computational complexity increases exponentially with the length of the code.

**Trellis Coded Modulation(TCM)** is a combination of coding and modulation hence the name Trellis Coded Modulation, Where the Trellis stands for the use of trellis(also called convolutional) codes. Coding and modulation as two independent aspects of the communications link, while in TCM they are combined.

## Turbo Coding

**Inter leaver:** In most communication systems, errors usually occur in bursts rather than individually. If the number of errors in a code word exceeds the error-correcting code's capacity, the original code word cannot be recovered. This problem is solved by interleaving, which shuffles source symbols across numerous code words, resulting in a more equal distribution of mistakes. Interleaving is therefore commonly utilized for burst error correction.
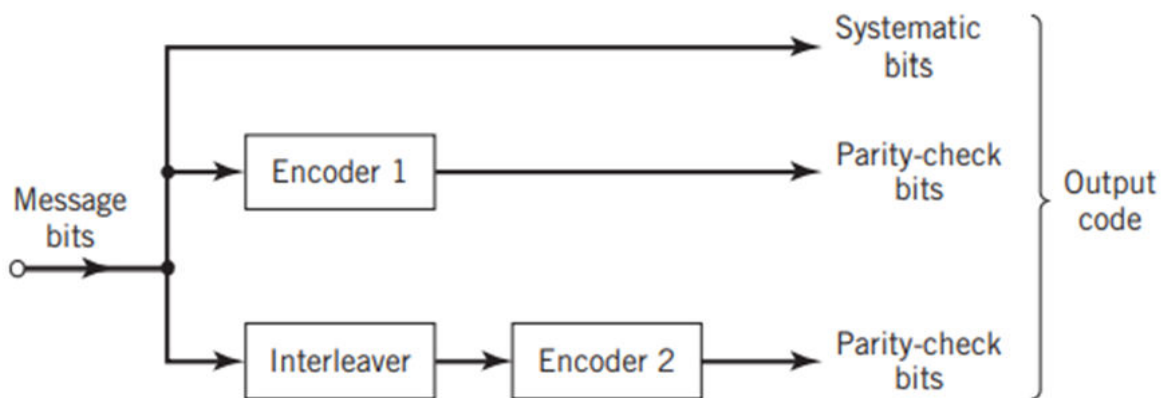


Fig.1.2.1 Turbo Encoder

### Turbo Decoding

The common structure of turbo decoding is iterative based structure, however some non-iterative decoders have been developed that produce acceptable result. In this dissertation, the concept of iterative decoding structure and some widely used algorithm are described. Figure 1.2.1 illustrates the general structure of iterative based turbo decoder.

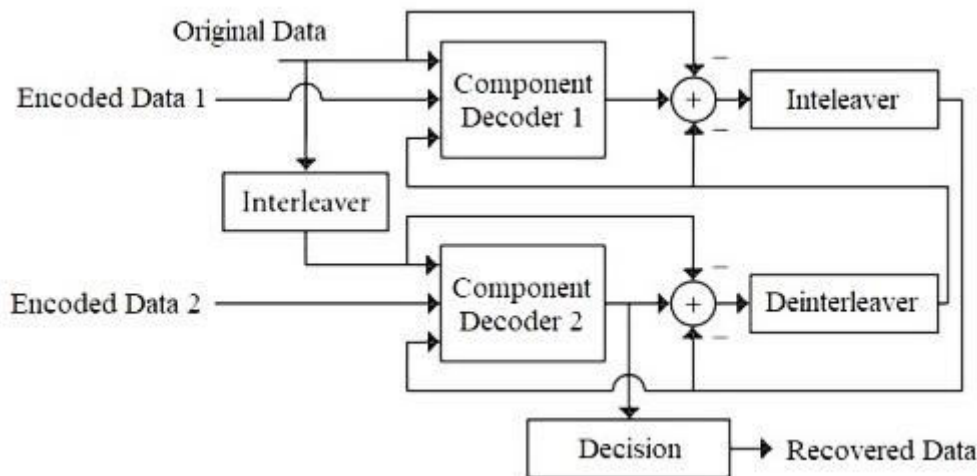The main parts are component decoders with inter leavers and deinter leavers in between

corresponding to the encoder structure. There are two types of inputs to each decoder: channel output bits that are encoded in the transmitter side and the decoded bits of the other component decoders which are called a-priori information, moreover for systematic coding structure, systematic data is also used in the decoding part. The component decoders have to employ these inputs and generate soft output.



Fig1.2.2.Turbo Decoder

### LDPC Codes

LDPC encoder: LDPC encoding is performed by generating a parity check matrix, which must be a sparse matrix with a specified number of columns and rows according to the codeword size and employed code rate respectively. A low - density parity check (LDPC) code is specified by a parity-check matrix containing mostly 0s and a low density

of 1s. The rows of the matrix represent the equations and the columns represent the bits in the codeword, i.e. code symbols.

To obtain the encoded data sequence, the entire binary data vector is multiplied by a generator matrix, which is derived from the parity check matrix [13]. Fig. 1.2.3 shows the LDPC encoding process block diagram.
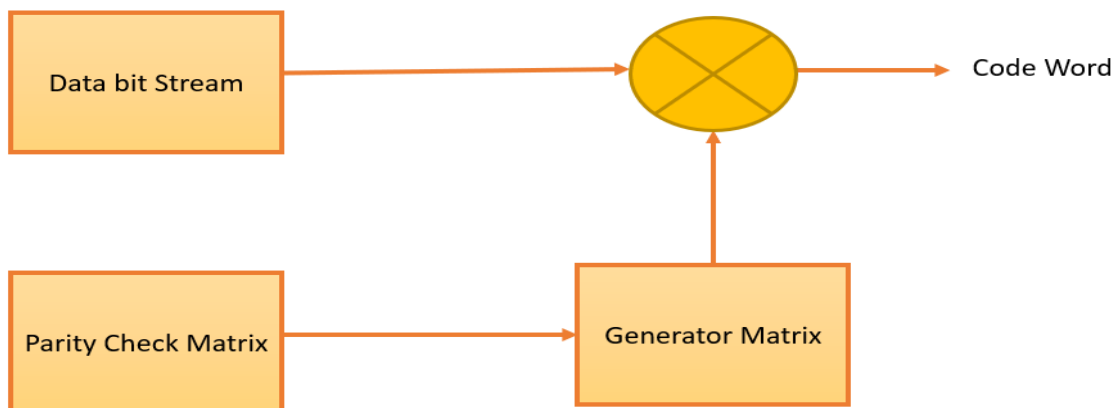


Fig1.2.3.LDPC Encoder Block diagram.

LDPC Decoder: The algorithms performing the LDPC decoding process produce efficient and iterative methods to decode the received data bits.

There are two possible decoding techniques of LDPC codes −

- In the first technique, the decoder does all the parity checks as per the parity equations. If any bit is contained in more than a fixed number of unsatisfied parity equations, the value of that bit is reversed. Once the new values are obtained, parity equations are recomputed using the new values. The procedure is repeated until all the parity equations are satisfied. This decoding procedure is simple and but is applicable only when the parity-check sets are small.

- The second method performs probabilistic algorithms on LDPC graphs. The graph is a sparse bipartite graph that contains two sets of nodes, one set representing the parity equations and the other set representing the code symbols. A line connects node in first set to the second if a code symbol is present in the equation. Decoding is done by passing messages along the lines of the graph. Messages are passed from message nodes to check nodes, and from check nodes back to message nodes and their parity values are calculated.

- The two subclasses of these methods are belief propagation and maximum likelihood decoding. Though these decoding algorithms are complex, they yield better results than the former.

### 1.2.3  M-ary PSK/MPSK

*M-ary* phase-shift keying (MPSK) is employed in some of the digital cellular standards and communication geostationary satellite systems. MPSK employs a set of *M* equal-energy signals to represent *M* equiprobable symbols. This constant energy restriction (i.e., the constant envelope constraint) warrants a circular constellation for the signal points. In MPSK, the phase of the carrier takes on one of *M* possible values

$$\frac{2\pi(i-1)}{M}$$

Where,

$$i = 1, 2, \ldots\ldots\ldots\ldots\ldots\ldots\ldots, M.$$

The MPSK signal set is thus analytically given by:

$$s_i(t) = \sqrt{\frac{2E_i}{T_s}} \cos\left(2\pi f_c t - \frac{2\pi(i-1)}{M}\right), \quad 0 \le t \le T_s, \quad i = 1,$$

The two orthonormal basis functions can represent the MPSK signal set are

$$\phi_1(t) = \sqrt{\frac{2}{T_s}} \cos(2\pi f_c t), \quad 0 \le t \le T_s$$

### 1.2.4  Multiple Access Techniques

The multiple access technique specifies how signals from many sources are integrated and allowed to enter the channel where TDMA, FDMA, CDMA, and CSMA are examples of common multiple access systems.

### 1.2.5  Transmission/Reception

Unlicensed spectrum operate at RF frequencies, thus up conversion to these frequency range and signal amplification before transmission with a compatible antenna are also required. Amplification and down conversion to an IF frequency is essential in detection.

### 1.2.6 Quantization and Digital to Analog Converters

At the transmitter, quantization and digital-to-analog converters are employed to convert the incoming analogue signal to digital and vice versa.

### 1.2.7  Types of Channels

Rayleigh fading channels, Rician channels, and Nakagami channels are examples of common wireless channels. The spectral efficiency of M-ary PSK improves as the value of M increases. As previous research [14] for QAM reveals, Greater spectral efficiency can be achieved by using non binary LDPC codes. MPSK/LDPC combinations have only been employed for M=2, M=4, and M=8[15]. The

MPSK-LDPC combination for larger values of M, therefore enhances spectrum utilization to meet the standards of future wireless technology.

### 1.3 Parameters In Digital Communication System

Bit Error Rate, Signal to Noise Ratio, High Data Rate

Efficient Bandwidth Utilization (Spectral Efficiency), Radio Channel Capacity are the important parameters of the digital Communication system.

MPSK-LDPC Systems for Spectral Efficiency for Wireless Communication Systems

During signal propagation over wireless communication channels there are simultaneously two stochastic effects: multipath fading and shadowing. Multipath fading presents received signal power variations due to constructive and destructive superposition of randomly delayed, reflected, scattered and diffracted multipath signal components. Since these variations occur over short distances, on the order of the signal wavelength, they are called small-scale or short term fading. Besides these variations, there are slow variations of the received signal power because of shadowing that is caused by obstacles in propagation path (that attenuate signal power through absorption, reflection, scattering and diffraction). Since variations due to shadowing occur over relatively large distances proportional to the length of the obstructing object, they are called large-scale or large-term fading [16].

These composite fading channels were mainly modeled by K or generalized-K distributions [17]. I. Kostic determined the outage performance of interference-limited systems over composite fading channel and bit error rate (BER) in detecting uncoded binary differentially phase-shift keying (PSK) signals in noise limited systems over gamma shadowed Nakagami-m (generalized-K) fading channels [18].

The BER performance in detecting uncoded binary PSK signals transmitted over generalized-K fading channel was determined in [18]. [19] presented the BER performance of uncoded multilevel PSK and quadrature amplitude modulation signals transmitted over generalized-K fading channels. Performance of convolutional, Reed Solomon (RS), turbo product RS and concatenated codes in combination with binary PSK (BPSK) over generalized-K fading channels was determined in [20]. Very recently, Yilmaz and Aloini proposed a very general extended generalized-K (EGK) distribution having five parameters that can approximate the fading envelope in wireless millimeter wave propagation [21]. The second order characteristics and capacity were determined in [22] for the case when fading envelope is approximated by extended generalized-K distribution. This distribution has good tail characteristics and contains many of the well-known distributions as special or limiting case. This EGK distribution can be used for modeling both multipath and shadowed multipath fading channels.

We determine the BER performance of LDPC-coded multilevel PSK signal transmission. This is the first time the performance of error correction codes in the channel where EGK distribution is used for fading modelling to be analyzed.

In phase shift keying, all the information gets encoded in the phase of the carrier signal. The M-PSK modulator transmits a series of information symbols drawn from the set m∈{1,2,…,M}. Each transmitted symbol holds k bits of information (k=log2(M)). The information symbols are modulated using MPSK mapping. Here, M denotes the modulation order and it defines the number of constellation points in the reference constellation. The value of M depends on the parameter k – the number of bits we wish to squeeze in a single MPSK symbol.

### 2.1 Transceiver Model with Blind Identification

The basic system model for the transceivers involving binary low-density parity-check (LDPC) coders/decoders. The block diagram of the transceiver involving our proposed new blind binary extended M-ary PSK LDPC

encoder identification mechanism is depicted in Figure 2.1. Without loss of generality, let's not consider source encoder/decoder here.

Denote the sets

$$P2 \stackrel{\text{def}}{=} \{0,1\}$$

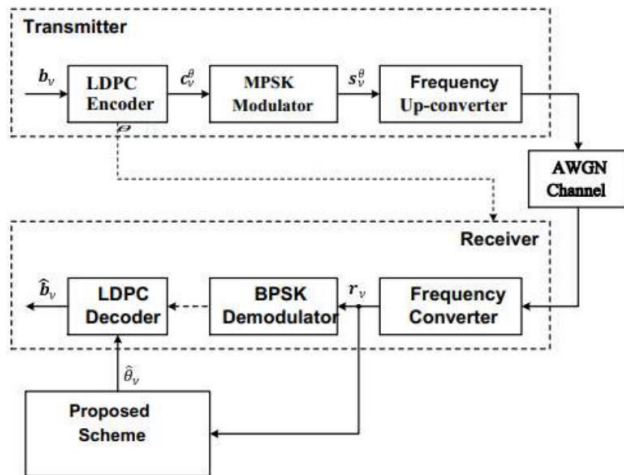$$B \stackrel{\text{def}}{=} \{-1,1\}$$



Figure 2.1: M-ary LDPC encoder identification mechanism

At the transmitter, original information bits are grouped into blocks, each of which consists $q$ consecutive bits, say $bu$ c $Z^{q \times 1}$ where $u$ c $Z$ is the block index. This block of information bits are passed to the LDPC encoder $\theta$ to generate a corresponding block of codeword or coded bits, say

$$C_u^\theta \epsilon Z_2^{m \times 1}$$

where, $\theta$ = denotes a particular type of LDPC encoder. Obviously the corresponding code rate is R = k/n. Then, the codeword $C_u^\theta$ should be modulated by Binary extended M-ary phase-shift keying (MPSK) modulator and the corresponding block of modulated symbols are denoted by $S_u^\theta$ c $B^{m \times 1}$

These modulated MPSK symbols will undergo a frequency up-converter to engender the pass-band signals for actual transmission.

The transmitted pass-band signals travel through the channel and arrive at the receiver. They will go through the frequency down-converter first to come back to the baseband. In this thesis, we assume that both frequency and frame synchronizations are properly carried out prior to encoder identification. It is possible that joint frequency synchronization, frame synchronization, and encoder identification can be accomplished blindly using the techniques.

Since each LDPC code has a unique parity-check matrix, the encoder $\theta$ can be unambiguously identified if we can successfully establish the corresponding underlying parity-check relations directly from the received signal data samples. The parity-check relations are manifested by that the sums of certain coded bits in the codeword block over the Galois field GF(2) are zero.

Consider the additive white Gaussian noise (AWGN) channel here. Each element of the $b^{th}$ block of received baseband signal samples,

$$R_b \stackrel{\text{def}}{=} [R_{b,0}, R_{b,1}, \quad \ldots \quad R_{b,j}, \ldots R_{b,m-1}]^T$$

can be expressed as

$$R_{b,j} = A_b S_{b,j}^\theta + W_{b,j} \qquad j = 0,1,2, \ldots\ldots\ldots..m-1$$

where,

$A_b$ is the unknown signal amplitude accounting for the processing gain

$S_{b,j}^\theta$ the channel gain belongs to B is the modulated MPSK signal generated from the encoder $\theta$,

$W_{b,j}$ is the zero-mean AWGN with the variance $\sigma^2$ for the $j^{th}$ signal sample within the $b^{th}$ block.

Consequently, the signal-to-noise ratio (SNR) per coded bit for the $b^{th}$ block of modulated signals is given by

$$\rho_b = \frac{A_b^2}{\sigma^2}$$

On the other hand, to take the code rate R into account, the SNR per uncoded bit for the $b^{th}$ block of modulated signals is given by

According to Figure 3.3.1, the receiver has no idea about the exact encoder $\theta$ the transmitter adopts. Therefore, it needs to identify the encoder before any received signal can be decoded.

$$\eta_b = \frac{\rho_b}{R}$$

### 2.1 Blind Parameter Estimation

Signal amplitude and noise variance are two parameters one needs to estimate first for blind LDPC-encoder identification. Since we focus on the blind scheme, the corresponding estimators have to be blind as well. There exist several non-data aided methods to estimate signal amplitude and noise variance, such as the M2/M4 estimator [23] and the EM (expectation maximization) estimator [24, 25,26,27]. The M2/M4 method works well for constant modulus modulations such as phase-shift keying (PSK).

### 2.2 Log-likelihood Ratio

Since we need to rely on the LLR metric for the blind LDPC encoder identification in this thesis, a preliminary introduction on the log-likelihood ratio formulation for a binary random process is provided here. The log-

likelihood ratio of a binary random variable X can be facilitated as,

$$\mathcal{L}_X(x) = ln\frac{P(x = 0)}{P(x = 1)}$$

which is the natural logarithm of the ratio between the probabilities of X taking values 0 and 1, respectively. Given another random variable, say Y, then the LLR of X conditioned on Z is given by

$$\mathcal{L}_{(X|Z)}\big((X|Z)\big) = ln\frac{P(x = 0|Z)}{P(x = 1|Z)}$$

### MPSK Simulation Results Discussion for Spectral Efficiency

The LDPC - Uncoded and Coded MPSK spectral performance with shadow effect over EGK fading channels are shown in Figure 3.1.
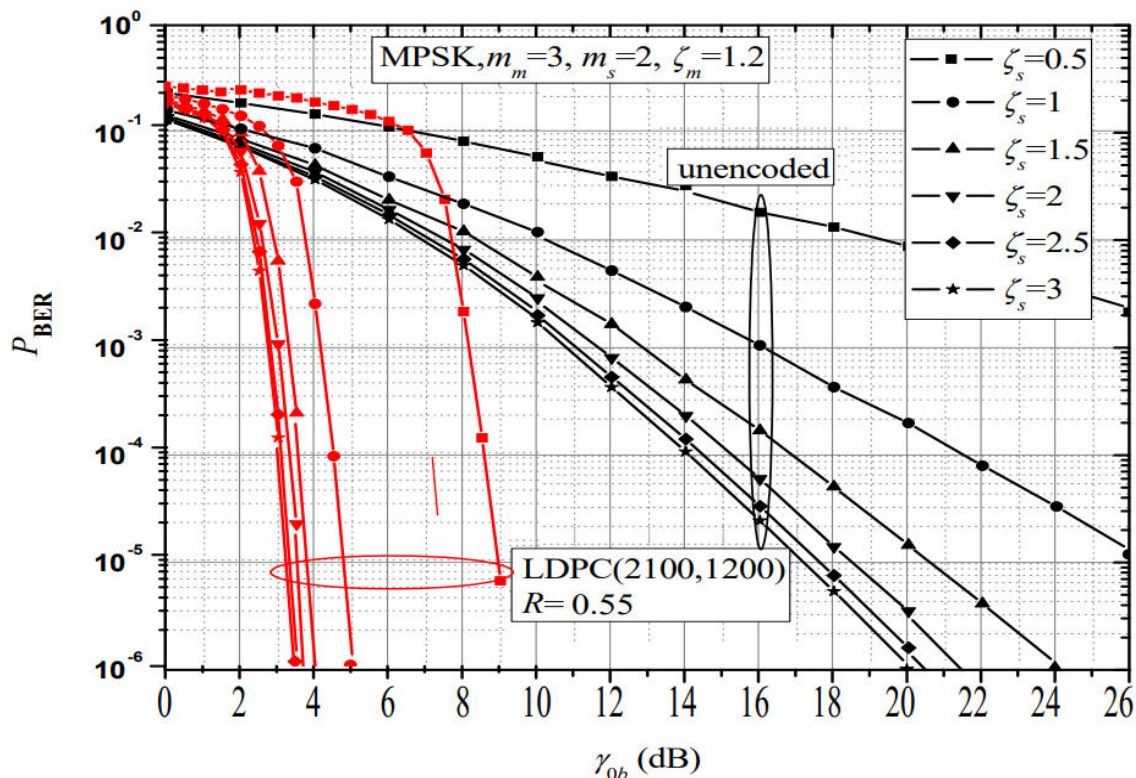


Figure 3.1: LDPC- uncoded and coded MPSK spectral performance with shadow effect over EGK fading channels

By using the simulation model described above the BER performance is determined by Monte Carlo simulations. The BER values are determined based on 1000bit errors. Fig. 3.1 above presents the effect of shadowing shaping factor on BER performance of signal detection over progressive edge growth fading channels.

The value of gamma has the considerable effect on BER values of both uncoded and encoded signal detection. Hence it can be concluded that high code gains are achieved by applying LDPC(2100,1200) of code rate R=0.55. BER of $10^{-6}$ is about 7.6dB. The code gain increases as rate decreases.
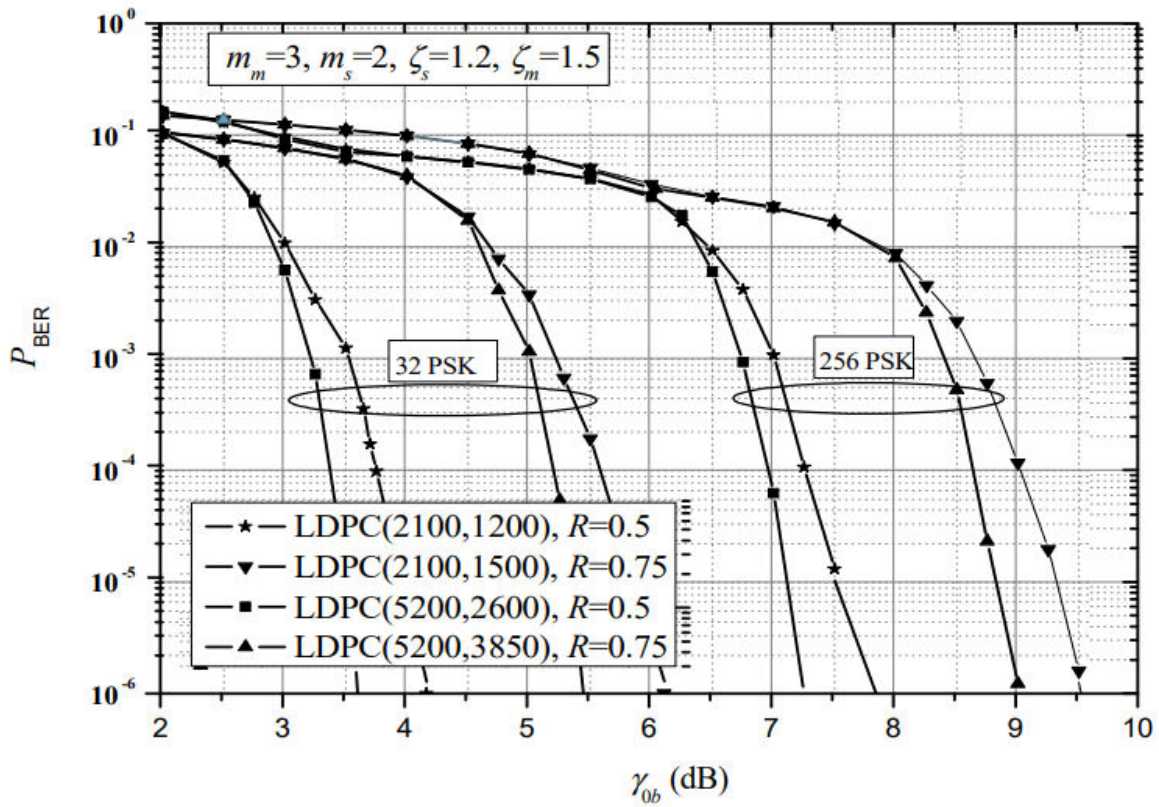
Figure 3.2: Combination with 32 PSK and 256PSK over EGK fading channels
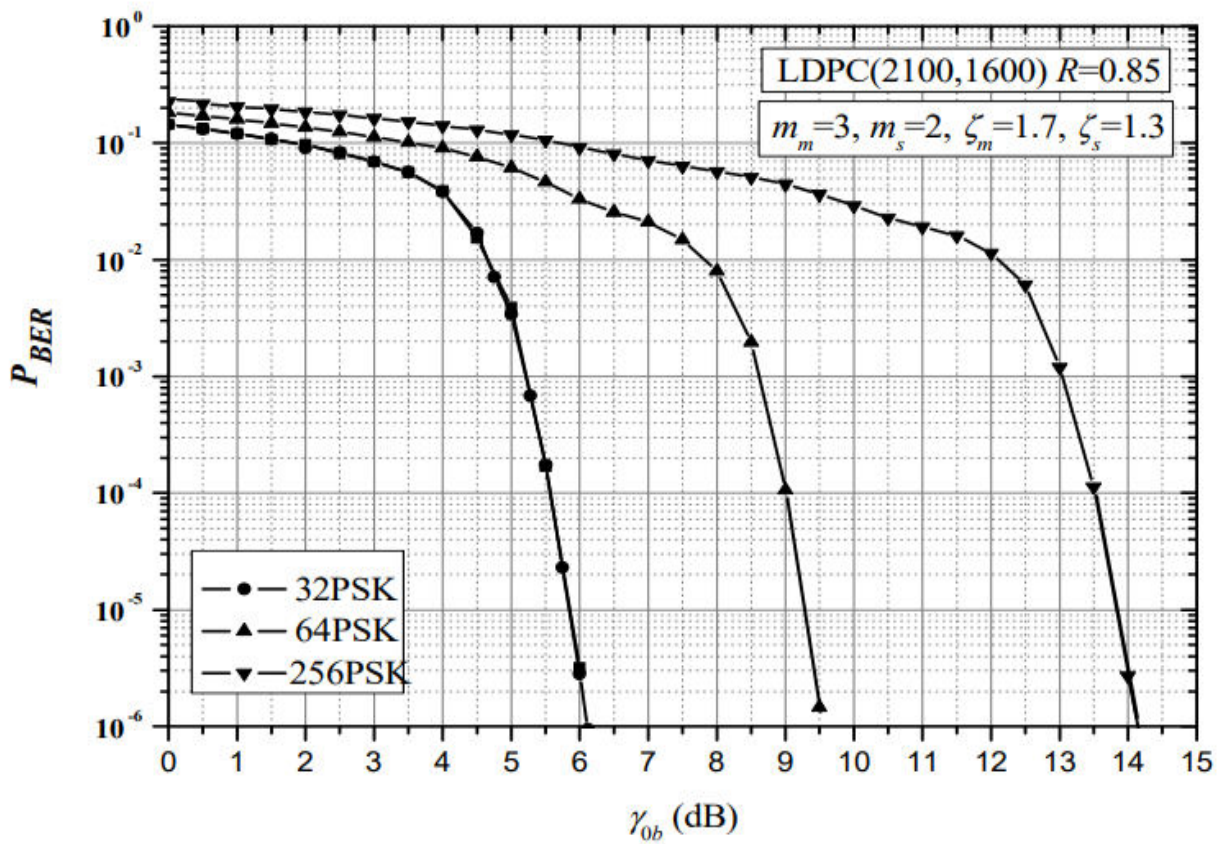


Figure 3.3: 32, 64PSK and 256PSK signals over EGK fading channels
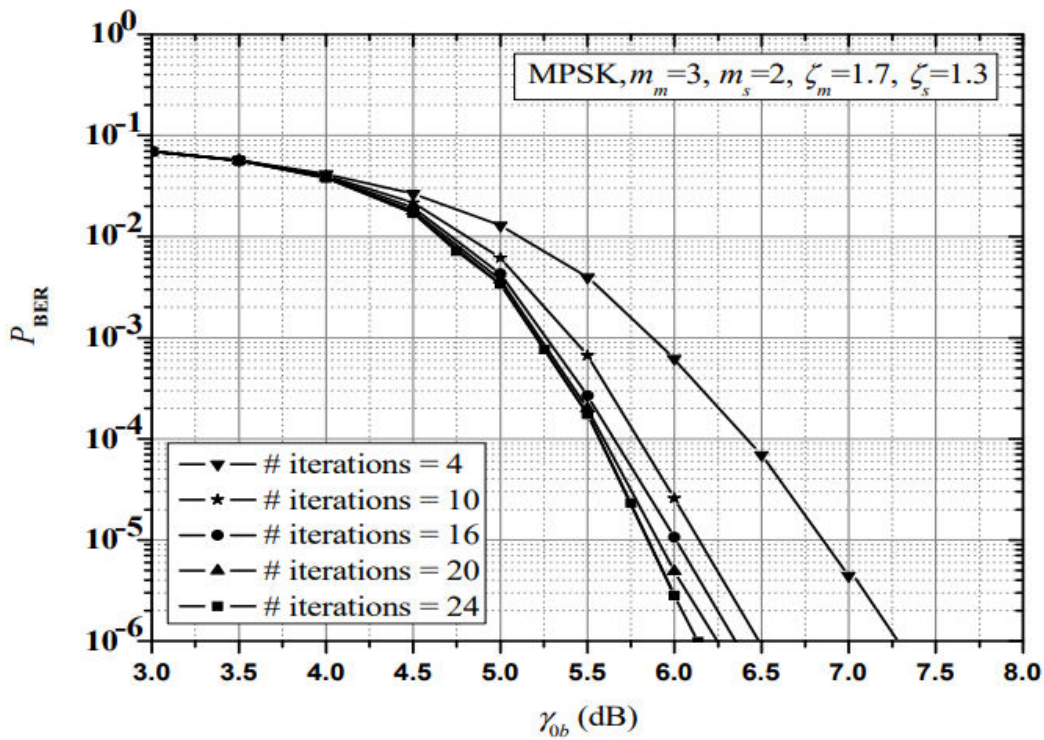
Figure 3.4: Effect of number of iterations on BER performance of LDPC-coded MPSK, signals over EGK fading Channel.
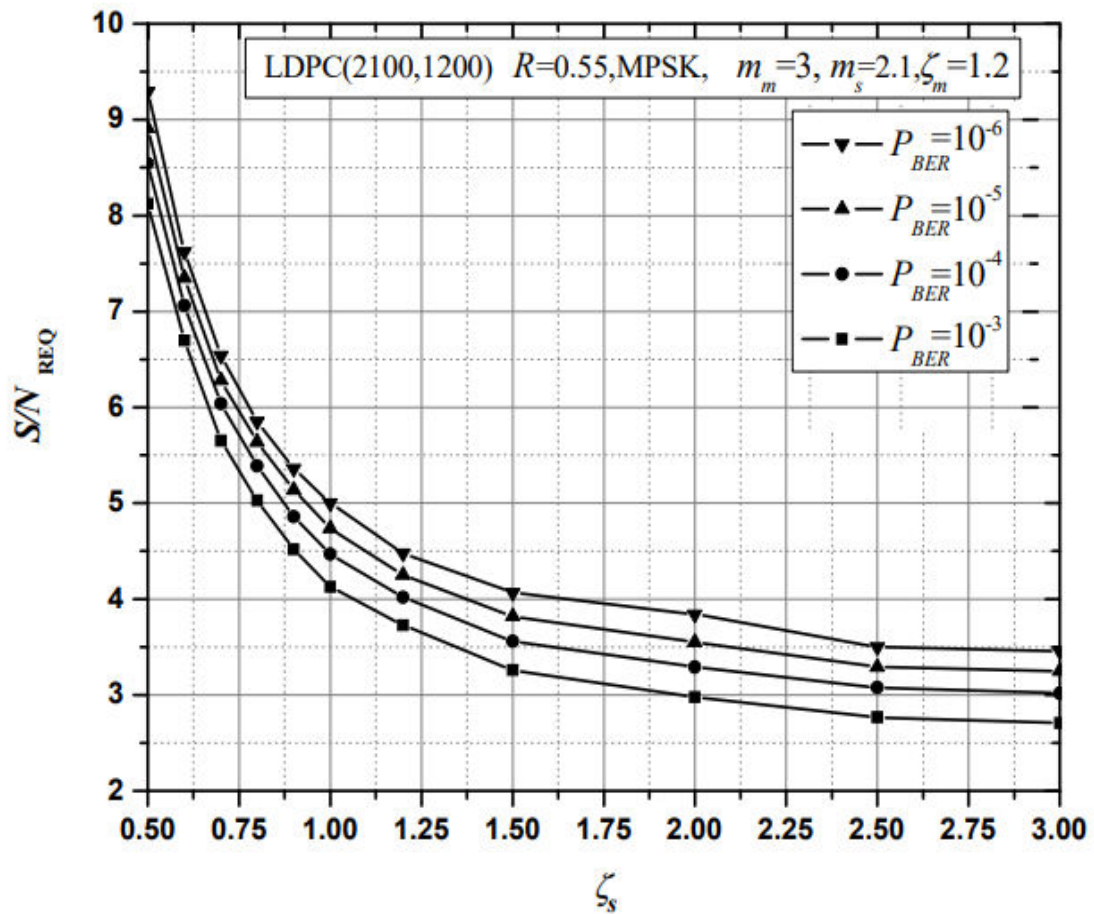


Figure 3.5: Required values of SNR in order to achieve specific EGK fading channels
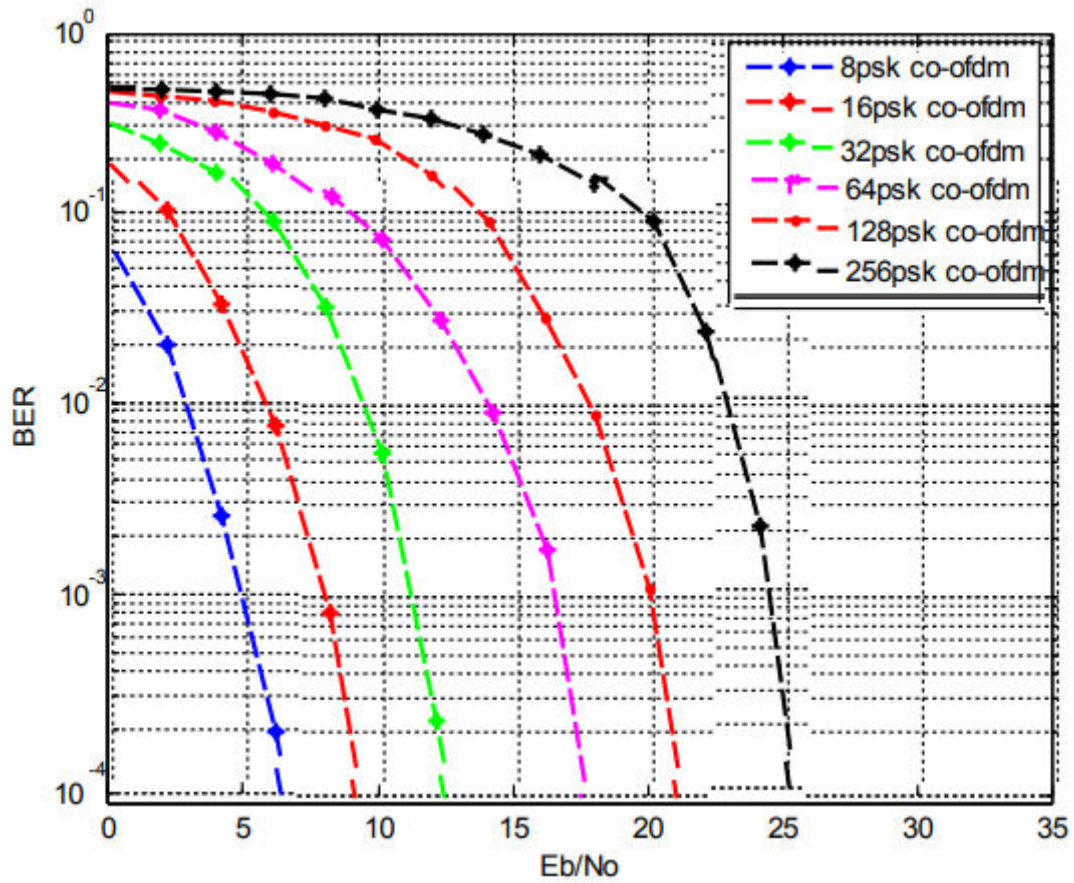
Figure 3.6: MPSK modulated LDPC-CO-OFDM
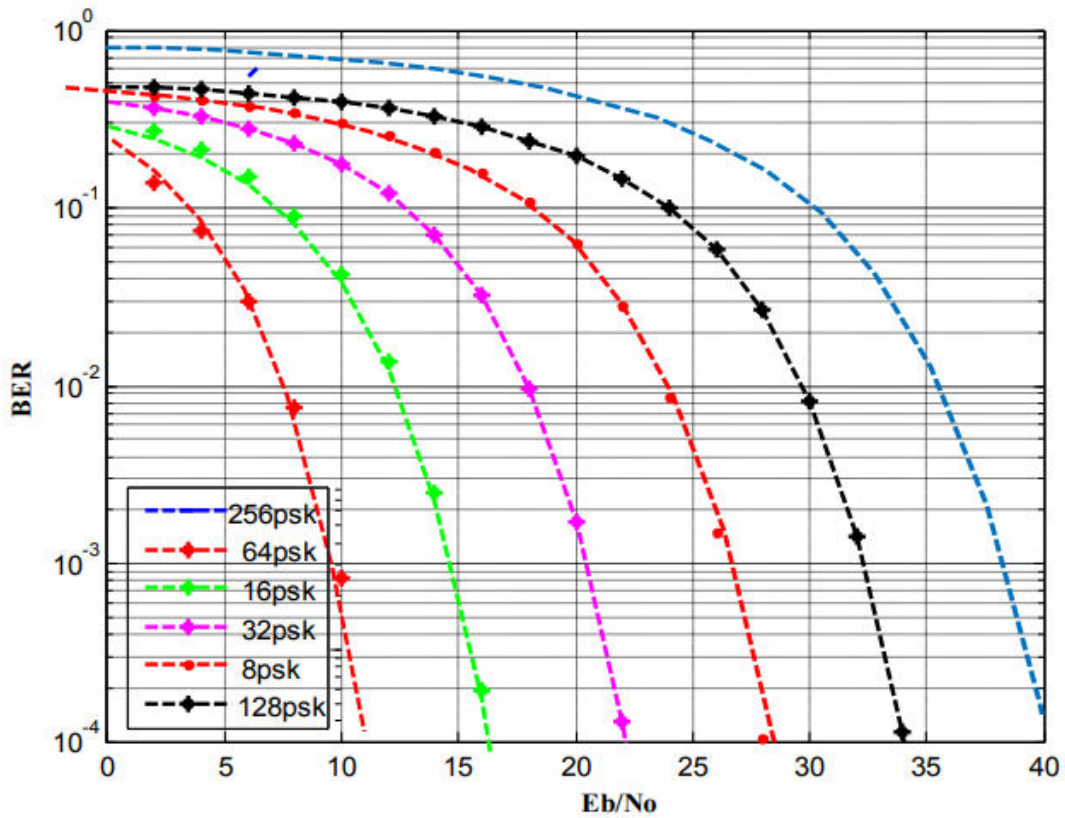


Figure 3.7: Bit error probability curve for MPSK using OFDM
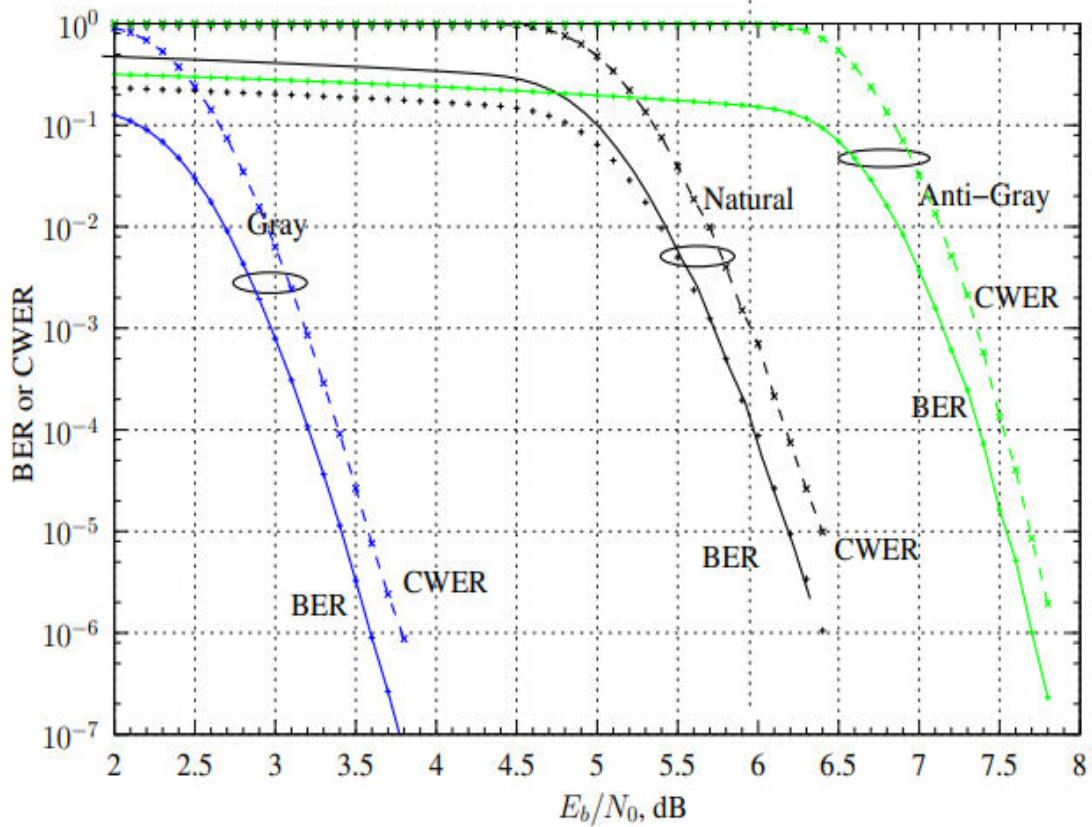
Figure 3.8:Performance of R= 1, /2 k = 1024 LDPC coded 8-PSK using various bit-to-symbol mappings.
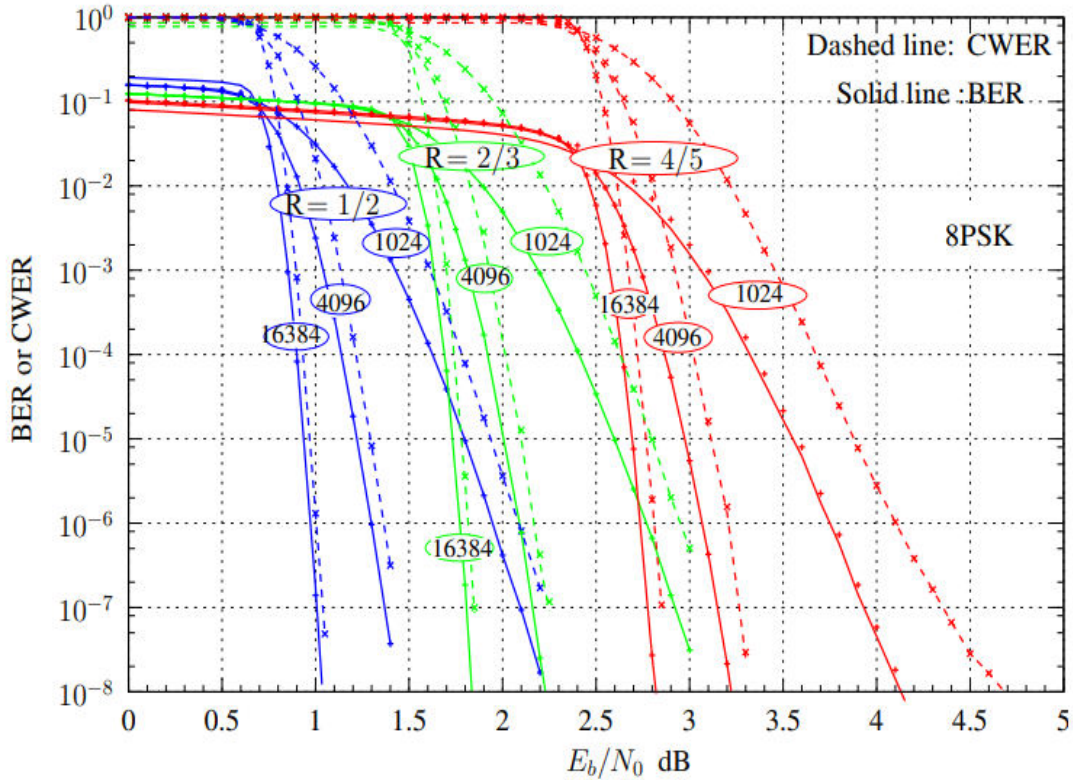


Figure 3.9: Performance of different rate LDPC coded 8PSK
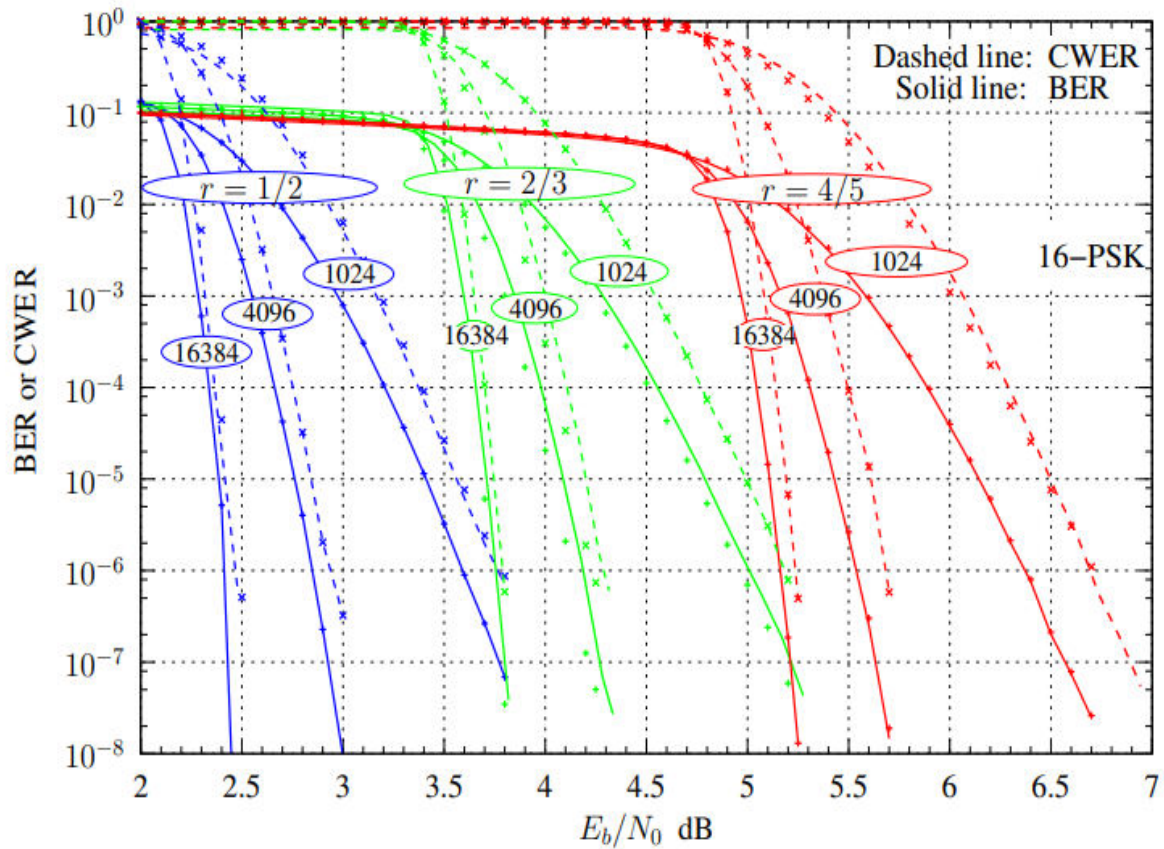
Figure 3.10: Performance of different rate LDPC coded16PSK
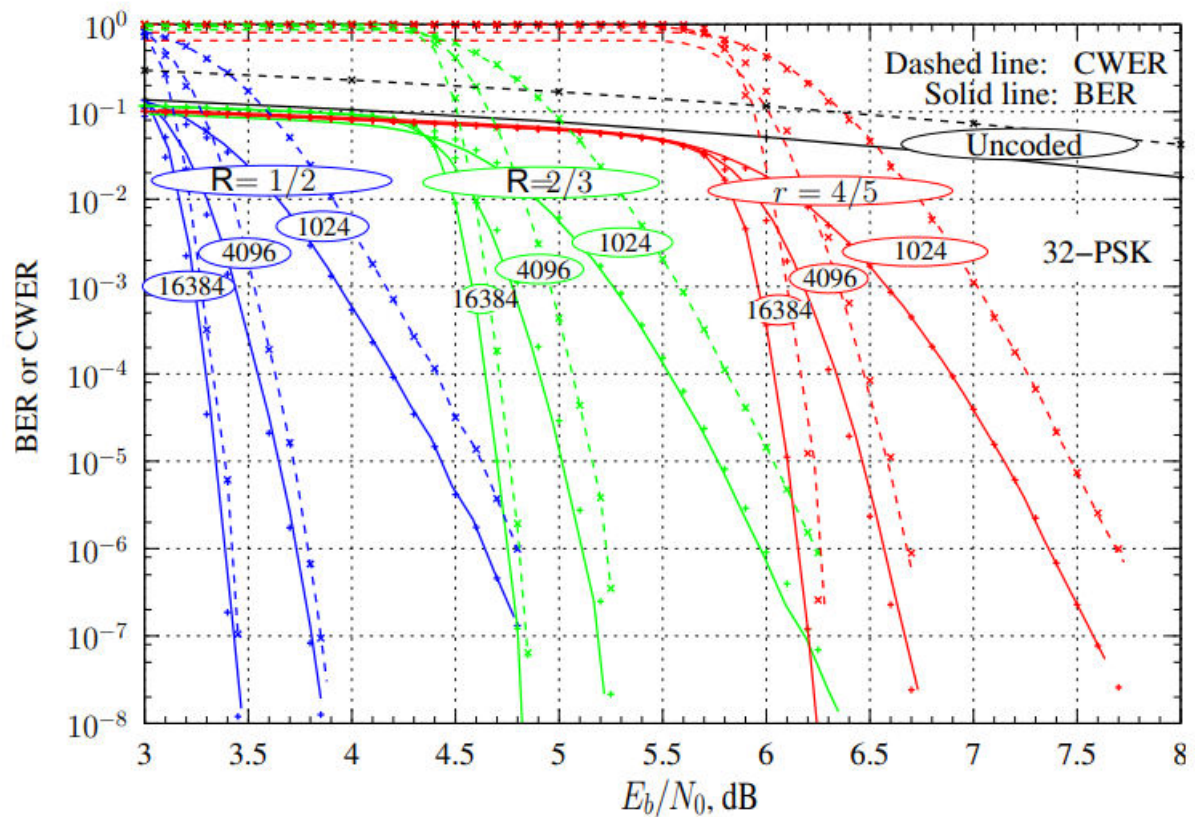


Figure 3.11: Performance of different rate LDPC coded 32PSK
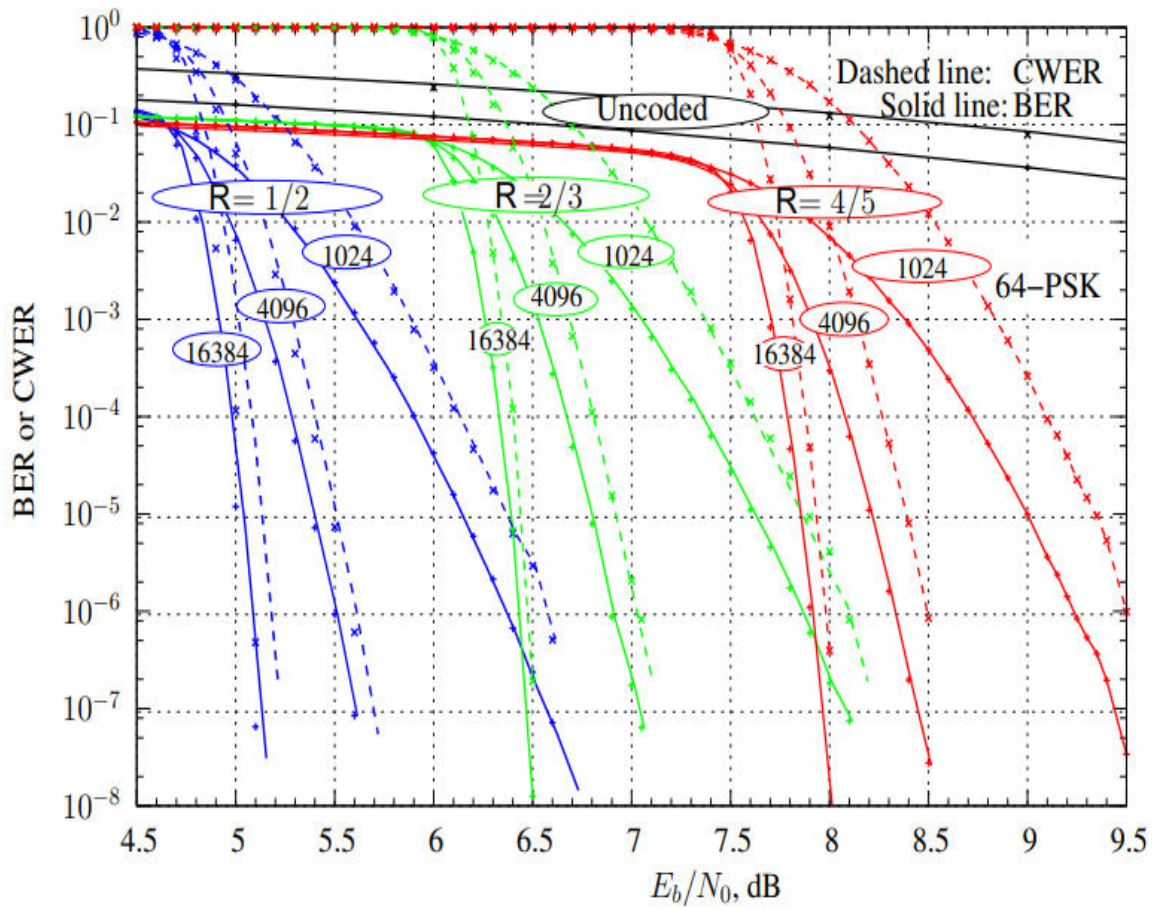
Figure 3.12: Performance of different rate LDPC coded 64 PSK
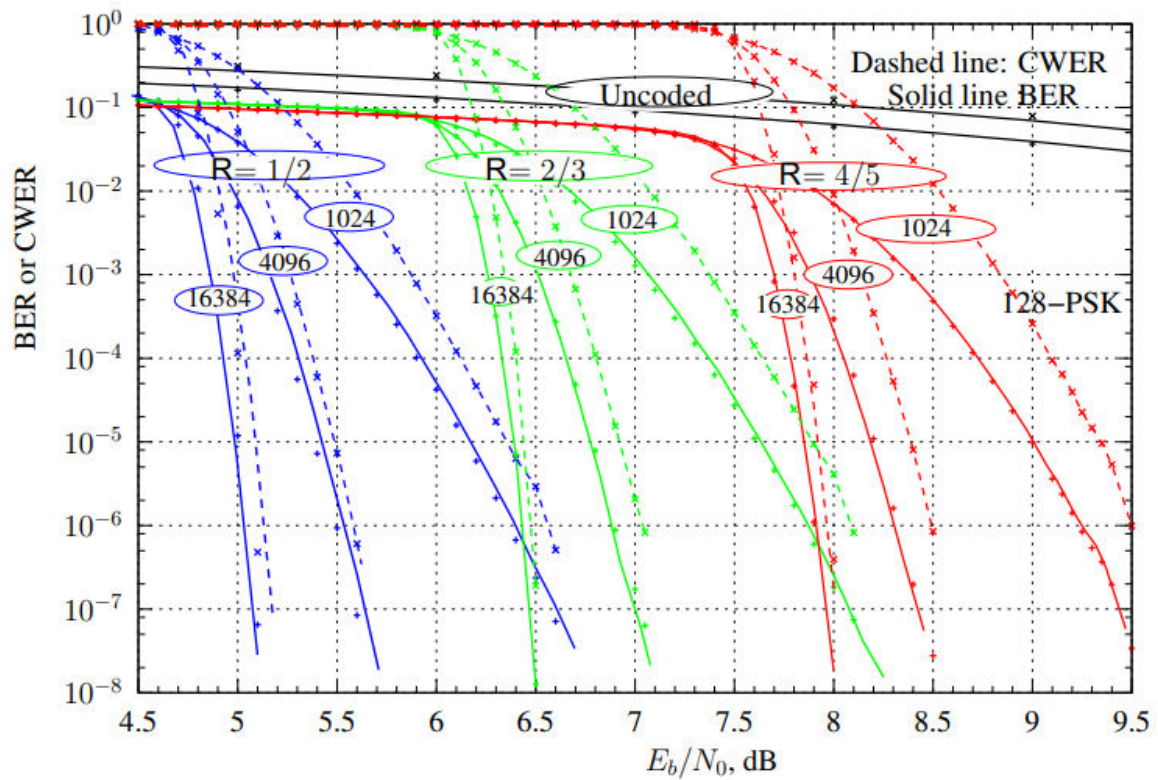


Figure 3.13: Performance of different rate LDPC coded 128 PSK
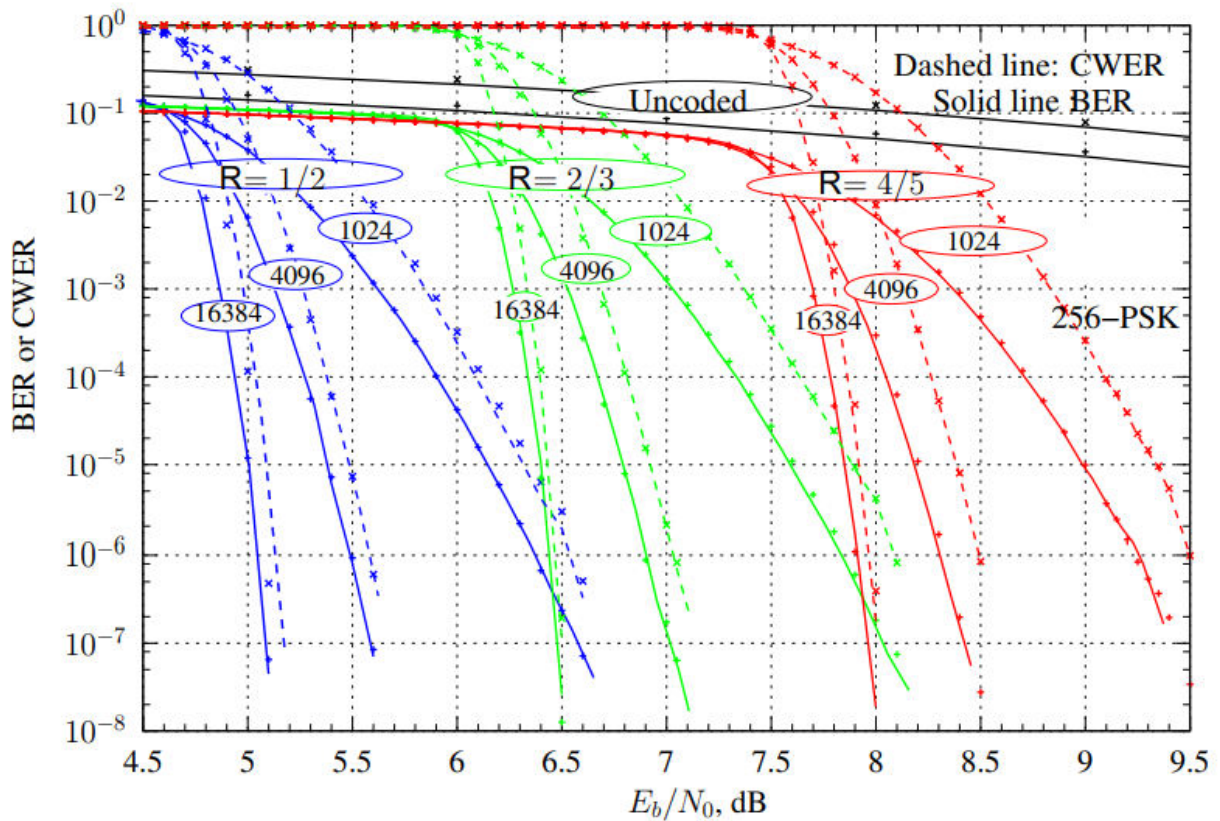
Figure 3.14: Performance of different rate LDPC coded256 PSK



Figure 3.15: Performance of rate 1/2 LDPC coded MPSK using hard decision demodulator
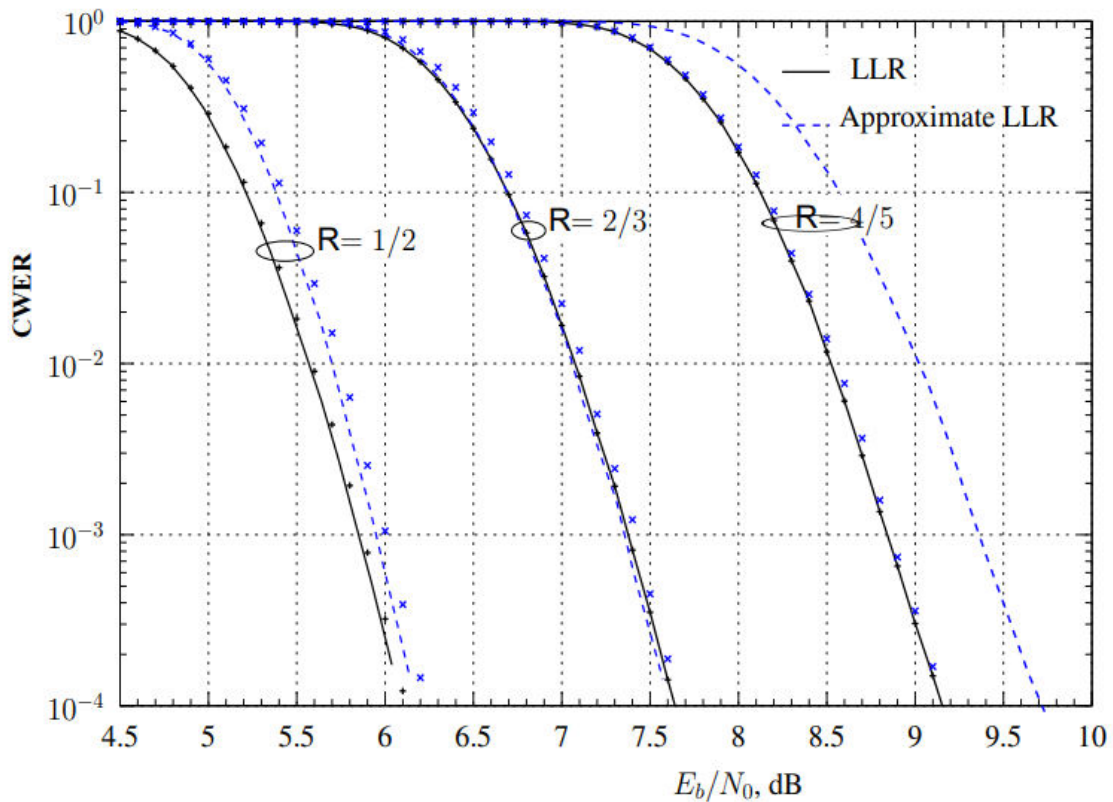
Figure 3.16: Comparison of LLR and approximate LLR decoder performance for LDPC coded 256 -PSK

Figure 3.2 presents the BER performance of M-ary PSK for different code rates R = 0.5 and R = 0.75 with different coding gains LDPC(2100,1200), LDPC(5200,2600), LDPC(2100,1500) and LDPC(5200,3850) over fading channels. Figure 3.3 presents the BER performance of encoded MPSK signal detection over EGK fading channels. As expected, the BER curves of BPSK and QPSK 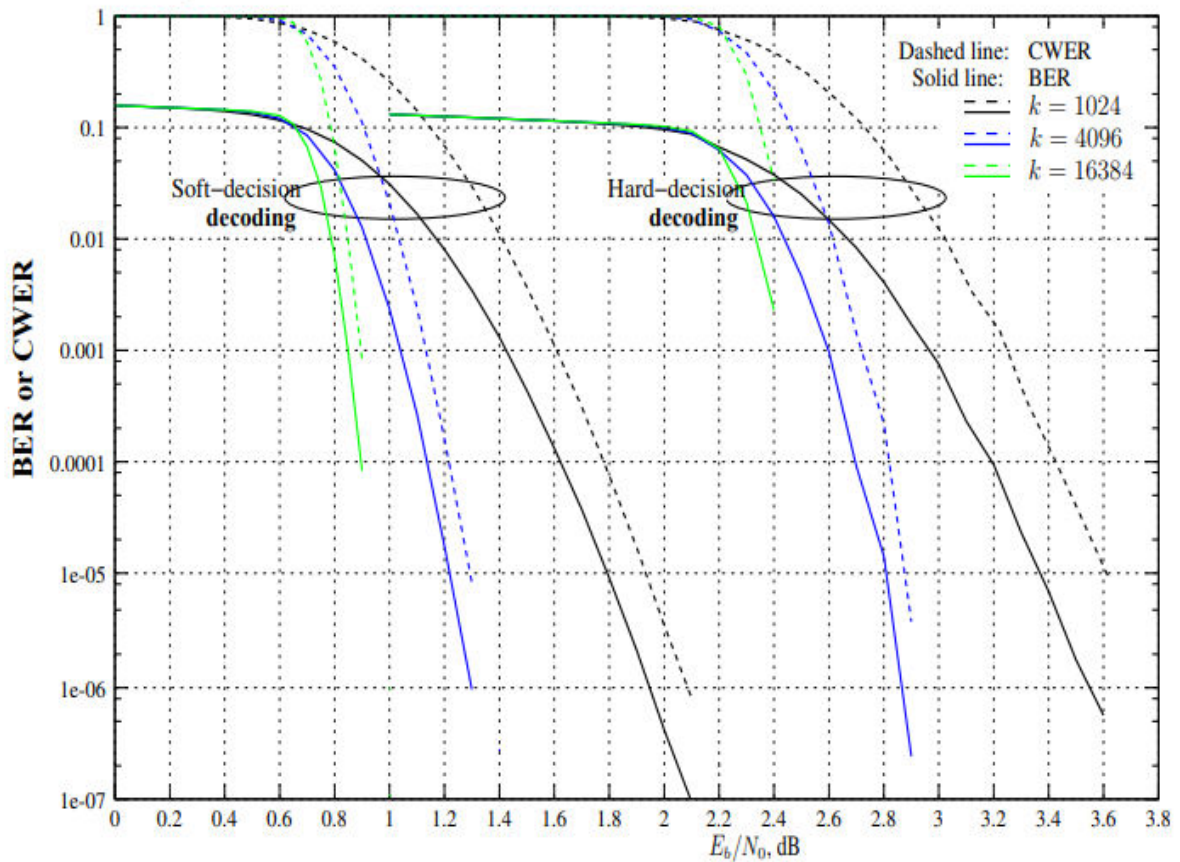signals overlap, and BER performance with phase level number increasing. Figure 3.4 illustrates the effect of number of decoding iterations on BER performance. By increasing the number of iterations from 5 to 20 the additional coding gain of 1.1 dB is obtained. Further increasing the number of iterations does not considerably improve the coding gain. By increasing the number of iteration from 20 to 25 causes the coding gain of only 0.1 dB. For given fading and shadowing parameters it is possible to determine the minimum number of iterations in order to achieve the desired BER. The decoder should be properly designed with minimum latency for signal processing.

Figure 3.4 and 3.5 present the required values of $\gamma 0b$ in order to reach given BER. These required values decrease with $\zeta s$ increasing. If $\zeta s = 1.5$ the required values of $\gamma 0b$ in order to achieve BER of 10-3 and 10 -6 are 3.2 and 4.1 dB for LDPC coded signal transmission, and 12.7 and 24.25 dB for uncoded signal transmission. High coding gains are achieved by applying LDPC (2100,1200) and coding gain are greater at lower BER values.

In Figure 3.6 and 3.7 shows the BER versus SNR plots for MPSK modulated OFDM system using gray mapping over AWGN channel. It is also clear that with higher levels of modulation, SNR has to be increased to achieve the same BER. Figure 3.8 shows the performance of coded MPSK on an AWGN channel, demodulated with an exact LLR computation and quantized to 8 bits, and decoded using up to a maximum of 200 iterations. BERs and CWERs are shown for codes of input codeword lengths k = 1024, k = 4096, and k = 16384 and rates 1/2, 2/3, and 4/5. These simulation results are in agreement with those reported elsewhere [1], except that the error floors have been eliminated. Figure 3.9 shows the performance of LDPC codes as before except that 8-PSK with a Gray mapping

is used. BERs and CWERs are shown for codes of input codeword lengths k = 1024, k = 4096, and k = 16384 and rates 1/2, 2/3, and 4/5. Figures 3.10 to 3.14 shows the performance of LDPC codes as before, except that 16- PSK, 32-PSK, 64-PSK, 128-PSK and 256-PSK respectively. BERs and CWERs are shown for codes of input codeword lengths k = 1024, k = 4096, and k = 16384 and rates 1/2, 2/3, and 4/5. Figure 3.15 shows the loss when the demodulator uses hard decision decoding. Figure 3.16 shows the codeword error rate (CWER) performance of the decoder when using the exact LLR and the nearest neighbor approximation. The results shown are for 256-PSK with LDPC codes of length k = 1024 and rates R = 1/2, 2/3, and 4/5.

encoded MPSK signal detection over EGK fading channels are discussed. High coding gains are achieved by applying LDPC (2100,1200) and coding gain are greater at lower BER values. The performance of coded MPSK on an AWGN channel, Summary 18 demodulated with an exact LLR computation and quantized to 8 bits, and decoded using up maximum of 200 iterations were discussed. The performance of LDPC codes as before except that 8-PSK with a Gray mapping is used. BERs and CWERs are shown for codes of input codeword lengths k = 1024, k = 4096, and k = 16384 and rates 1/2, 2/3, and 4/5 simulated and discussed. The performance of LDPC codes as before, except that 16-PSK, 32-PSK, 64-PSK, 128- PSK and 256-PSK respectively. BERs and CWERs are shown for codes of input codeword lengths k = 1024, k = 4096, and k = 16384 and rates 1/2, 2/3, and 4/5 are simulated and discussed.

## Conclusion

In this paper, simulation results for MPSK spectral efficiency with LDPC codes with different code rates and BER performance of

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# TO IMPLEMENT 3-PHASE FAULT PROTECTION FOR UNDER-VOLTAGE, OVER-VOLTAGE AND OVER-LOAD CONDITION USING ARDUINO

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## ABSTRACT

*Distribution automation enables utility companies to update any adaptive control of the distribution system to improve the efficiency, reliability and quality of power services. Automation can not only improve these characteristics but also reduce manpower and save under voltage, overvoltage, and overload. It is one of the most common problems in many countries that damage insulation and equipments. The purpose of this document is to develop a microcontroller-based automatic restart for a three-phase network. The circuit breaker closes automatically after a short circuit. Interrupt when a temporary error occurs, but remain closed when a permanent error occurs. This process will likely replace the mechanical relays in the system and integrate them into the data acquisition system, thereby improving system efficiency and reducing system hardware costs. Demonstrates how under voltage, overvoltage and overload problems can cause the system to fall into a catastrophic situation. It also describes how to use automatic restart systems with warnings in IoT systems to minimize these problems economically.*

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*Keywords: Microcontroller, three phase system, IoT.*

## 1. Introduction

The power distribution system performs a critical position in the power supply of the entire power system to consumers. Therefore, we need a better protection system to ensure the smooth flow of power and protect the system from interruption. The power quality is poor. Power sources often cause voltage surges, over voltages, and voltage fluctuations, leading to lamp flickering, home appliance failures, TV signal reception interference, etc., and unplanned operation of network resources may cause short-circuits to ground, electrical and electrostatic discharge. If faced with these problems, electronic devices will instantly collapse. And cause the isolation performance of the device to decline or fail. The reactive power output of the capacity or will increase quickly and is proportional to the sq. of the voltage. The reactive power output of the capacitor increases rapidly and is proportional to the square of the voltage. Repeated overvoltage conditions can damage the capacitor. Low voltage (UV) may be caused by a reverse operation that causes RH. The increase in motor heat loss due to the increase in current may shut down electronic equipment and reduce the reactive power provided by the capacitor bank. Voltage fluctuations will affect the illuminance of incandescent lamps and discharge lamps [1], [2]. This issue requires immediate intervention in the security system. However, fixing errors is a difficult task. Although the fault display device provides a reliable fault identification method, it is still necessary to manually detect the fault for multiple hours and monitor multiple communication errors. The system can be identified by monitoring the current sensor and the voltage sensor. The sensor connected to the Arduino uses Wi-Fi-based monitoring to send fault information to the power board and authorized personnel through the Blynk.

## 2. Problem Statement

If an error occurs in the electrical system in the current scenario, regardless of whether the error is temporary or permanent, the line will be disconnected. Therefore, unless the flow is restored by an external shutdown, the flow will not be restored. If the error is temporary, reactivate, if the error is permanent, deactivate. Therefore, the use of an automatic reclosing program will maintain the integrity of the electrical system.

### 3. System Description

It checks the voltage levels of the different phases of the current. ZMCT103C sensors are interconnected to check the currents of each phase. Now the microcontroller is the core of the system, it reads information from the sensor and processes the sensor's value. The code is integrated into the microcontroller in C language. The microcontroller monitors the voltage and current of each phase and updates them on the LCD and IOT. When a fault occurs in any voltage or current appears in any phase, the relay is immediately energized to interrupt the power supply. All voltage and current values are printed on the 20*4 LCD screen, so if an error occurs, the system will automatically disconnect the circuit. The shooting timing is displayed on the LCD.

### 4. Block Diagram
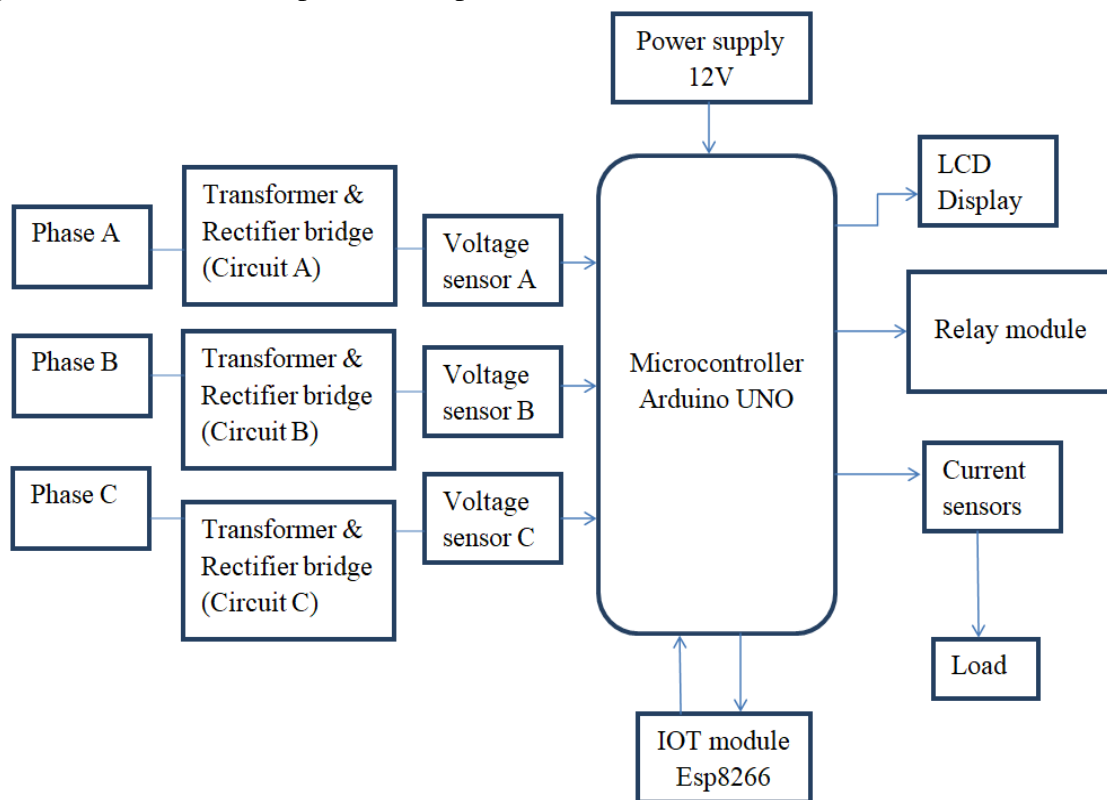


Figure 1: Block diagram of the proposed system

### 5. System Components

#### 5.1 Power supply unit

The power supply is divided into several blocks, and each block has a specific function.
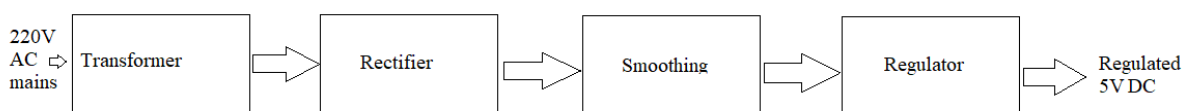


Figure 2: Block diagram of the regulated power supply

Transformer: AC stepping to low voltage AC

The rectifier: Converts AC power to DC power, but the output current is constant.

Smoothing: Smoothes the DC power from highly variable to small ripple.

Controller: Eliminates ripple by setting the DC voltage at the DC output terminal [3].

#### 5.2 Arduino UNO Microcontroller

Arduino UNO is called an open source development board. Because it allows us to use it to interact with the real world by downloading programs to the board. It is based on the ATMEL ATmega328 microcontroller. It can communicate with anything electronically controlled. The frequency is 16 MHz Quartz

oscillator with 5 V operating voltage, accessible via USB port or using external adapters, also supports external micro SD card. The board has a built-in voltage regulation function.

### 5.3 Step-down Transformer

This is a device that converts a high primary voltage to a low secondary voltage. Since the number of turns of the primary winding is greater than the number of turns of the secondary winding, the magnetic coupling of the primary winding of the transformer is also greater than that of the secondary winding. The law of electromagnetic induction, also known as "Faraday's law of electromagnetic induction", is the working principle of transformers. The transmission effect in the transformer is caused by the mutual inductance between the windings.

This term is used to design converters or reducers

$NS / NP = VS / VP$ [4]

### 5.4 ZMCT103C current sensor module

The amplifier is used for more accurate transmission sense and sufficient signal. In the range of 5 A it is the best solution for recording AC signals. It is a high-precision miniature transformer. With this module, you can easily monitor AC power currents up to 5 amperes.

### 5.5 Voltage sensor

The voltage sensoris employed to observe and calculate the voltage value within the object. Voltage sensors are wireless instruments that can be connected to any number of systems, machines or equipment [3]. Voltage sensors can be used to detect AC and DC voltages. The input of the sensor can be voltage and the output can be a switch, analog voltage signal, buzzer, current signal, etc. The sensor essentially includes a voltage divider circuit.

The voltage is divided into two resistors, a variable resistor, and a voltage reference, to form a voltage divider circuit.

### 5.6 Internet of Things [IoT]

The Internet of Things system allows us to automate, analyze and deepen system integration [3]. The Internet of Things uses existing and new technologies for network, sensor, and robotics. Without sensors, the Internet of Things loses its meaning. They serve as an important tool to transform the Internet of Things from a standard passive device network to an active system that can be integrated into the real world.

### 5.7 Relay

The most commonly used switch device in electronic products is a relay. The pull-in voltage is one of the important relay parameters. This is the voltage required to turn on the relay, which switches the contact from the ground→normally closed to the ground→normally open. Another parameter is the voltage and current of the load, which is the magnitude of the voltage or current. The common terminal of NC, NO, or relay can bear it. In our case, for DC, it is a maximum of 30 V and 10A. Therefore, the load you use must be within this range.

Relay connection is usually implemented as COM, NC, and NO: COM (common) is normally connected to NC or NO, which is the active part of the switch. NC (normally closed) when the relay coil is broken. When open, the ground reference (COM) is connected to this NO (standard fly open) When the relay coil is open, the ground (COM) is connected to this.

### 5.8 LCD

A liquid crystal screen that uses liquid crystal light modulation characteristics. It can be accessed on electronic video screens, visual screens, and flat panel displays. The input power of LCDs is lower than that of plasma displays and LEDs. Use 20 x 4 LCD module The module has four lines on the screen, one line can display twenty characters, and one screen can display eighty characters. The biggest feature of this module is that it can display 80 characters at a time. The input voltage of this module is 5V or 3V.

The LCD module adopts the parallel interface HDD44780, which is used to display monochrome text display drive. The LCD

display screen is attached to the microcontroller.

### 5.9 Diode - 1N4007

1N4007, this type of diode is a PN junction rectifier diode and these diodes can most effective by skip modern in a single direction. Therefore, it can be used to convert alternating current to direct current. 1N4007 is electrically suitable for other rectifier diodes and can be used to replace 1N400X series diodes. 1N4007 has different applications in real life, such as the use of free diodes, general rectification of power supplies, inverters, converters, etc. [3].

### 5.10 PCB (Printed circuit board)

A general-purpose printed circuit board, as the name implies, is a general form of the printed circuit board. Generally speaking, we mean that we can use this circuit board to make any circuit. This is useful for small batch production of electronic equipment and new ideas before production.

### 5.11 10K POT (Potentiometer)

A Pot is an instrument that measures unknown voltage by comparing unknown voltage with a known voltage. It can also be defined as a three-pole device that measures the potential difference by manually changing the resistance. The identified voltage is consumed by a battery or other power source. The potentiometer uses a more accurate comparison method than the deflection method. It is usually used where the measured source has no current or high accuracy. Potentiometers are used in electronic circuits to control the volume. It is used to measure the balance point or zero points that do not require energy. Since no current flows through the potentiometer, the potentiometer does not depend on the source resistance during the calibration process.
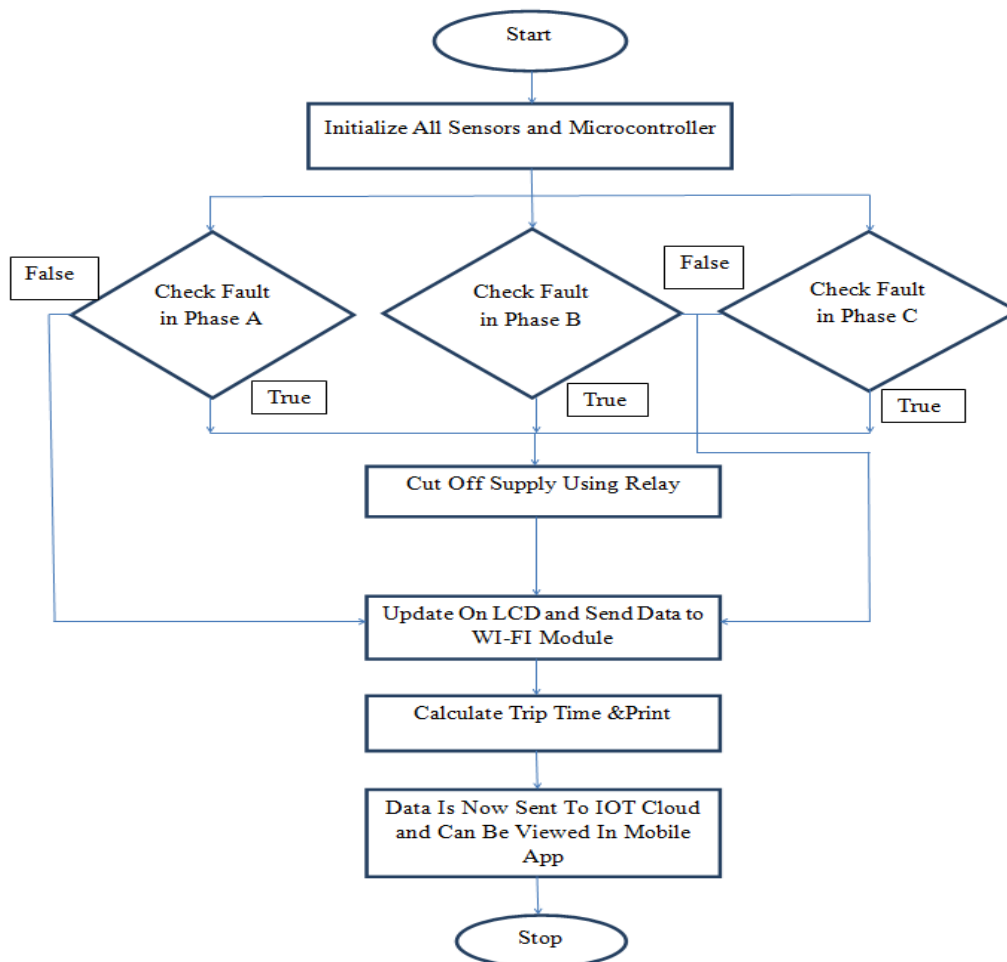
### 6   Flow Chart



Figure 3: Flow chart

## 7  The Main Features of the System

➢ Absolute reliability: With the continuous development of interconnection lines and the increase of power plant capacity, the demand for reliable switchgear becomes crucial. If the system occurs in a part of the power system, the faulty part of the remaining chain will be isolated with the help of an automatic re closer.

➢ Absolutely clear distinction: If a certain section of the power grid fails, the AR device must be able to distinguish the fault section from the power source. You need to cut off the bad parts of the system without disturbing the good parts. This guarantees uninterrupted supply.

➢ Fast operation: If part of the power grid fails, the re closer must work quickly to avoid damage to generators, transformers, and other equipment.

➢ Manual operation: The automatic reclosing device must not be operated manually. It should work automatically.

## 8  Advantages

➢ Three-phase voltage monitoring.

➢ Under voltage, overvoltage and overload status detection.

➢ Automatic cutting feed.

➢ Real-time data monitoring of the Internet of Things.

➢ No need for human resources to troubleshoot.

➢ Time calculation.

## 9  Application

➢ Can be used for home automatic control and protection.

➢ Industrial equipment and materials.

➢ Can be used for under-voltage monitoring and protection in industrial applications.

➢ Can be used for the power management system.

➢ Can be used in power plants.

## 10  Conclusion

With the help of this document, the goal of developing and creating an Arduino UNO device based on under voltage, overvoltage, and overload protection systems has been achieved. This prototype is used to complete the Arduino UNO as a controller to drive LCD and non-relays and run code on the Arduino UNO. The input voltage value and charging status are displayed on the LCD screen. The prototype has successfully passed the user test and can cutoff the load when the load fluctuates. The system provides more reliable protection for home and office equipment. The simplicity of the design means a significant reduction in equipment costs. The decisive advantage is the scalability of the system, which makes it possible to integrate any number of devices without major implementation changes.

## 11  Future Work

➢ We can interconnect many other sensors in future work, such as frequency measurement and harmonic measurement.

➢ Can be connected to the fuse system in the project to protect the circuit. The current system can be configured to work with ordinary SCADA or other communication services (such as GSM) for remote operation.

➢ Considering the saving of time and resources, the conclusion of future projects is very good.

### Acknowledgement

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# INDUSTRIAL AUTOMATION BASED ON IoT USING ZIGBEE COMMUNICATON PROTOCOL

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## ABSTRACT

*Industry 4.0 is the present-day business revolution which particularly objectives with inside the alternative of wireless communication with wi-fi communication. The essential purpose behind switching over to wi-fi communication is to enhance the mobility, scalability and decrease the deployment fee and cable damage. Industrial utility is taken into consideration for the accomplishing the above. The communication protocol proposed right here aid low loss price and is strong that is one of the essential demanding situations the economic automation has confronted because of interference with different communication gadgets and mirrored image with the steel gadgets in enterprise. Industry 4.0 objectives in combining numerous technologies along with synthetic intelligence, digital reality, robotics and Internet of Things. The essential agenda of our work is to attach gadgets to IoT on the way to enhance the accessibility of the enterprise from everywhere with inside the international which could automate all of its operation. The proposed protocol is Zigbee communication protocol alongside IoT service. To gain clever tracking and administration IoT is used which connects something on net though a distinctive protocol with sensors, gadgets, device for moving the records and for communication amongst gadgets intelligently in accomplishing clever tracking and management. Here we use numerous sensors to monitor industry and employee's health. By interfacing the sensors with Arduino manage is executed over any fault condition.*

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*Keywords: IoT technology, industrial automation, Zigbee communication, wireless sensor, Arduino.*

## 1. Introduction

If we examine wi-fi verbal exchange over wired verbal exchange, wi-fi verbal exchange gives greater advantages while in comparison to wired verbal exchange along with decrease cost, rapid deployment, with better flexibility of wireless communication. Current revolution is focused on integrating various things in order to automate various activities. Even with the growing applications of wi-fi generation, the fundamental industries are automated. The major motive for fundamental methods over wi-fi generation is the stern necessities imposed through the commercial applications [1].

The Internet of Things has become popular of its ability to connect many devices across the world. The main purpose of using this technology here is to connect the various type of sensors to a common central unit from where the data can be collected for remote monitoring. The remote monitoring can be done throughout the day 24×7 irrespective of the constraints in case of manual monitoring.

Zigbee is a high-level protocol which communicates making the use of low electricity digital radios for non-public place community the use of standard known as IEEE 802. It transfers information to long distance with the help of mesh topology. It transmits information through some gadgets to reach more remote ones. It is utilized where there is necessity of data transfer in low rate, lengthy storage lifestyles and steady networking. It has an information rate of about to 250 kilobits per sec. It works with both end users with gadget along with switches.

## 2. Problem Statement

- Monitoring the parameters of an industry is difficult if done manually and also time consuming.

- Safety of working personnel is not ensured.

- Lack of preventive control causes serious damage to machines.

- There's no proper indication of pollution in industrial environment.

### 3. Objectives

- To safeguard the working personnel and costly machines of an industry by giving pre-alerts in case of any fault occurrence

- To transfer the real time data using ZigBee and IoT technology for smart monitoring which is globally accessible through any smart phone

## 4. Proposed System

### 4.1 Block Diagrams
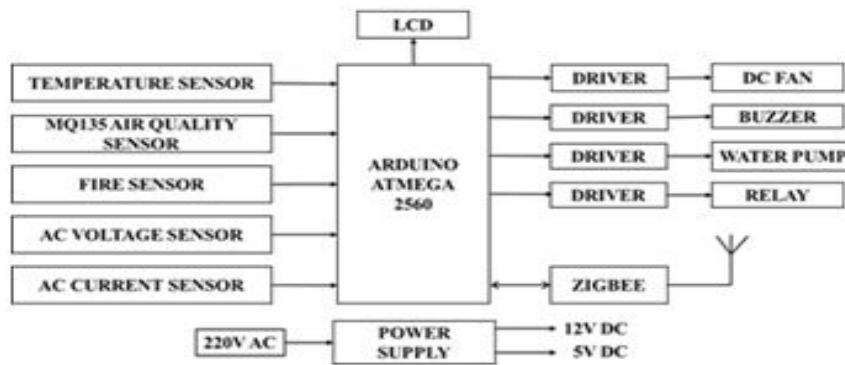


Fig.1. Factory Unit
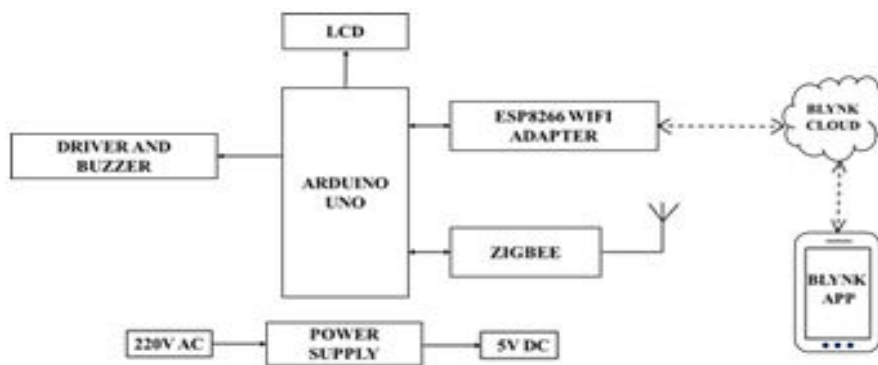


Fig.2. Central Unit

### 4.2 Working

The proposed system is composed of various sensors consisting of temperature sensor, Fire sensor and Gas Sensors (air quality), AC voltage sensor, AC current sensor. These sensors experience distinctive data consisting of temperature, Fire and air quality, AC voltage, AC current and pass it on directly to Arduino.

The temperature of industrial environment is sensed using temperature sensor and keeping in view with the data acquired the DC Fan will be operated according to the need. If the temperature raises beyond the preset limit the fan will be made on and if it decreases it will be made off.If any fire is identified in industry

due to short circuits, the water pump will be activated to sprinkle water for quenching the fire. The air fine sensor senses the fine of air and if the air is of bad quality, then a buzzer will be directly to alert the personnel within side the industry. AC Voltage sensor senses the AC mains supply to the machines and if over voltage or under voltage is detected the system trips the power supply in order to safe guard the costly machinery in the industry similarly an AC current sensor is used to trip the system if there is an overload detected.

These parameters are sent to the central unit via Zigbee protocol which can cover a distance of 1000mtrs. The central system/unit has Arduino mega, Zigbee transceiver, Wi-Fi transceiver and a buzzer. All the received parameters are

displayed on to the LCD and also sent in real time to the BLYNK Cloud using WIFI protocol. Under fault condition the buzzer is activated in central system and beep sound in the smart phone. Any smart phone with a BLYNK Application installed can be 24x7 connected to the central system remotely from anywhere in the world.

## 5. Methodology Adopted

- Using IoT condition monitoring, the machine is protected against over voltage, under voltage, fault current and the workers from harmful environmental conditions by comparing the measured data with standard values set in the sensors.

- SKETCH IDE (integrated development environment) is the programming language use dinARDUINO a processing unit which helps to monitor uncertainties.

- The hardware and software are embedded and using BLYNK app the monitore din formation is sent to a cloud which can be globally accessible on a smart phone.

## 6. Hardware of Proposed System
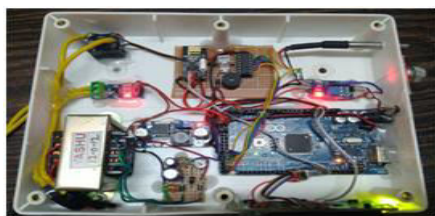


Fig.3.Hardware Connection and Display at Factory Unit



Fig.4.Hardware Connection and Display at Central Unit and Corresponding Display at Factory Unit

➢ **Hardware Description**

### 6.1 Arduino

Arduino is a computing platform which provides free access without need to buy licence for working on it. It also supports installation on any version of any operating system. There is no restriction for multiple downloads. The changes in the program can be easily made.

➢ **Arduino ATMega 2560**
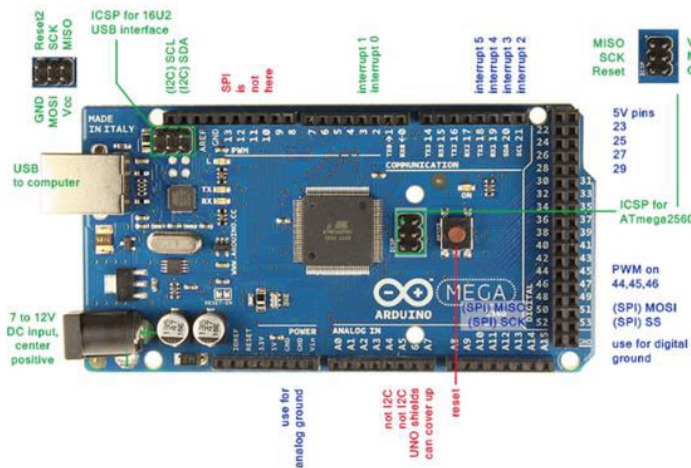


Fig.5.Arduino AT Mega 2560

The Arduino mega is one of the types of Arduino boards which has many input/output ports compared to others. Major features include 15 digital pins which can be used as both input and output, 16 analog pins, 4 UART ports, 1 two wire interface, 1 serial peripheral interface and a reset switch.

➤ **Arduino UNO**
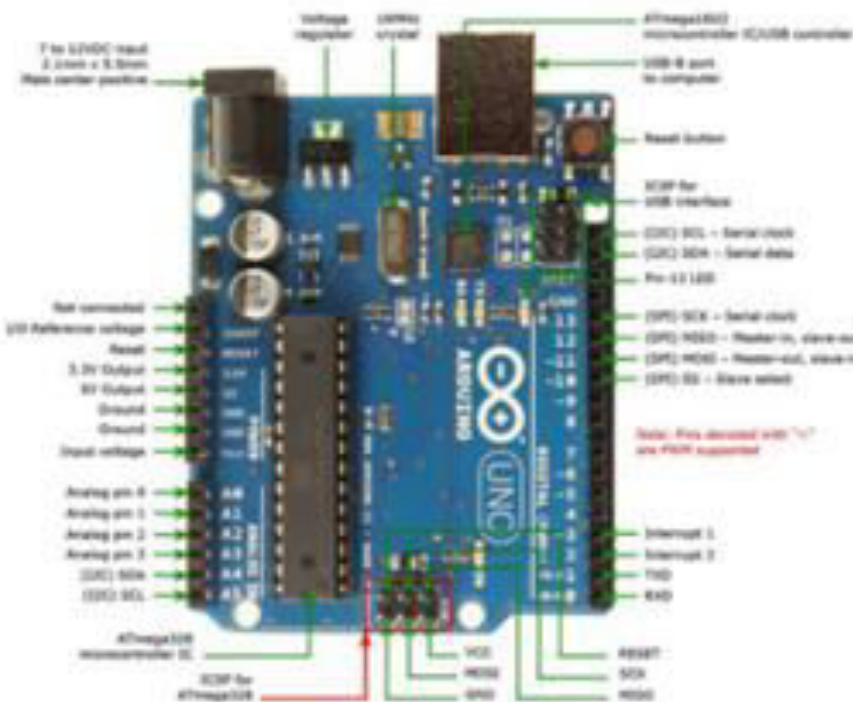


Fig.6. Arduino UNO

➤ Arduino Uno is as shown in figure above. When there is no need for sensors to be connected Arduino Uno can be used. It has 14 pins which accepts digital input or gives digital output, 6 analog pins, reset button, etc.

### 6.2 Temperature Sensor



Fig.7.Temperature Sensor

The Fig.7 indicates the temperature sensor named as DS18B20 which gives digital output of the temperature measured.  The DS18B20 transmits data through a 1 wire bus which helps in reducing cable cost. The output is normally in Celsius, if output is required in terms of Fahrenheit conversions are done in programming.

### 6.3  MQ135 Air Quality Sensor



Fig.8.MQ135 Air Quality Sensor

The MQ-135 gas sensors shown in Fig.8 are utilized in air monitoring system. It uses $SnO_2$ to measure the purity of air since this compound combines with impurity gases. This sensor has digital pin which eliminates the necessity of separate ADC.

### 6.4 Fire Sensor
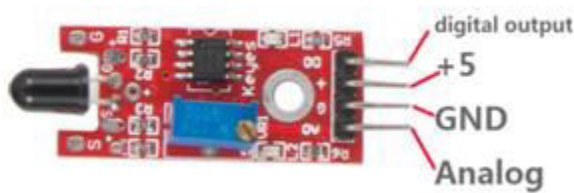


Fig.9. Fire Sensor

A fire sensor is used to detect the presence of fire or other infrared sources in the surrounding. The sensing range can be set according to type of industry in which it is installed.

### 6.5 AC Voltage Sensor

AC voltage sensor is used to measure voltage variations. Here voltage divider circuit is used where two resistors are used. One of the resistors is fixed and other is varying. Depending on the sensitivity of Arduino used value of fixed resistor is determined. The output voltage of the divider circuit gives equivalent value of input but which is reduced. The same factor by which it is reduced is used as multiplication factor in the programming to convert it to real voltage value.

### 6.6 Current Sensor (ACS712)



Fig.10. Current Sensor (ACS712)

A current sensor is a type of sensor which provides proportional voltage or current value. The ACS712 Module is as shown in Fig.11. It makes use of the well-known IC called as ACS712. It is low cost and provides accurate solutions for AC or DC input current. Hence it is widely used in industries and many more applications. The positive and negative copper strips are connected in the pins provided through which the current to be sensed are passed. When current passes through it

magnetic field is generated which is used to measure the equivalent voltage.

### 6.7 LCD



Fig.11. LCD

A Liquid Crystal Display (LCD) is a digital display device which finds wide application in current era. It is one of the broadly used low cost, low-energy tool able to display textual content and images. The 16×2 translates right into a display of 16 characters in 2 lines.

### 6.8 Relay



Fig.12. Relay

The term relay in popular refers to a device which offers an electrical connection between 2 or more factors in reaction to the utility of a control signal. Electromechanical relay or EMR is the most common and extensively used form of electric relay.

### 6.9 Buzzer



Fig.13. Buzzer

A buzzer is a device to give alert. There are many types of principles on which buzzers operate. Most widely used is which operates on piezoelectric principle. When any parameters monitored exceeds the preset value buzzer is

activated to give precautionary alert.

### 6.10 Power Supply

The power supply unit is required since Arduino works only on 5V DC. The supply from AC mains usually has fluctuations. Hence RPS is used to ensure that the output is constant even if input changes. Power supply commonly refers to the process which it undergoes to power the module used. Power deliver is divided into 4 essential blocks as shown in figure below.
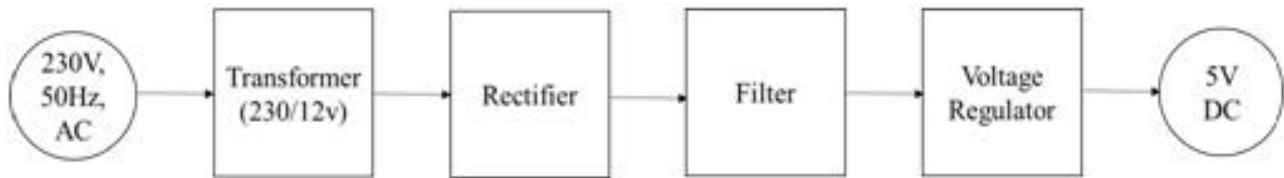


Fig.14. Block Diagram of RPS

The functions of the block are as follows:

Transformer - Steps down voltage from A Cmains to lower value.

Rectifier –Rectification can be done using bridge rectifier. It is a process of converting alternating quantity to direct quantity.

Filter–We are using capacitor filter along the output of the rectifier to get ripple free DC.

Regulator –This is final block in RPS. It provides the constant output even if the input or any other changes occur.

### 6.11 Zigbee Pair
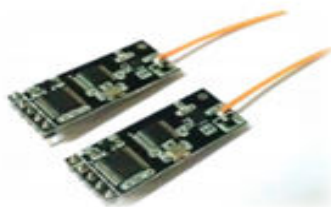


Fig.15. Zigbee Pair

The Zigbee pair has both transmitter and receiver. It can enable data transmission with 1 kilometre distance between them. Here transmitter is placed in factory unit and receiver is placed in central unit.

### 7. Software Requirement

### 7.1 Sketch IDE

The Sketch IDE is a unique application which can be runon the computer that permits us to write down codes for the Arduino. The code is typed after which it can be uploaded to the Arduino improvement board. This programming type is derived from C, C++ and Java.

### 7.2 Blynk App

Blynk app is mainly designed for the IoT. This app permit smanage of hardware from any corner in the world. It is able to show sensor data, it is able to save data, visualize it and do many different things. Blynk sever is central system which makes for all form of data transfer among the cell phone and hardware. The authentication token of the app which is got when installed in any smart phone is used in the program to connect to the Arduino module.

### 8. Result
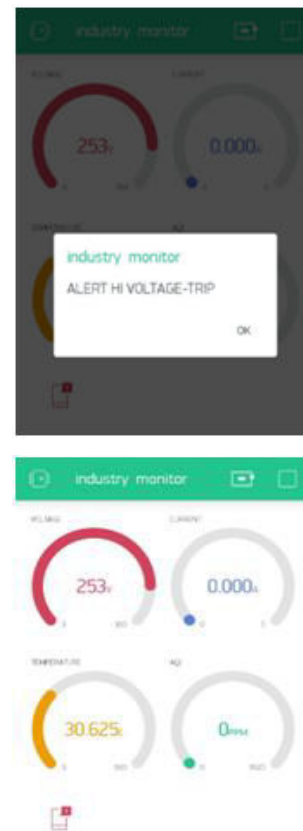


Fig.16. Real Time Display on Blynk App

## 9. Advantages

- 24×7 real-time monitoring in low cost.

- Remote monitoring and control.

- Detection of fault in machine condition and industrial environment and control is taken before any serious damage is caused.

- Eco-friendly.

- Flexible and hence can be extended in future.

- Pre-alert in case of fault.

- Safety of working personnel is ensured.

## 10. Applications

Can also be implemented in public places like

- Schools, colleges

- Hospitals

- Shopping malls

- Railways stations

- Air ports, etc.

## 11. Conclusion

In this paper, the industrial automation is achieved using Zigbee and IoT technology. The parameters like voltage and current of machines, temperature and air quality of industry atmosphere is monitoring continuously and the real-time data of the sensed parameters are sent to central unit and the same can be assessed through any smart phone installed with Blynk app 24×7.Under any fault condition control can be taken remotely hence saving the costly machines and health of working personnel.

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# REGENERATIVE BREAKING ON E-BIKE

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## ABSTRACT

*As the Basic Law of Physics states, "Energy can't be made or obliterated, it must be changed over starting with one structure then onto the next." During the passing of a colossal measure of energy in the environment as warmth. It would be pleasant if we would some way or another store that energy which is burned through and reused the following time we begin speeding up. Regenerative slowing down alludes to a framework in which a vehicle's dynamic energy is briefly put away, as total energy, during deceleration, and reused as motor energy during speed increase or running. Regenerative slowing down is a little, however vital, venture toward our possible freedom from non-renewable energy sources. These types of brakes allow the batteries to be utilised for extended periods and not necessary to interface them to an out of doors charger. These sort of brakes likewise expand the driving scope of each single electric vehicle. Regenerative de-acceleration down is much to grow the scope of electrical vehicles. By and enormous of crossover vehicles, this framework is likewise applied to breed vehicles to additional develop efficiency.*

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*Keywords: Regeneaking Breaking System (RBS), Kinetic Energy , Fuel economy*

## 1. Introduction

Global warming and the insufficiency of ancient resources become the major problems in this scenario. As a result of India' economic challenges within the automotive sector, the hybrid bike market has immense growth potential. individuals decide to move towards "clean" energies. These facts among others will profit the electric alal bicycle trade at the best of the agendas not entirely in India. Moreover, the vision of the electric motor, that supports muscular strength, has become a reality. Bicycles with an electrical booster motor belong to the innovative vehicles, that are compatible for everyday life. With in the face of constant climate debates and permanent traffic jams, electrical bicycles have the potential to unravel such issues and build a lot of energy-efficient and environmentally friendly traveling doable Accordingly, an eternal trend towards electric bicycles will be expected at the same time across India. Therefore, it's become terribly necessary to manufacture electric circuits inexpensively in order that the overall public in our country should buy them. Current electric scooters are way more expensive, and because of budget

constraints, someone of the center category cannot afford such a locomotive in their place. Besides developing technologies, theory should even be enforced to style and manufacture a product which will be sold with bigger frequency, that has terribly low cost and sensible quality [1]. so as to implement all of the on top of ideas, we tend to planned to create the planning and therefore the product in such the way that it can be competitive with the prevailing "e-bikes" within the market.

The high use of mobile vehicles has led to an increase in the problems associated with air quality and petroleum use. Human sensitivity to biological and environmental problems encourages research into alternative solutions to the automotive field, such as multi-fueling, hybridization and electrification. At a similar time, particularly with reference to urban areas, the new standards obligatory vital changes to mobility. during this context, the automotive as an electrical high-powered bicycle will be thought-about as a promising different means that of private transportation and consignment delivery, especially for tiny and medium distances: the utility bike is capable of moving at a mean speed adequate

that typical of town traffic however needs energy for its movement terribly on the brink of the energy required to displace folks The transferees. Electrically powered bikes are usually powered by a chargeable battery, and their driving performance is influenced by battery capacity, engine power, road types, operative weight, handling and, in particular, by auxiliary power management [2]. A electrical bikes will be classified into two categories:

a) The first type is represented with the aid of using a natural electric powered bicycle, which integrates an electric powered motor into the motorcycle body or wheels, and is powered with the aid of using engine strength most effectively with throttle handlebars.

b) The second type will be a highly-powered bicycle or a human-powered hybrid bike that supports the rider with power during the rider.

Thus, auxiliary torque management is of particular importance in order to reach the desired performance in terms of driving ability and comfort.

## 2. Proposed System

### 4.1 Block Diagram
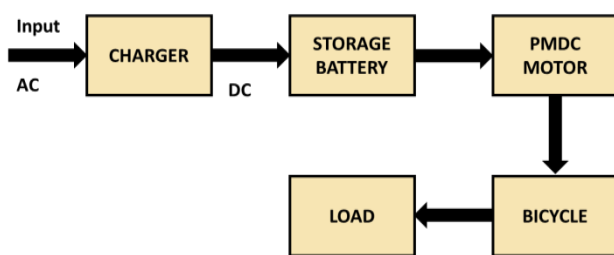


Fig.1. Block Diagram for Electric Bike

### 4.2 Working

The basic idea is to fix a motor to the cycle for its movement. The battery powered motor which will be turned on and off throughout troublesome parcel and a pedal to recharge the battery whereas occupation a flat terrain space the thought came to our mind as totally different stages of project planning, initial we tend to wished to implement a straightforward moving system, therefore dropping the cycle as a system came to our mind, and also the second stage was adding a essentially helpful

element that might be useful within the future and for the final public, falling into the present trend was the hybrid system therefore it' over we tend to commanded to set up the motor unit assembly in a very cycle motor. there have been many problems that came up whereas creating such a system major, among them the facility of the engine that will be used, since no such previous systems had been built, we couldn't predict what reasonably engine we should always choose. The second issue is that the weight factor, that is the further weight on the system, which might cause discomfort to the rider while they're pedaling normally. Third, is the type of battery to be used, we should choose. A battery with a extended life, economically viable, and has fewer maintenance problems [1]. The fourth, downside was that the battery self-recharging with the generator unit that was also not viable with the easy cranking motion of the cycle, we tend to had to use a mechanism that might are available handy here which was victimisation the regulator rotation technique. In an electrical vehicle, a regenerative cracking system is employed to convert the vehicle' mechanical energy into energy hold on in a very battery. Later this energy is accustomed drive an electric vehicle with regenerative fracture as well as the motor to rotate the wheels. These engines is inverted and act generator to slow the automotive down. With in the process, the electrical motor powers the battery.

## 3. Methodoly Adopted

- The overall objective of this project is to design, develop and build an operational motorcycle, which uses regenerative braking to regenerate energy.

- This goal will be achieved through the integration of electrical and mechanical knowledge.

### 3.1 Electrical Method

- In an electric vehicle, RBS is used to change the kinetic energy of the vehicle into chemical energy stored inside the battery. Later, it can be used to drive an electric vehicle with regenerative braking including motors to rotate the wheels. Battery power

can be used to rotate the motor. These engines can be inverted and act as a generator to slow the car down. In this procedure, the electric motor boosts the battery.

• The  The Electric vehicles (EVs) primarily operates from the charge that is stored in a primary battery, however use of regenerative braking is to assist charge in the battery, additionally to the regenerative system. all electrified vehicles have typical braking systems as do regular vehicles. These use metal discs, referred to as rotors, that are situated behind the wheels which rotate with them. after you deep press the brake pedal, the pressure of the hydraulic fluid presses the metal constraint tightly against the rotors, and also ensuing the friction, slow down the car. the thought behind regenerative braking is to capture and use that wasted kinetic energy, and convert it into electricity.

### 4. Hardware of Proposed System

Fig.2. View of an electric bike

#### ➢ Hardware Description

#### 6.1 PMDC Motor

The The motor 250W PMDC is hooked up to the regulator victimization the sprocket, then the shaft from the flywheel is attached to the sprocket on the opposite aspect with the housing. The drive from this sprocket is connected to the multi-crank free wheel. The motor of this shaft is directly connected to the rear wheel sprocket that facilitates its movement.

Fig.3.View of PMDC motor mounted to the rear wheel of a bicycle

#### ➢ SMF Battery
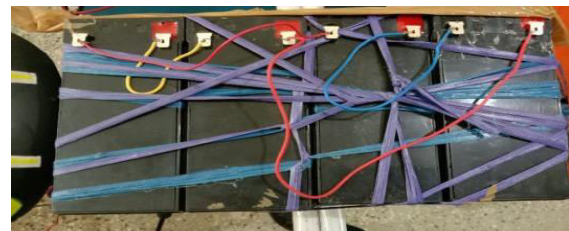
Fig.4. SMF battery arrangement

The SMF batteries are placed on the rear rack of the bike. Four 12V batteries SMF are used to power the motor, two batteries connected in series plus these two batteries connected in series are connected in parallel combination to form a complete battery that produces 24V.

#### 6.12 Throttle

Fig.5. Throttle

● The throttle is mounted on the bike handlebar and the gear shift can be adjusted. The engine uses power from the battery when the throttle is on. The power used depends on how well the throttle is twisted.

● Throttle situating is equivalent to in any case a bicycle or bike works. when the choke is locked in, the engine gives power and pushes you and furthermore the bicycle forward. A Throttle licenses you to pedal or unwind and delight in a "free" ride! ☐

- The E-bike is provided with each throttle and pedal assist modes. The e-bike will be started in pedal assist mode then get an additional boosted by turning the throttle. E-bikes have a throttle, which can call forth visions of a motorcycle' twisted grip, however in point of fact it is sometimes simply anti low electrical button and might even be tuned sort of a volume dial between low and full power .

- Depressing the accelerator pedal works the same as depressing the accelerator pedal in your car - no further action is required to accelerate or keep moving forward.

- The light is placed at the front of the bike between the handle bars and the bike lock placed on the crossbar.

### 6.3 Controller



Fig.6:24V, 250W Controller

- The motor is connected to the control unit which can be called the brain of the electric bike because it controls the speed of the motor. The controller used is 24V and 250W as shown in the figure.

- The regulator comprises of different wires, the classifications of wires and the wire terminal (connector) of the e-bicycle regulator are regularly unique in a few regulator plan. you might have the electrical bicycle control schematic to affirm the appropriate wiring associations. Most e-bicycle regulators have these wires, engine, battery, brake, choke/gas pedal or PAS pedal help framework (a few regulators have such wires, some have one in everything about). extra wires are found in cutting edge control units, like speedometer, rectifier light, etc.

### 5. Experimental Analysis
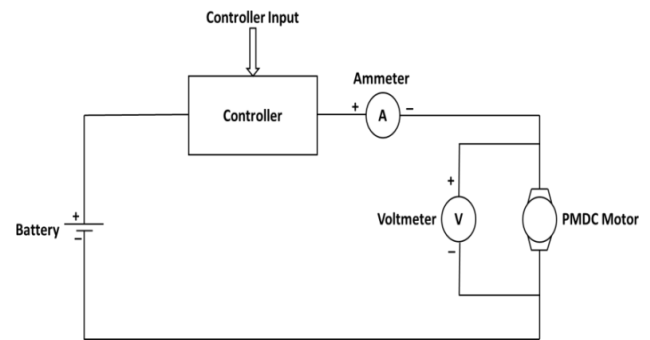


Fig.7: Circuit diagram of electric powered bicycle

- The generalized schematic diagram of the electric bike is shown below. The entire control unit describes the engine control unit connected to the throttle and other components. To determine the values of voltage and current used to rotate the wheel, an ammeter and voltmeter should be used. We used two multimeters to determine the voltage and current drawn.

### 5.1 Procedure

1. The connections are made as shown in Fig. 5.1 where the multiple meters are connected in series with the control circuit and parallel to the PMDC motor accordingly. The knob of the multimeter is kept at point DC for both voltage (200V) and current (20A)



Fig.8:Multi Meter

2. A radium sticker is attached to the wheel rim to calculate the number. of wheel rotation. The tachometer is used to measure the rotation of the wheel. The number of times the radium label passes/cuts through the tachometer is number of the cycles rotate the wheel.
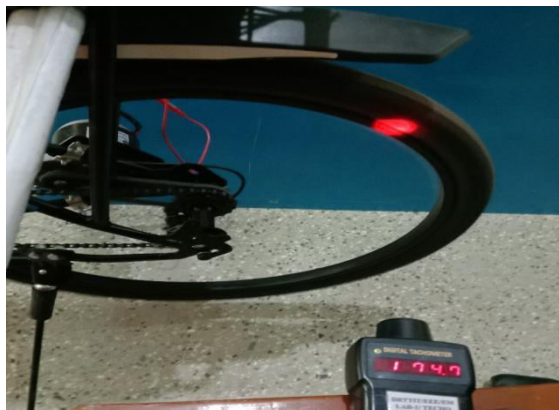
Fig.9: Tachometer measuring the rotation of the wheel

3. The throttle is twisted to allow the motor to rotate and the amount of current drawn for a given voltage is noted down along with the rotation of the wheel in round per minute. The values are written down until the maximum voltage is reached.

## 6. Result

| Vload, Volts | I, Amps | Power, Watts | RPM | Speed, km/hr |
|---|---|---|---|---|
| 27.1 | 7.02 | 36.585 | 216 | 26.4654 |
| 22.1 | 6.76 | 28.73 | 172 | 21.0743 |
| 18.9 | 6.60 | 29.484 | 146 | 17.8886 |
| 15.1 | 6.45 | 19.177 | 114 | 13.9678 |
| 13.3 | 5.51 | 16.492 | 100 | 12.25 |

Fig.10: SMF Battery Reading

## 7. Advantages

- Pollution And Noise Free
- Saving Of Fuel
- Less Maintenance
- More Durable
- It Extends The Battery Charge

## 8. Applications

Can be implemented in places like

- Electric Vehicles
- DC Motors
- Induction Motors
- Electric Traction

## 9. Conclusion

In this paper, "The Regenerative Breaking on E-Bike" was Designed . The parameters like voltage, current and Power of E-Bike was tabulated and a graph of current verses voltage was drawn. The energy wasted in the form of heat during the mechanical breaking is over taken by the RBS.

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# FOOTSTEP POWER GENERATION USING PIEZOELECTRIC TRANSDUCER

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## ABSTRACT

*Today electric power is one of the basic needs in the human life, in ours day to day life which we are going through significantly demands the electric power for various purposes. Demand for electricity is increasing with the increase in the population of the country. This project which we have undertaken mainly deals with the generation of electricity without affecting and polluting the environment. The project here focuses on the energy which is obtained from the normal activities done by the people in day today lives like running, walking etc. and it is converted into electricity using piezoelectric sensors. This non-conventional energy system converts the physical energy from the foot steps into electric energy. The system can be implement edandused in public places like pavements, educational institutions, bus and railway stations etc., the piezo electric transducer deforms when the pressure is applied and this physical movement is convert dinto electrical energy and this is the main principle of this system.*

*The electric power generation system which we have proposed is applied with the array of piezo tiles are placed such that the electricity generation is by the human's physical activity on the floor and thus harvesting energy from the humans relates with the driven kinetic energy of the humans.*

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*Keywords: Piezoelectric sensors, Electricity, Ripple Neutralizer, LCD, Battery, Microcontroller, footstep power generation.*

## 1. Introduction

Electricity is the lifeline of the mankind. The gap between the energy supply and demand has led to the discovery of alternate source of energy. The power generation which we have proposed is a source of renewable energy and an array of the piezo electric tiles are placed and the electricity is generated by walking or running on these piezo tiles and hence harvesting the energy from the people where the vibration is obtained from the human footsteps. By engineering the floor with the piezo electric technology, the sensors will capture the pressure and this pressure is converted into electrical energy. It is also governed by certain factors like maximum output voltage, and the output voltage can be monitored by the use of the microcontroller and the battery is used to store the electrical energy and by using an inverter we can     use it for many different AC applications which is an effective   model and easy to implement.

This technology which we are actually adopted uses the piezoelectric effect, which has the ability to develop power from the pressure and the force applies on the piezoelectric system. This effect actually describes that responding to the force applied it generates the electric potential. Harvesting energy instead of getting waste dis the best and right solution we can choose to meet the demand for the energy crisis that we are going through in the aspect of the population and demand.

Power being a very critical part in our country it is featured as a set that would be connected with group of charges. There can be two types of power which are very specific  static power, which is held steady and the dynamic power.

Thus the transferred energy which is also known as kinetic energy is acted. The acted kinetic energy on the floor is then converted into electrical energy which is a usable form and also thus the produced energy is used for the various purposes for the various loads which can be act edu ponit. While the systems can be either connected to the AC loads by inverting or directly to the DC loads. The systems which is renewable and the energy is obtained with the sources cannot be ignored if it is in the smaller amount. At each and every

point energy is considerable and with that various technologies is adopted and can be considered for the various purposes a part from the appliances which is large or small. Though many developing countries and which are upcoming with the industries will require large amounts of power and also there will be no proper continuous supply of electricity in many cities and villages. Thus the people at cities may use batteries or other alternative sources like Diesel generators to run electricity.

### 1.1 Purpose of the system

*   The main purpose of this system is to over come the energy gap through put the world though it is not fulfilled the over excessive for the electricity

*   This system aims over the people safety and it may not create the problem for the people, however the system is projected underneath.

*   When the movement of the people through their footstep losses some amount of energy to the floor which is in the form of kinetic, this energy can be used for the electricity instead of getting wasted.

*   However the components used here are of very low cost and pollution free for cent percent.

## 2. Proposed System

There are number of systems which are adopted among them we use piezoelectric tile method. Developed countries like Japan has already started the demonstration on the piezo electricity for the generation of electric power. They started implementing on the stairs of the bus. Therefore when a passenger gets into the bus or step up on to the bus, they trigger smaller vibrations which is stored in the form of energy. The flooring tiles which is made of rubber and all the vibrations which the passengers are making can be absorbed on to the tile. This vibrations which generates electricity on the tiles while the person is running or walking on this surface. Under the tiles piezoelectric materials will be placed. When there will be movement of the people like running or walking on the stairs the piezo material gets activated thus by activating the material the voltage is developed under the property of the material sheet which is used on the piezoelectric sensors. Thus the produces voltage is controlled and made linear with the help of charge controllers and these are stored in the batteries in the form of DC and this can be used for the various purposes under DC loads or this can be inverted again and consequently used for the AC loads as well.

## 2. Experimental Setup



Fig 3: Experimental setup of the module

### 3. Methodolyadopted

- Sketch IDE (Integrated Development Environment) 1.8.1or higher version Programming Arduino is used as Software for Programming.
- Prepare a Mat consisting the area 10x10mm² in which piezoelectric sensors are connected in series and parallel to obtain the deserved voltage of around6V.

- On squeezing on the piezo material sheet there quired voltage is obtained and these voltage with the help of hardware is brought to the battery and kept stored and again it gets connected to the appliances based on the voltage available
- Hardware and software are embedded.

### 4. Block Diagram
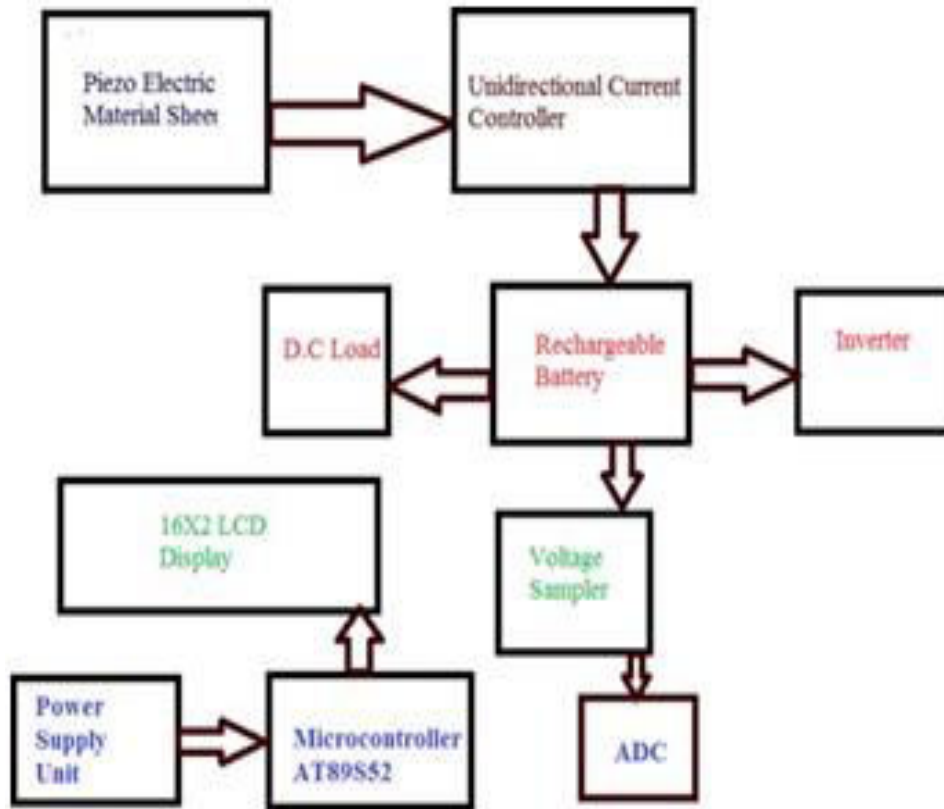


Fig 2: Block diagram

### 5. Component Description

### 6.1 Piezo electric transducer

This piezoelectric sensor which we use in our module is a device which converts the force from the human footsteps into electrical energy. Sensors are here connected in series for desired voltage and again in parallel to get desired current and overall desired power. For e.g., if 10 piezo electric material is connected in series arrangement then we can generate a power of 9v and 100mA current. There are different type of piezo material is available in the market considerably two. Lead zirconated titante and PVDF. The voltage of the sensors can be controlled by the use of filters and charge controllers. Fig below shows the basic piezoelectric sensors.



Fig 4: Piezoelectric sensor.

### 5.1 At89s52microcontroller

The Microcontroller used in our project is of AT89S52 and the desired characteristics of these microcontroller includes 8Kbytesofflashmemory,10000 read/write cycles,4.5 to5.5 operating voltage , its frequency can vary from 0HZ to 33MHZ,

there is 3 level program memory lock, internal RAM of 256X8, 32 programmable I/O lines, 3 16 bit timers,8sources,duplexUARTserialchannel,Dual data pointer., these features make the microcontroller unique to use, which is most common among all.

Diode is also called unidirectional current controller and is used to flow the voltage or current parameters in only one direction.., it is also used in rectifier circuit and fig below shows the diode.

### 6.4 Lead Acid Battery

The batteries which use lead as a working medium are called as Lead acid storage batteries. We have chosen to use these batteries in our systems because of its low cost and its easy availability on earth. These batteries are available in wet and dry sealed batteries. Fig., below shows the Lead acid batteries, which has very high reliability because of its extraordinary capacity to withstand heavy charge and discharge cycles and also the electric shock.. These batteries will have strong charge acceptability and very low discharge capability and large electrolytic volume. These batteries can be used to testing using computer aided engineering design. These batteries find a wide range of applications in the uninterrupted power supplies and the inverting systems.

### 6.5 LCD





Figure 5: Lead Acid Battery

### 6.5 Diode

Diode is also called unidirectional current controller and is used to flow the voltage or current parameters in only one direction.., it is also used in rectifier circuit and fig below shows the diode.
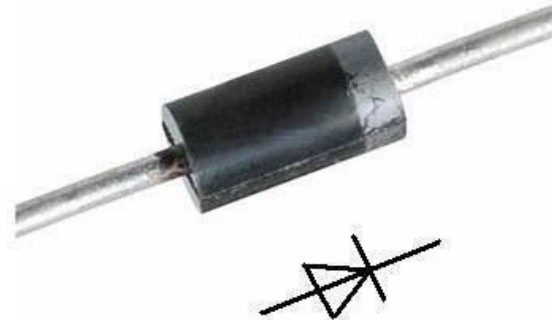


Figure 6: Diode

LCD stands for Liquid Crystal Display which are very cheaply available for the purpose of displaying the values of the voltage, current, and all electrical parameters and also has the capacity to display data in form of text and pictures. LCDs are extremely used in the systems which are embedded, because since such systems will not have the monitors to display video data as that of the conventional monitors of the desktop. It can be found in wide variety range of devices like wrist watches, telegram, fax, copy, machines and the digital calculators. LCD Initialization is shown in the above figure.

### 6.6 Analog to Digital Converter

This component which is used in this system converts analog to digital signals which give up to microcontroller to display the output. This alters an output to give up to the digital format and thus displaying it on the screen. it also relates the magnitude of voltage and current and also helps to modify the voltage and current. converters and the representation is seen below in the fig considering ADC
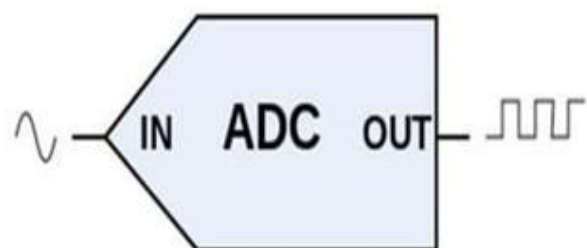


Figure 7: Analog to Digital converter.

### 6.7 Inverters

In our project we use inverters to convert direct current into alternating current. These inverters can be at any voltage and at any required frequency. Solid state inverters are used in many appliances because they have no moving loads and this is the reason piezoelectric system also uses this kind of solid-state inverters. Basic inverter is shown in the figure below.



Fig 7: Inverter module

### 6.8 Capacitive Filters

Capacitive filters are used in this system to remove the ripples from the Ac components to sensors. These also store the minute charges and functions the property as charging and discharging phenomenon. The basic working diagram of the capacitive filter is shown in the figure below.
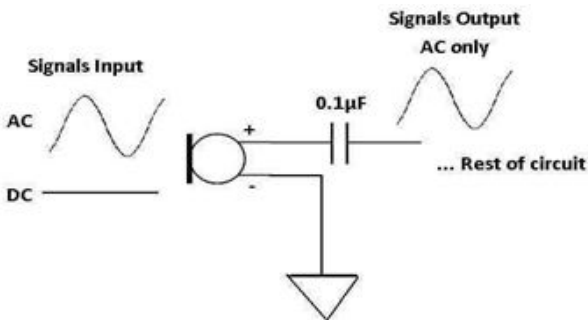


Fig 8: Capacitor filter

### 6.9 Voltage Sampler

Fig below shows the voltage sampler and it is also known as hold circuit, which is very essential part and building block of many analog circuits. The voltage samplers is very important in the digital circuits for their conversion and the analog circuits which is used to sample the data and it holds the analog data for sometime for a period of length and it then starts to process the data.
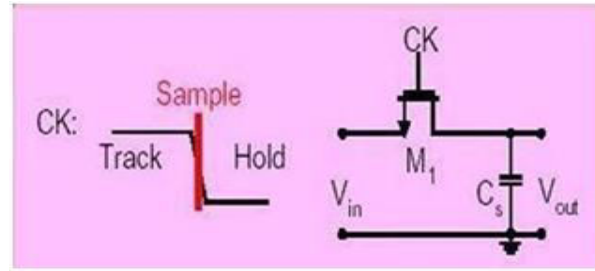


Fig 9 : Voltage Sampler

### 6 Advantages

- These system suggests for just walking and running on the floor tiles which is the man's daily activity.

- In our system there is not requirement of Fuel.

- There is conventional system

- Battery can also be used to store the electricity generated.

### 7 Disadvantages

- This system is not suitable for all the places.

- There will be much mechanical parts in volved

- There should be frequent concern towards the batteries

- Initial cost may be high.

### 8 Applications

- This can be implemented on railway stations

- Bus stations

- Can be effectively used in vehicle parking systems

- Hydraulic lift systems

- Lighting the lamps in streets

- Airports can use this system to setup their own power system.

### 9 Results and Discussions

The project prototype describes about the piezoelectric system in which the electricity comes out of the footsteps by converting the kinetic energy. The voltage that is carried out by the piezo electric sheet can be displayed on the LCD screen and there will be loads connected to either AC or DC systems can be

based on the application and the amount of voltage it is carried. Though the system cost is very low this can be effectively used with preferred locations.

## 10 Conclusion

In this paper we have calculated the various methodologies for footstep power generation using piezoelectric sensors. The experimental setup is discussed with all the required components and the results are obtained based on the output voltages which is obtained. Also we can have the relation showing between the voltage and current and also the advantages of these system is the electricity is generated simply by walking and there is no requirement of the fuel.

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# "STUDIES ON THE EFFECTS OF PROCESS PARAMETERS ON THE HYBRID MATERIAL JOINT PRODUCED BY FRICTION STIR WELDING PROCESS"

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## ABSTRACT

*FSW (friction stir welding) is a new technology which was initially used for joining non-ferrous materials. Later on the process was also used to join many ferrous materials. Recently the process has been adopted to join many thermoplastic materials especially in aerosace and automotive industries as it has optimum strength and low density which inturn reduces the weight of the product. Friction stir welding of thermoplastic materials shown an increase in the strength of the joint and also the joint efficiency. In this paper I am exploring the important effects of process parametrs on the hybrid joint processed by friction stir welding technique. Hybrid material production by friction stir welding process improves the joint strength and joint efficiency. The important process parameters for improving the joint strength are rotational speed, tool transverse speed and the plunge depth.*

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*Keywords: Friction stir welding, hybrid joint, process parameters, polymer joining, thermoplastics.*

## Introduction

The solid-state joining process was inveneted in the year 1991 in UK by Wayne Thomas. Friction stir welding (FSW) [1, 2].FSW process uses a tool which is made of high speed steel material will not be consumed in the process and has two major parts called pin and shoulder. The pin is available in different profiles such as cylinder, taper, threaded, triangular, and hexagonal.

During FSW operation the rotating pin was slowly inserted into the joint line, shoulder touching the work piece surface and traverses along the joint line. Due to friction the work pice materials softens which inturn results in formation of the joint. FSW technique was initially used for joining aluminium and magnesium alloys which are non ferrous materails [3-15]. Recently the process also has been employed to join polymeric materials (thermoplastics) [16-21]. FSW process is widely used in transportation such as automotive, aerospace, railway, ship building etc.



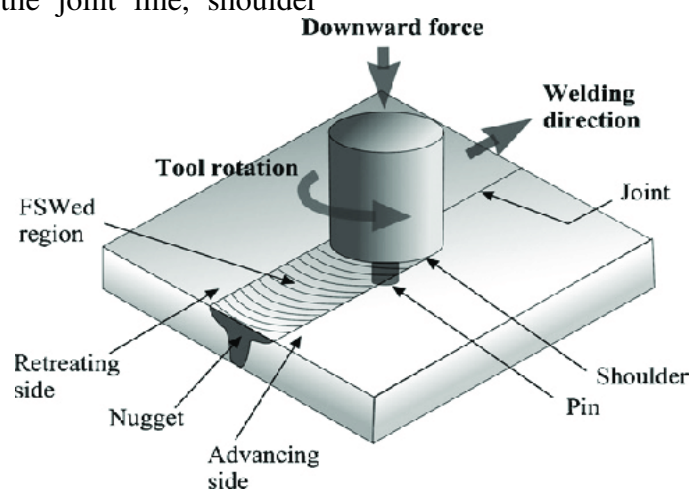Figure 1: A Schematic represenation of a FSW

Polymeric materials are mainly used in industries such as automotive, aerospace, electronic etc [22] due to the reason of having light weight, high strength, flexibility, resistant to chemicals and most importantly available at low cost. Polymer joining by fusion welding process is impossible as it induces lot of problems. On the other hand solid state joining

processes have many advantages such as excellent mechanical properties, no filler material, requires less energy and negligible heat-affected zone. Friction welding's are of four types and in this paper only solid state joining process is reviewed as the process is

suitable for joining polymeric materials. The solid state joining process is generally used in the case of joining metallic materials where the original material properties needs to be preserved to a maximum possible extent.



Figure 2: Tool Profiles

The two important classes of organic polymers are thermoplastics and thermosets. It is possible to weld only thermoplastics because it has the potential to soften when heat is supplied and becomes hard when cooled. Examples of thermoplastic materials include Polyethylene (PE), Polypropylene (PP),Polycarbonate (PC), polyvinyl chloride (PVC) etc.



Figure 2: Types of polymers

Dissimilar thermoplastics materials such as PP & PE can be friction stir welded with pin rotational speed of 2500 revolutions per minute and a welding speed of 100 mm/min [23]. Similarly PMMA & ABS can be easily processed by solid state joining technique [24].



Figure 2: FSW machine

**Hybrid joint**

A hybrid joint is produced by adding an organic fiber in the joint line which is formed by placing two thermoplastics side by side (high density polyethylene and polypropylene) on the table of the machine by friction stir welding equipment. Hybridization helps in improving the joint properties such as tensile strength and bend strength. Hybrid material produced by friction stir welding equipment had properties superior to that of base material. Also the mechanical properties of the hybrid joint obtained are mainly depends on the process parameters selected. One has to select optimum process parameters so as to produce strong joint.

In the process of joining any organic or inorganic material will be including at the joint line to make it as hybrid by using friction stir welding equipment. The process gives stronger joint i.e., strength equals or greater than the base metal strength without making hybrid. But an attempt is made that producing hybrid materials provides higher joint strength or the joint strength remains same and according to that the possible engineering applications will be studied.

## 2. Consequences of important factors on FSW of polymers

The important process parameters in the joining process are pin circular movement, transverse speed and tool penetration into the work piece [25]. Each parameter is important in producing strong joint and increasing the

joint efficiency. Among the all three factors only circular movement of the pin had a major consequence on the tensile strength and bend strength of the hybrid joint.

## 2.1. Rotational speed

A low rotational speeds result in insufficient heat is generated and thus the polymers do not soften enough to mix and make a strong weld. A high rotational speed causes excessive softening of polymers which in turn cause squeezing instead of mixing. Due to this one cannot produce a strong weld. A moderate rotational speed is very important in generating enough heat which does not cause excessive softening of polymers which results in strong joint.

### 2.1.1. Transverse speed

At higher transverse or travel speed, the rotating tool in the process does not join the polymeric materials. Instead the tool removes the side material from the polymer. This causes the tensile strength to decrease. Moderate travel speed is very important to increase the tensile strength and joint efficiency.

### 2.1.2. Tool penetration

The penetration of lower part of the tool into the work piece which are to be joined is also an important factor for producing good joint. Plunge depth gives a least contribution in friction stir welding of polymers. Optimum plunge depth in the range of 0.5 mm to 1mm is good in the joining process.

## 3. Major parameters contribution rate in the FSW
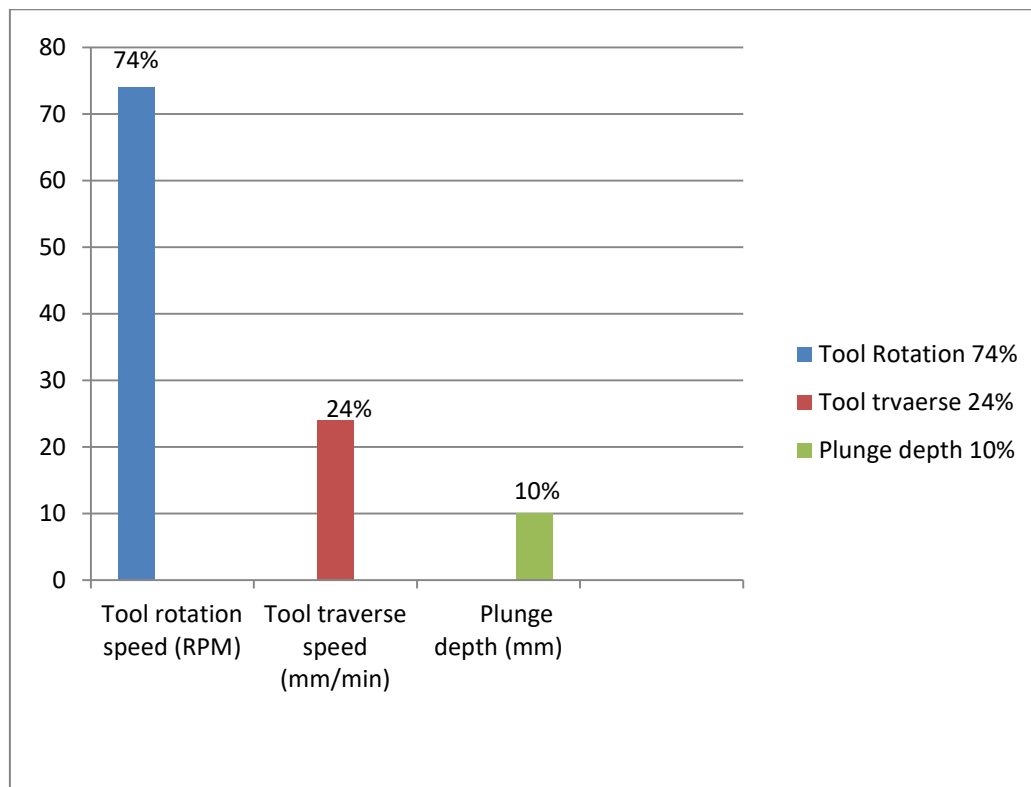


Figure 3: Welding parameters contribution rate

## Conclusion

Even though the process parameters in FSW are very few but has significant effects on the joint strength and joint efficiency. Moderation is the key i.e. moderate rotational speed and travel speed results in high quality joint, increases the weld strength and other mechanical properties. If optimum welding parameters were not selected than produces a weak joints. Among all the different parameters, rotational speed is the only parameter which gives strong weld. So it is very important to optimize the tool rotational speed before joining the polymers.

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# NETWORK INTRUSION DETECTION – EXPLORING CYBER SECURITY ATTACKS

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## ABSTRACT

*This novel work is to reconcile the complication and serious threat possessed by network intrusion. The term network intrusion or anomaly designates the serious threat created by hackers, high jackers, spoofers, etc., which means the intruders who try to access our system with counterfeit intention. The complexion and threat are faced by all the Networks and to consolidate this complication; I have used an anomaly detection system. Due to the increasing development of network technology recently, there are various cyber-attacks that posed huge threats to various fields all over the globe.  There are ample number of researches are in progress about cyber-security to develop a safe network environment for the society. The focus of this concept is to build detection models for classifying the attack data. Hence, we applied the cyber security attack data set, which combines both normal and modern low-level attacks because we would like to create an experimental scenario close to the real world. The KNN model is used for categorizing the multi-class in the project, and the average accuracy for testing is around for ten categories classification. The dataset is preprocessed, cleansed and visualized using heat maps and graphs. However, the prime objective of this research is to evaluate the frequent attack category and the attacked IP address using the KNN classification algorithm.*

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## 1. Introduction

A network intrusion refers to any unauthorized activity on a digital network. Network intrusions often involve stealing valuable network resources and almost always jeopardize the security of networks and/or their data. In order to proactively detect and respond to network intrusions, organizations and their cyber security teams need to have a thorough understanding of how network intrusions work and implement network intrusion, detection, and response systems that are designed with attack techniques and cover-up methods in mind. Detection

The IPS has a number of detection methods for finding exploits, but signature-based detection and statistical anomaly-based detection are the two dominant mechanisms.

Signature-based detection is based on a dictionary of uniquely identifiable patterns (or signatures) in the code of each exploit. As an exploit is discovered, its signature is recorded and stored in a continuously growing dictionary of signatures. Signature detection for IPS breaks down into two types:

i. Exploit-facing signatures identify individual exploits by triggering the unique patterns of a particular exploit attempt. The IPS can identify specific exploits by finding a match with an exploit-facing signature in the traffic stream.

ii. Vulnerability-facing signatures are broader signatures that target the underlying vulnerability in the system that is being targeted. These signatures allow networks to be protected from variants of an exploit that may not have been directly observed

in the wild but also raise the risk of false positives.

Statistical anomaly detection takes samples of network traffic at random and compares them to a pre-calculated baseline performance level. When the sample of network traffic activity is outside the parameters of baseline performance, the IPS takes action to handle the situation.

## 2. Proposed Method

In proposed system, new approach, based on the k-Nearest Neighbor (KNN) classifier, is used to classify program behavior as normal or intrusive. Program behavior, in turn, is represented by frequencies of system calls. Each system call is treated as a word and the collection of system calls over each program execution as a document. The attacks are then classified using KNN classifier, a popular method in text categorization. This method seems to offer some computational advantages over those that seek to characterize program behavior with short sequences of system calls and generate individual program profiles. Preliminary experiments with the dataset audit show that the KNN classifier can effectively detect intrusive attacks and achieve a low false positive rate. In data visualization techniques, by using heat map sand graphs clearly see the most frequently attacked IP address.

## 3. Attack Categories

Cyber Security dataset which contains the events with different durations and patterns. Dataset has nine types of attacks, namely, Fuzzers, Analysis, Backdoors, DoS, Exploits, Generic, Reconnaissance, Shell code and Worms.

In this way, the following attributes are available in the data:

Time: start and end date of the attack in timestamp format.

Attack category: type of registered cyber security attack.

Attack subcategory: subcategory of the type of cyber security attack registered

Protocol: protocol used for the attack.

Source IP: IPv4 address where the attack came from.

Source Port: logical port where the attack came from.

Destination IP: destination IPv4 address.

Destination Port: logical destination port.

Attack Name: technical name for the cyber security attack.

Attack Reference: Common Vulnerabilities and Exposures (CVE) reference of the type of cyber security attack.

### 3.1 Frequent Attacks
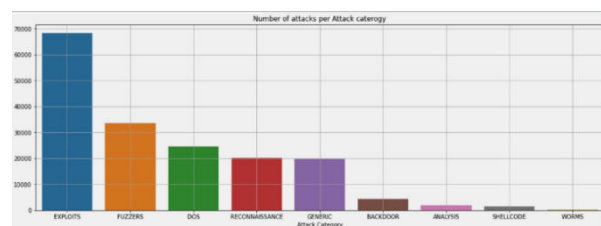


Fig1.Types of attacks

## 4. Classification of the Attacks

The aim of the work is to build the detection models for classifying the attack data. Hence, the applied cyber attack network data set which combines both normal and modern low-level attacks because we would like to create the experimental scenario close to the real world. Here, in the project, the KNN model is used for categorizing the multi-class in the project, and the averaged accuracy for testing is around 23% for ten categories classification.

### 4.1    KNN Classification Algorithm

K-Nearest neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm. K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems'-NN is a non-parametric algorithm, which means it does not make any assumption on underlying data. It is also called a lazy learner algorithm because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset. KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data. The advantages of KNN algorithm are simple to implement, it is robust to the noisy training data. It can be more effective if the training data is large.

## 5.    Results and Discussions

Therefore, anomalies in network may cease or terminate their work which may lead to a serious disaster. In future utilization of machine learning in networking will be very essential by reducing the manpower as everything is detected and cured automatically.
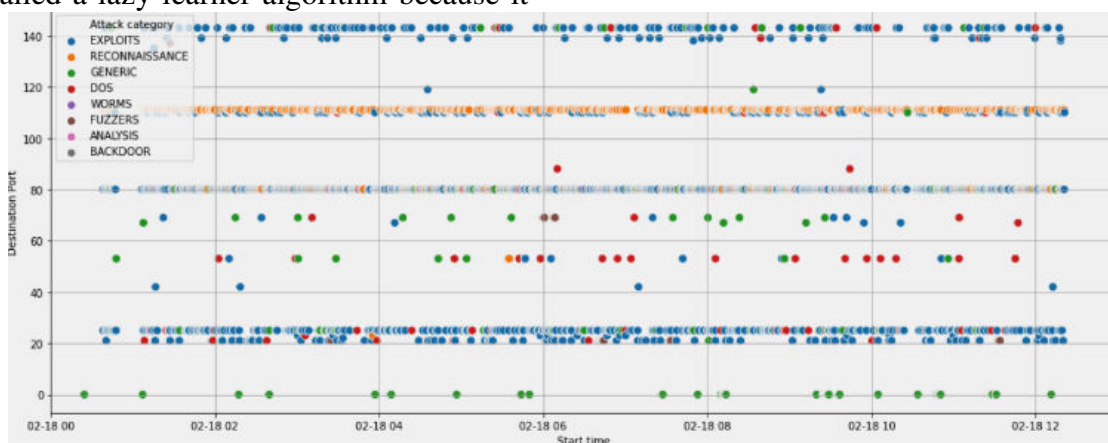


Fig2.Most frequent attack and the Ports

In figure 2 shown in the above graph, the X-axis denotes the start time and the Y-axis denotes the destination port.

Here in this graph the different color denotes the type of attack category. This graph clearly shows that on Port number 80 all types of attack had occurred.
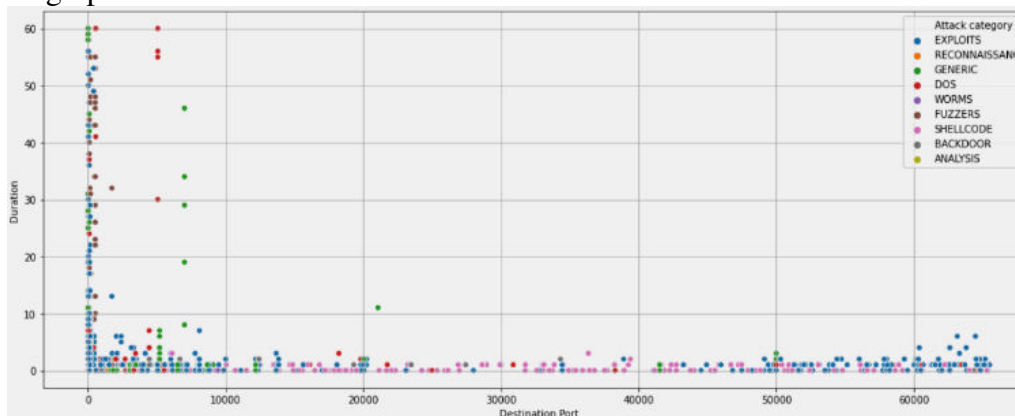


Fig 3.Visualization of the Duration of attacked Ports

In the above graph, the X-axis denotes the the

Destination port and the Y-axis denotes the

Duration.

This graph clearly shows that in higher ports, attack happened only for short duration and in

lower ports attacks happened for higher durations.
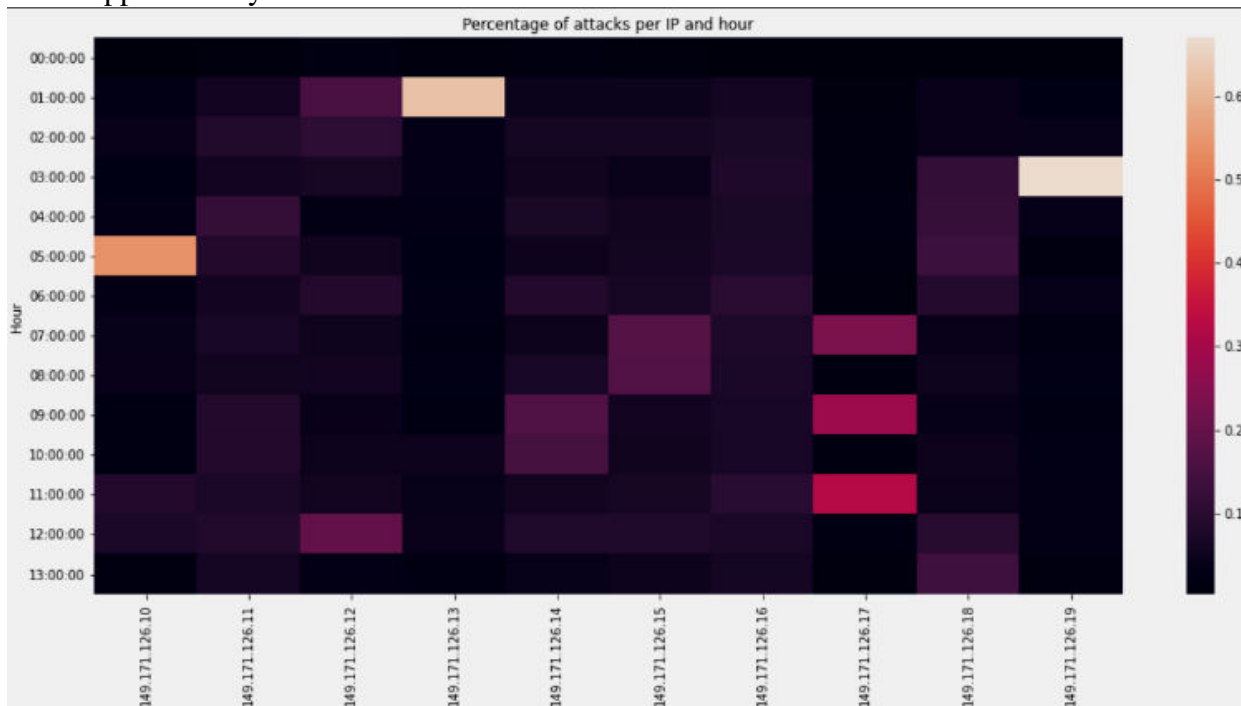


Fig 4.HeatMap on most frequent attacks

The pattern in this graph clearly shows that during odd hours, attacks are more and in even hours, the attacks are less. Here, the X-axis denotes the attack category and the Y-axis denotes the duration(hrs).

Here the black color (2000) denotes the minimum no of attacks and the light orange color (8000) denotes the maximum no of attacks. Here the more number of attacks occurred from Dos to generic. The least number of attacks are Shell code and worms.
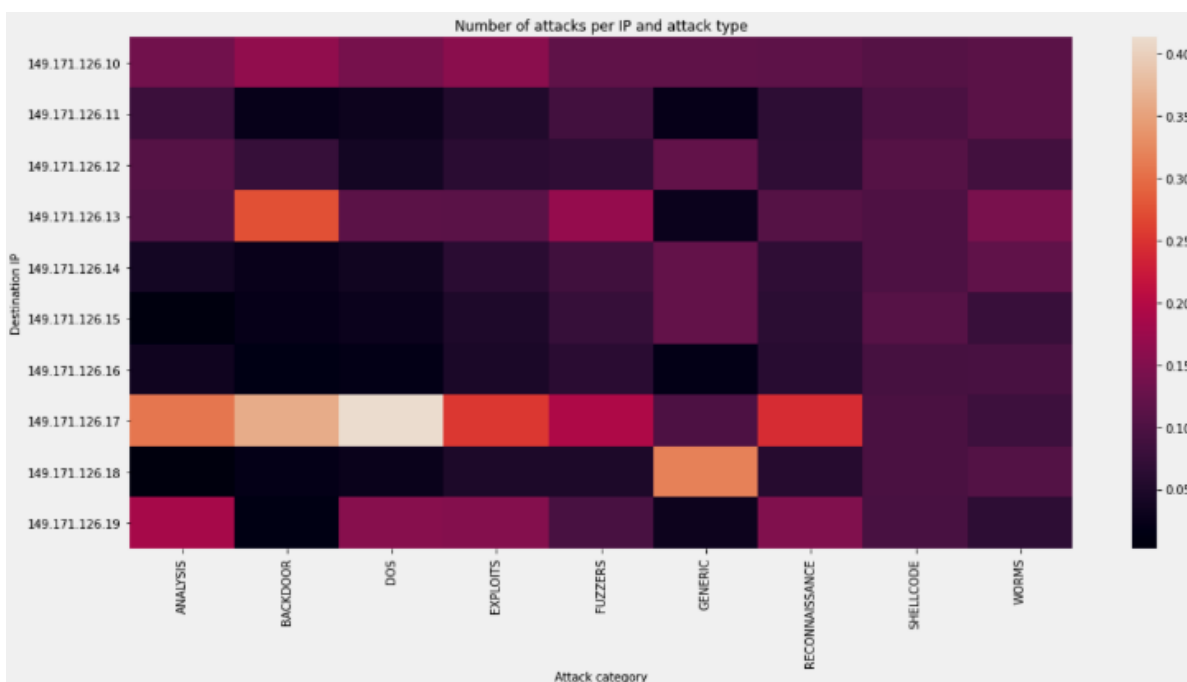


Fig5.HeatMap on mostly attacked IP

The X-axis denotes the attack category and the Y-axis denotes the Destination IP. By analyzing the graph, we say that the most attacked machine is the one with the IPv4 address 149.171.126.17. Conversely, while worms, shell code and generic attacks are not directed at particular machines, Denial of Services Exploits and Backdoor attacks are clearly targeted towards specific servers.

## 4. **Conclusion**

This project addresses a broad KNN classification algorithm for the classification of network anomalies, an approach that has been studied in security even as the volume and variety of cyber security threats and internet-based attack vectors proliferate. The mass usage of computerized systems has given rise to critical threats such as zero-day vulnerabilities, mobile threats, etc. Despite research in the security domain has increased significantly, it is yet to be mitigated. The most attacked machine is the one with the IPv4 address 149.171.126.17. Conversely, while worms, shell code and generic attacks are not directed at particular machines, Denial of Services Exploits and Backdoor attacks are clearly targeted towards specific servers.

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# GRADINGOF HARVESTED MANGOESBASEDON QUALITY EVALUATION AND MATURITY PREDICTIONUSING MACHINE LEARNING TECHNIQUE

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## ABSTRACT

*Now a days, the important feature to make good fruit set to increase agricultural profits. Nowadays filtering fruits such as Mango, Bananas, Dates and Grapes is done by hand, as this is difficult to find a craftsman at this time. In our project mangoes are categorized into three classes such as green, yellow and red mango based on the machine learning process. Ourproject looks at RGB values, area(size) and diameter. we used Posterior technique to find the best opportunities. It will help to train the system to find the right maturity of the mango. The test was performed through a machine learning process i.e., the Naive Bayes Technique. It is adopted to obtain the possibilities of a different category depending on the different indicators. As compare to theexisting system, our system will be more accurate as we adopted posteriortechnique.*

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*Keywords: Quality Evaluation, Maturity Prediction, Naive Bayes Algorithm, Posterior Techniqueand Grading.*

## I.  Introduction

Mango is an annual and profitable fruit and is the "King of Fruits". In India it is very famous because of its sweet aroma and colour. Mangoes are grown in various nations such as India, Nepal, China, Japan and Bangladesh. It is also exported to various countries. Now the day-to-day arrangement of fruits such as mangoes, bananas, dates and grapes is done by hand, so the goal of finding enough craftsmen at this time is difficult and the process is time consuming and deals with problems such as inconsistencies and inequalities in judgment as people are different. In this project using the Machine Learning Technique, the system enables us to classify mango as ripe,un-ripe and overripe. Estimation is doneon the basis of quality of the fruit by looking at the number of features such as shape, size and colour. In this process the noise is removed by converting the RGB images to a gray scale image [1].

## II. Details of Literature Survey

Dnyaneshwari Pise, G. D. Padhye [1] suggested that "Quality Assurance of Harvested Mango and Maturity Based on Mechanical Learning Programs", It is very important to make good fruit planning to increase the profitability of the agricultural and food industries. The process of mango placement is usually based on mango structures. In this paper, the image noise is removed by converting RGB image to gray scale image. Then surface area is analysed by converting the gray scale image to binary image. Naive Bayes and Support Vector Machine in the form of Posterior Analysis are approved for measuring mangoes in size, shape and colour of images. It will help to train the machine to find the right ripeness of the mango. The system provides more accuracy as background analysis is used.

Chandra Sekhar Nandi, Bipan Tude and Chiranjib Koley [2] suggested that the Automatic Fruit Grading System is based on the Fuzzy algorithm. This paper proposes a system based on the machine's concept of automatic measuring of fruit in terms of its ripeness and quality. Manual editing by humansinterventiongenerates problems in maintaining consistency and accuracy this is also time consuming and this process requires a lot of staff. In this project a new computer vision system is proposed based on an automated fruit planning system. The automatic system captures an image from acamera mounted on a conveyor belt which carries a mango, and then scans the images to collect sensitive features at maturity and

quality level. Finally, a rules-based algorithm is used to sort the fruit into four marks.

Yogitha. S and Sakthivel. P [3] suggested that "Distributed Computer Viewing System for Automatic Testing and Grading". A computerized system viewing system that can be used to filter and process fruit at high speeds is proposed. Fruit sorting is done on the basis external factors, colour, size, and shape. The proposed machine-vision test system depends on the width as well as weight of the fruit uses a distributed network design to connect input-output devices and a camera surveillance system to a computer system using the Gigi LAN network in a flexible manner. This project is planned to be done in a virtual studio using OpenCV. The relevant process of measuring color data and geometric parameters uses complex library sequence such as sound extraction, editing, loosening, stretching, filling, loosening, filtering, histogram, color values, pixel measurement etc.

Kedar Patil, Shriniwas Kadam, Suraj Kale, Yogesh Rachetti, Kiran Jagtap and Dr. K.H. Inamdar [4] proposed "Experimental Fruit Testing with Fruit Machine Viewing Machine". The objective of this system is to create and implement an inexpensive automated procurement system for fruit and vegetable filtration. Fruits are ripe, rotten, and edible. And then the edible fruits are sorted by size. This paper describes the data collection process such as size, color, fruit and vegetable defects and is categorized into different categories.Suitable algorithms for MATLAB such as conversion to Binary Image, location calculations and pixel value calculations. For filtering purposes Arduino-Uno-Microcontroller is used.By using the longer length of the belt in the proposed process the accuracy can be increased in speed.

## III. Methodology

The Proposed Mango Grading System is used to determine the Mangoes Quality and Maturitybased on the area(size), diameter and surface defects. Applying a variety of strategies increases the profitability of the sellers and the use of time is limited.

Figure 1 shows the Block diagram of Grading of Mangoes, mainly contains picture installation, pre-image processing techniques, image training, Naive Bayes and Posterior analysis [1].

Image pre-processing techniques are used to find the area, surfaceand diameter is measured. The classification is done by adopting Naive Bayes and Posterior Analysis techniques. We can obtain good probability as Posterior Analysis is used. These techniques will train the images of Mangoes to predict the quality, maturity and color of the mango and the output obtained is graded Mango.
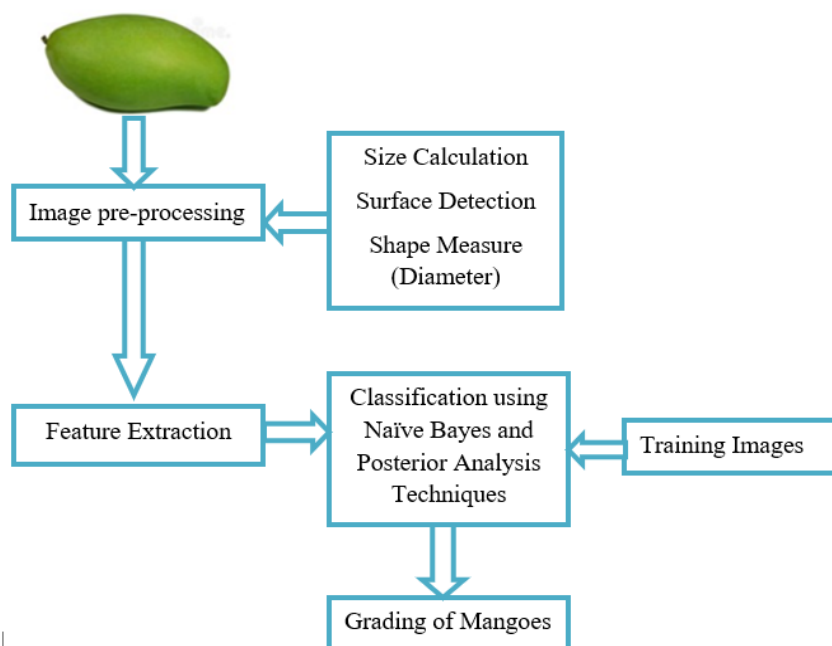


Figure 1: Block Diagram of Grading of Mangoes

## IV. System Architecture

This System is used to determine Mango Maturity and Quality in terms of area(size), color and diameterof Mango Images. By adopting these methods we can increase the profitability of traders and the use of time is limited [2].

### Input: Mango Image.

### Output: Graded image of Mango based on Maturity level.

By using pre-processing techniques, we can remove the noise and able to improve the quality of the image [10].

Mango placement process is usually done according to the mango structures. Noise can be removed by converting the RGB pictures to monochromatic (gray scale) pictures. The balanced monochromatic pictures are then converted to binary pictures. The Naive Bayes Posterior Analysis method is used to measure mangoes in size, shape and colour of Mango images [2].

The aim is to automatically set the mango with the help of the image processing algorithm and the Naive Bayes segmentation. Mango traders can use this system to measure mangoes and categorize them automatically. In industry, time and efficiency are the major factors beyond the reach of a human testing program because it is difficult for a person to test a large number of mangoes [10].

### 1. Preview the image:

Image noise is defined as distinct pixels that differ in appearance from neighbouring pixels. Excessive isolation is occurringdue to the presence of noise and insignificant fluctuations that produce real minima. To improve quality of the picture noise is removed by using Pre-processing technique.

The input original image is pre-processed in advance by using a variety of methods such as the Monochromatic, binary picture presentation.Mango features are considered as area, diameter and color. Features can be obtained by detecting the RGB values, the area and diameter of the picture[1].
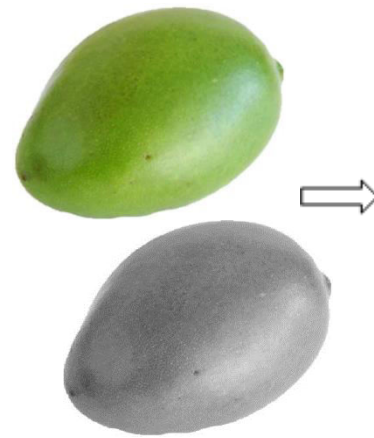


Figure 2: RGB to Grayscale Conversion

Gray images, that only carry the intensity of the images. The grayscale image can also be called as the black and white image as shown in Figure 2, black with weak contrast to white [1].

Binary images can made from the grid of a grayscale or colour scale to distinguish an object as shown in Figure 3. The foreground colour of the image is white and the background colour of the images is black [1].
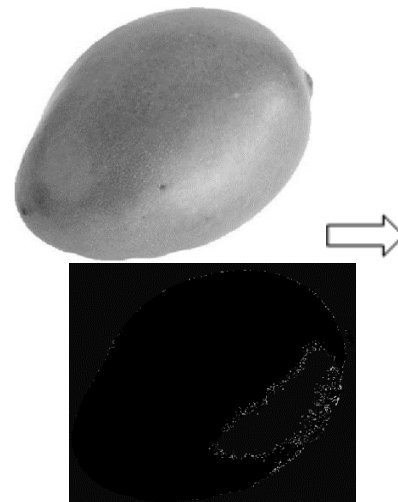


Figure 3:Grayscale Image to Binary Image

### 2. Feature Extraction

Features are extracted to enter relevant information from the entered data and then the required function is performed with the help of reduced input data instead of its complete original data. Feature extraction is used to reduce the resource by a fair value from a large data set. Image processing is the most important area for feature extraction. When an algorithm is used to find the desired part of an

image. Feature extracting is done to remove a portion from an image [12].

Feature extraction is used to check the Maturity level and defected part of Mango.The purpose of the removal process is to represent the green image in its reduction form to aid the decision-making process such as pattern editing. Entropy, Mean and Standard Deviation used to extract gradient object to file the proposed project. Removing feature to allow the difference between the infected part and ripe fruit. [8].

Entropy formula for an image is given as,

$$Entropy = - \sum_m q_m \log_2 q_m \dots\dots (1)$$

Where,

i) $q_m$ is the probability of difference between 2 nearest pixels is equal to m.

ii) $\log_2$ is the base 2 logarithm

Standard deviation formula is given as,

$$S = \sqrt{\frac{\sum_{i=1}^{N}(y-\bar{y})^2}{N-1}} \dots\dots (2)$$

Where,

i) N is no. of Pixels.

ii) $\bar{y}$ is mean value of $y_i$

iii) $y_i$ is each pixel values.

The formula to calculate the arithmetic mean is given as,

$$\bar{Y} = \sum \frac{Y}{N} \dots\dots (3)$$

Where,

i) $\bar{Y}$ is the mean.

ii) N is no. of values.

## V.  Techniques Used

Naive Bayes for classification (Training details) and posterior analysis techniques:

### 1.  The Naive Bayes

It is a classification dependent on the Bayes Law of independent thinking among the predictions. Generally, the Naive Bayes classifier consider the existence of specific attribute in the class and is not related to the any exitance attribute value [1].

NB technique is easy to implement and is used for the large data sets.

By using Bayes Law, we can calculate the posterior probability P(m/n) from P(m), P(n) and P(n/m).

$$P(m/n) = [ P(n/m) P(m) ] / P(n) \dots\dots (4)$$

$$P(m/n) = P(n_1/m) * P(n_2/m) * \dots * P(n_n/m) * P(m) \dots\dots (5)$$

Where,

i)  P(m/n) - posterior probability of class (m, target) given predictor (n, attributes).

ii)  P(m) - prior probability of class.

iii)  P(n/m) - likelihood

iv)  P(n) -  prior probability of predictor.

2. Posterior Analysis:

Naive Bayes can be view in the posterior resolution step detection [1].The parts in Naive Bayes are the same you follow the point below:

$$Posterior = Likelihood * Prior Evidence \dots\dots (6)$$

Given below steps are used to determine the classification:

### I.  **Prior Probability**

Previous opportunities such as the value of a particular category are obtained through the experience of past events. Large data in the past has been used, and then the possible future values, the better and sometimes the number of previous opportunities has been used to determine the effect of segregation when certain values of previous opportunities between phases [1].

Ex:

P (Phase i) P (Phase ii) ........ P (Phase-m)…… (7)

When m specifies the number of phases = i,ii, iii..m.

### II.  **Conditional Probability**

Conditional opportunities may be necessary for previous events and events in a particular category, such as $i^{th}$ class "class-i" which means the need for the event to take place initially, followed by the occurrence of succeeding events, i.e., the "Criteria-1",

"Criteria-m" event. ", in which im means the value of an element or process or parameter [1]. Therefore, note the flexibility in terms of conditions, namely,

P (Terms 1 | Category-i) * P (Terms 2 | Category 1) *P(Principle-m|Category-i)………. (8)

### III. Marginal Probability (Evidence)

Evidence for the possibility of a single appearance or set of other events "P(Terms-1, Terms-2, Terms-m)" can be summarized by summarizing the outcome of "likelihood * prior" which apply to all existing criteria [1].

### I. Posterior Probability

The Posterior probability distribution is the probability distribution of an unknown quantity, treated as random variable and conditional on evidence obtained from an experiment [1].

Grading of Image:

Finally, after applying all the concepts formed and using Naive Bayes algorithm graded image of mango is obtained.

### Mathematical Model of Naive Bayes Algorithm

RGB values of mangoes images are calculated as

$M_N$= R, G, B $=\frac{1}{r}\sum_{N=1}^{K}\sum_{M=1}^{L}(MN*PQ)$…..(9)

Here, PQ is a Bi-Level image of mango. MN is an RGB pictures taken, L and Kare the number of columns and rows of mango pictures.

Attributes Made:

The difference between the mean values of RGB for calculating mango pictures is:

$(A_G - A_R)$, $(A_G - A_B)$ and $(A_R-A_B)$  ………(10)

The difference in the standard value of RGB is the equator, stem, title and region.

Diameter:

Itcan be measuredby knowing the formulae:

$d_g(x,y)=\sum_{i=1}^{N}\sqrt{x_i^2 - y_i^2}$………. (11)

The Naive Bayes process performs mango subdivisions using an intermediate distance of an unknown mango element with a random mango number stored after which the algorithm will find the closest examples of an unknown mango.

Accuracy:

It compares the probability values, which is probable evidence provided by the parameters:

Y: $P(\theta|Y)$

Let us have the earlier belief that boundary opportunities θ are given the recognition of Y by opportunities P (θ | Y), then the background opportunity is defined as:

$P(\theta|Y) = \frac{P(Y|\theta)*P(\theta)}{P(Y)}$………… (12)

### Steps in Naive Byes Algorithm for proposed system is shown below

Input to the system: Images of Mango for (Training and Testing).

Output of a system: Sorted Mango Image based the maturity.

Step 1: Insert the mango pictures from the training dataset.

Step 2: Mango images are pre-processed to obtain the attributes.

Step 3: In feature extraction, the features obtained are diameter and RGB values of Mango.

Step 4: A Frequency table is created for dataset after features gets extracted.

Step 5: Likelihood is generated according to the Probabilities values: Overcast Probability = X and Probability of outcome = Y.

Step 6: Testing images of mango are read from data testing and follow the Step 2 and 3.

Step7:Posterior probabilities is evaluated for every class of mango by using the equation of Naive Bayes. The class which is having high posterior probability is the result of outcome [1].

### VI. Results and Discussion

In this mango grading model, the mangoes are classified into three types, such as: the, Green, Yellow and Red Mango, by using the machine

learning technique. Our model takes into account the RGB values of the shape and size of the Mangoes. The posterior analysis is used in order to have a really good result. This will help the system to train and find the exact term of the mango. This experiment is based on the Naive Bayesian Analysis and a posterior analysis is to compare the probability performancebased-on accuracy. In comparison with the existing model, ourmodel allows for a higher level of accuracy by using a posterior analysis. Here we are going to use MATLABR2018a tool.

### A. Experimental Setup:

This system is implemented using MATLAB tool. A GUI-formatted window is displayed, here firstly training datasets are loaded and then the testing datasets of each image is compared with the training datasets and the output is to be observed such as RGB values,

Diameter, Maturity prediction and class of the mangoes.

### B. Datasets of Mangoes:

Standard databases ofmango pictures are available in internet and have been downloaded the data sets for a variety of mango images from GitHub, Kaggle and Mendeleev Datasets. Image training data sets = 100 and image testing = 50. Table 1 shows the mango database:
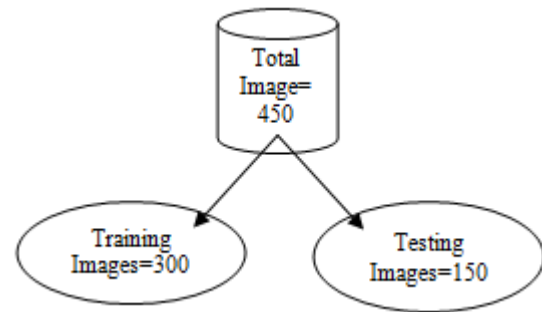


Figure 4: Datasets Classification

### Table 1: Mangoes Database

| Mangoes Type | Training Images | Testing Images | Total Images |
|---|---|---|---|
| Green Mango | 100 | 50 | 150 |
| Red Mango | 100 | 50 | 150 |
| Yellow Mango | 100 | 50 | 150 |

### C. Experimental Result:

The proposed program summarizes here that the Naive Bayes process and the posterior analysis process work with mango images based on their prediction of maturity, area and diameter. Image processing is done to determine the value i.e. the diameter, area, color and RGB values of the mango to adjust the impact on the techniques used in the project.

### Table 2: Result of Classification of Mangoes

| Sample Images | RGB Values | Diameter | Mango Class |
|---|---|---|---|
|  | R=193.401 G=209.972 B=164.199 | 420.000 | Green Mango |
|  | R=230.585 G=169.550 B=167.141 | 340.000 | Red Mango |
|  | R=251.104 G=236.557 B=201.891 | 236.000 | Yellow Mango |

The final output obtained in MATLAB for Green color of mango image is as shown

below:-
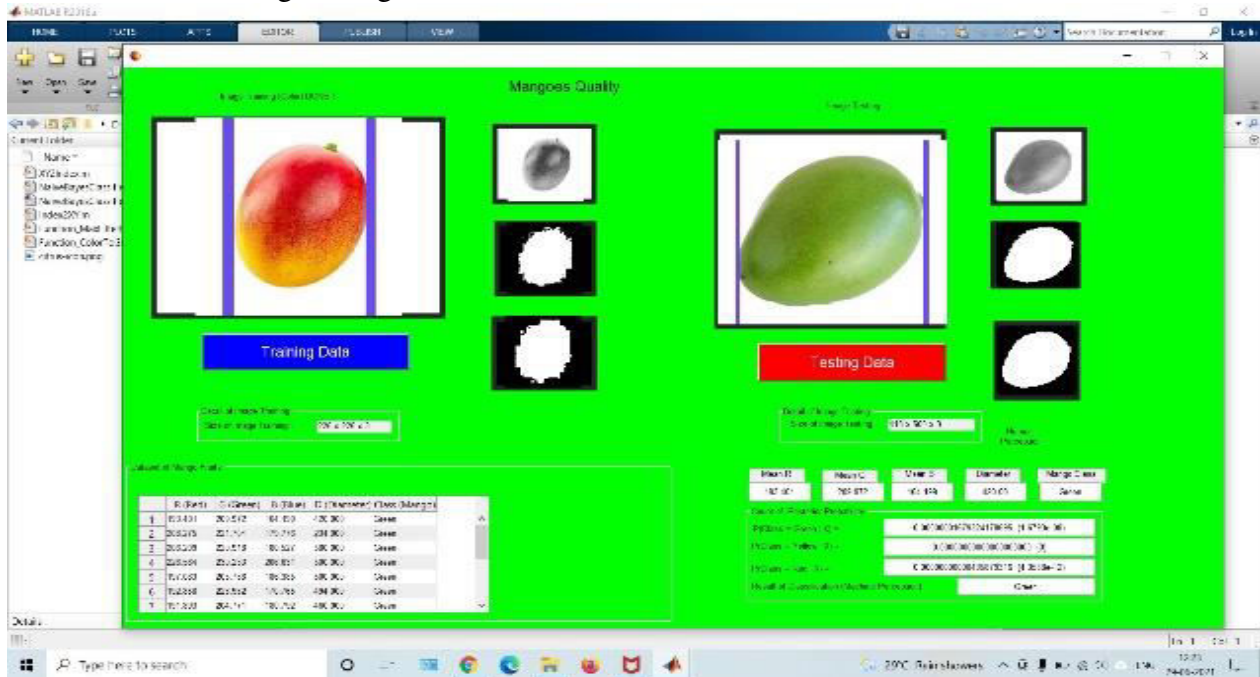


Figure 5: Output for Green Mango ImageMATLAB

### VII. Conclusion

The mango sorting model determine Maturity and Quality of the Mango by knowing the area, diameter and defects of the mango pictures. By adopting a variety of strategies increases the profitability of the sellers and the use of time is limited.

Our model has an ability to categorize the mango according to the ripeness i.e., riped or un-riped. To obtain this we have used the technique of machine learning. Pre-image processing methods are used to calculate Mango size, mango surface is obtained and diameter is measured. The classification is done by adopting the Naive Bayes and posterior analysis techniques. Our model gives more precised results as we have adoptedposterior analysis to improve the accuracy of the data training, and we measure the quality of the test picture accurately. These methods will train images of Mango to predict the quality, ripeness and color of the mango and the result obtained by the sorted Mango.

Our system only works in a specific location looking to detect a defective pixel. If out of surface a feature exists, we cannot find it. To obtain this next we need to consider a rotating direction or some different directions of the surface of mango.

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# IOT BASED WEATHER REPORTING SYSTEM

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## ABSTRACT

*The IoT-based Weather Monitoring and Reporting System project is used to get Live reporting of weather parameters. It will Monitor temperature, humidity, altitude, and pressure. when Scientists/nature analysts want to monitor changes in a particular environment like a volcano or rainforest and agriculture to see the weather condition to get the best yield or to monitor the physical parameters in a laboratory. It then displays all data in the   Blynk application.  The project has been developed using ESP 32 Microcontroller, DHT 11 temperature and humidity sensor, LDR (light dependent resistor), BMP280 pressure and altitude sensor, and OLED display to show the parameters measured. This system will monitor the changes of weather condition happening over the environment and then provides the users fastest way to access the information from anywhere*

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***Keywords*** *IOT, weather station, android interface for*     *Wi-Fi communication, microcontroller, embedded*
*c/c++ and weather monitoring.*

## Introduction

The weather reports these days is unpredictable and need to be accurate because the climate changes drastically over the weather. because of that, the Weather Reporting System is needed used to monitor the continuously changing climatic and weather conditions over various areas like house, industry, agriculture, etc. And monitoring a weather parameter can help in Labotories as well for maintaining certain parameters. in real-time monitoring. Internet of Things

(IoT) platform use is Blynk it's should be able to displaying the weather parameters and the information will also be visible from any place of the world and it's also displaying on the OLED display with microcontroller communicates via Wi-Fi hotspots to get the internet access. The value of some place that is sent by satellite weather report system does not give the accurate condition. However, the problem comes when we needed the accurate weather report at the current time. With this weather reporting system, allweather parameters measured using sensors will be controlled by the ESP32 microcontroller as the main node that will send all the data collected by sensors to the database off Blynk and will visible from anywhere in the world and also

on the OLED display that uses Wemos D1 mini as its microcontroller and a I2C connection. Hear the display and the pressure altitude and temperature sensor use the I2C connection for communication which stands for the inter interconnected circuit where the one master device can control 64 slave devices (*because it has an 8-bit address line*) so the display is connect to the address 0x3C and the BMP280 is connected to 0x76 address the added advantage of this is using only 2 lines called SDK and SDL (laving GND and VCC) therefore only using 2 lines we can control many devices(64) simultaneously , the DHT11 using the serial commutation and the LDR using the analog to digital converter to senses the changes, This MCU will monitor the changes of weather condition happening over the environment and then provides the users fastest way to access the information from anywhere using and android application Blynk.
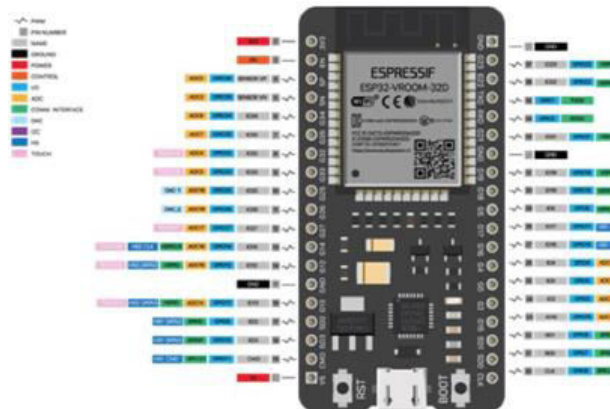
## Methodology

This project will concentrate on the design and development of the Blynk (an *IoT platform)* that shows the data of the sensor on an android or iso platforms. The process is divided into two parts which are hardware circuit part and software development part. The hardware development involves the circuit construction

and develops the structure and circuitry. On the other hand, the software part involves microcontroller programing, and data analyzing.

By using three (3) types of sensors to monitoring the weather parameter that are temperature, humidity, luminance, pressure, and altitude the system will be able to display the weather parameters with the sensor value data. All the data will be control by a microcontroller ESP32 and Wemos as the driver IC that will receive the sensor data from ESP32 and display it on OLED display. Furthermore, this system will also be seen on an android and iOS application that is Blynk to display the weather parameters value. The data collected will be sent to the Blynk web servers and those data will be reflected in all the applications and microcontroller. The Internet of Things (IoT) will connect the system with the user wireless and online without the need of checking manually.

## System Design

Our main microcontroller which we are using is called as the node MCU because we can connect multiple of those controllers together and form a network just like computers do because of this special feature multiple microcontrollers like this can be connected to gather and form a network where each microcontroller will act like a node hence it is called the **node** MCU and the MCU stands for the microcontroller unit

Since this is an IOT based project, the microcontroller needs to be connected to the interne at least for the first time boot up because it needs to fetch the data like current date, time and altitude of our current location

The microcontroller can be programed using 2 ways one using the Arduino ide which is well known for the Arduino development board and the other way is using the BareMetal programming using the standalone language specifically designed for this microcontroller in our project we are using Arduino ide and our project is written in c and C++



## ESP32 Development Board

ESP32 is a lowcost, low-power consumption systems on a chip of microcontrollers with integrated Wi-Fi and dual-mode Bluetooth (low power and performance mode where the low power is for the short range and the high power can be used for long range and while the initial setup). The ESP32 microcontroller has a Tensilica Xtensa LX6 microprocessor it is a both dual-core and single-core CPU chick can be designed by the programmer and includes built-in antenna switches for the Bluetooth and Wi-Fi connectivity, low-noise receive amplifier, RF balun, power amplifier, filters, and power management modules.

ESP32 is developed and manufactured by Espress Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using its 40 nm process.

### Features

- processor CPU: Xtensa dual-core (or single-core) 32-bit LX6 microprocessor, operating at 160 or 240 -MHz and performing at up to 600 DMIPS, Ultralow-power (ULP) co-processor.

- Memory: 520 KiB SRAM, 448 KiB ROM.

- Wireless connectivity: Wi-Fi: 802.11 b/g/n, Bluetooth: v4.2 BR/EDR and BLE (shares the radio with Wi-Fi).

- Peripheral interfaces:

a. 34 × programmable GPIOs.

b. 12-bit SAR ADC up to 18 channels.

c. 2 × 8-bit DACs. 10 × touch sensors (capacitive sensing GPIOs).

d. 4 × SPI. 2 × I²S interfaces.

e. 2 × I²C interfaces. × UART.

f. SD/SDIO/CE-ATA/MMC/eMMC host controller.

g. SDIO/SPI slave controller.

h. CAN bus 2.0. Infrared remote controller (TX/RX, up to 8 channels).

i. Motor PWM. LED PWM (up to 16 channels).

j. Hall effect sensor and temperature sensor

## ESP32 PIN DIAGRAM (Figure 1)

**OLED DISPLAY:** This display is made of 128x64 individual white OLED pixels; each one is turned on or off by the SH1106 controller IC as its microcontroller chip. the display made up of individual pixels hence no backlight is required and the display will also be compact and light weight to carry. This reduces the power required to run the OLED display which has the diagonal size of 0.96 inches. The 128x64 pixels OLED Display has an outline dimension of 26.70 x 19.26 mm and AA size 21.74x10.86 mm, it is built-in with SH1106 controller IC and it communicates via 6800/8080 8-bit parallel, I2C, and 4-wire serial interface. In our project we have the display programed to perform the 5 different operation which are more likely called as screens, the 1st display shows the current date and time of the current location which will be fetched by the microcontroller once it is connected to the internet , 2$^{nd}$ display shows the temperature as a main parameter and humidity and pleasure as the secondary parameters and corresponding the red led will be turned on, 3$^{rd}$ display we have the humidity as the main parameter and temperature and altitude as the secondary parameters and the corresponding the blue led will be turned on, 4$^{th}$ display shows the pleasure as a main parameter and humidity and temperature as

the secondary parameters and corresponding the green led will be turned on and finally 5th display we have the luminance as the main parameter and temperature and humidity as the secondary parameters and the corresponding the blue led will be turned on Apart from these 5 led we have other 2 Leds one of them is the WIFI status led and display switch led. The Wi-Fi status led is a multicolor led shows us whether the microcontroller is connected to internet or not once the microcontroller is connected to the internet the Wi-Fi Staus led turns into green color and when the Wi-Fi is not connected the Wi-Fi status led will be in blue color, since this is an IOT based project the microcontroller need to be connected to the internet at least for the first time boot up because it need to get some data like current date and time our current location the location will be automatically identified once the microcontroller is connected to the internet. Well, the other led is the display switch indication led which will turn on once the display switch commend is given from a Blynk application which will be mentioned in the upcoming pages
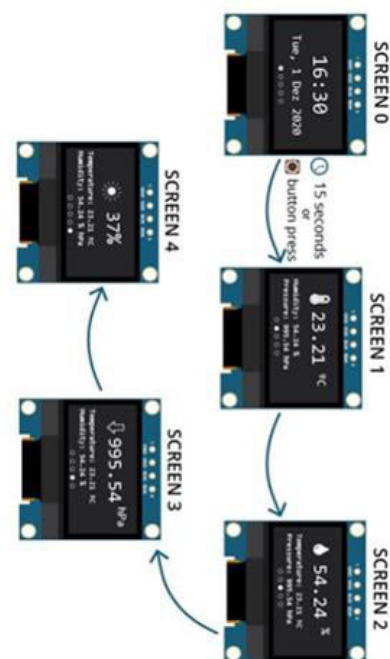


Oled Display and its Interface (Figure 2)

**LDR (LIGHT DEPEENDENT RESISTOR):** A photoresistor (also known as a light-dependent resistor, LDR, or photo-conductive cell) is a passive component that decreases resistance concerning receiving

luminosity (light) on the component's sensitive surface. The resistance of a photoresistor decreases with an increase in incident light intensity; in other words, it exhibits photoconductivity performance.

The LDR stands for the light dependent resistor in our project led is used to senses the amount of light present in the environment as a result instead of displaying the luminance we will be displaying percentage of light falling on the sensor (the minimum and maximum values can in modified in the program which will be loaded into the microcontroller), the LDR 1st terminal is connected to the ground and the other pin is connected to the 10k resistor to limit the current and the resistor

leads to the +VCC. The junction of +VCC and the resistor is used as the data lines which will be connected to the analog to digital converter of the microcontroller and the code is done in such a way that the output will in the percentage

**BMP280 SENSOR:** BMP280 Digital Pressure Sensor is an absolute biometric pressure sensor specially designed for mobile applications. The sensor module is made in an extremely compact package. Bosch Sensor tec is the company who manufactured BMP280 Digital Pressure Sensor small dimensions and its low power consumption allow for the implementation in battery-driven devices.
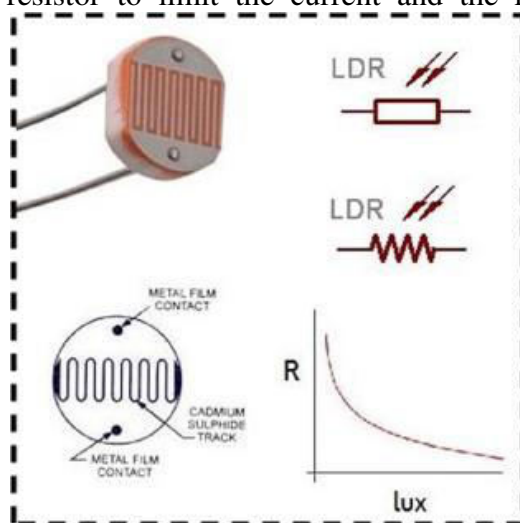


LIGHT DEPEENDENT RESISTOR (Figure 3)
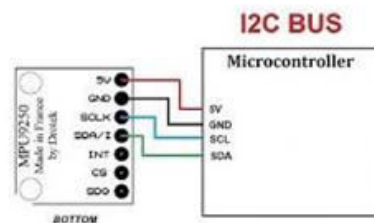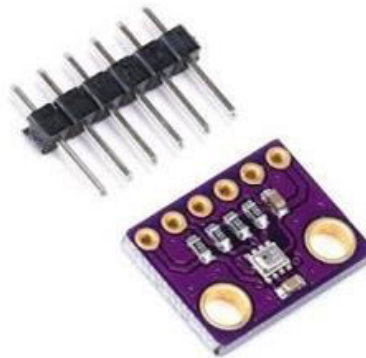
The BMP280 is based on piezo-resistive pressure sensor technology, featuring high accuracy and linearity as well as long-term stability and high EMC robustness. Numerous device operation options offer the highest flexibility to optimize the **BMP280 (Figure 4)**

The above diagram shows the connection for the for I2C connection apart from the ground and VCC this type of connection has the SDA and SDK where SDA stand for the serial data line and SDK stands for serial clock line, both of these lines are connected to the microcontroller SDA and SDK respectively.

**Features:** this sensor is mainly used to measure the temperature pressure and altitude

- 300hPa to 1100hPa pressure range, 8-pin LGA metal-lid package

- $\pm 0.12$hPa, equiv. to $\pm 1$m (950 … 1050hPa @25°C)

- relative accuracy Typ. $\pm 1$hPa (950 to 1050hPa, 0 to

  +40°C)

- absolute accuracy 1.5Pa/K, Equiv. to 12.6cm/K temperature coefficient offset

- Digital Interfaces

- I2C (up to 3.4MHz)

- SPI (3 and 4 wire, up to 10MHz)

- 2.7μA @ 1Hz sampling rate current consumption **Circuit:** The block diagram consists of the components that are used in this project. Firstly, the microcontroller will involve ESP32mcu. This microcontroller board will communicate with other sensors as specified to get sensor data from the respective sensors and send data collected to servers via wireless communication and hotspot Wi-Fi. the data is then synced with the Blynk server and displayed to OLED display. The microcontroller will display the sensor data on OLED and also on the Blynk app. The data collected will be analyzed and displayed in the application
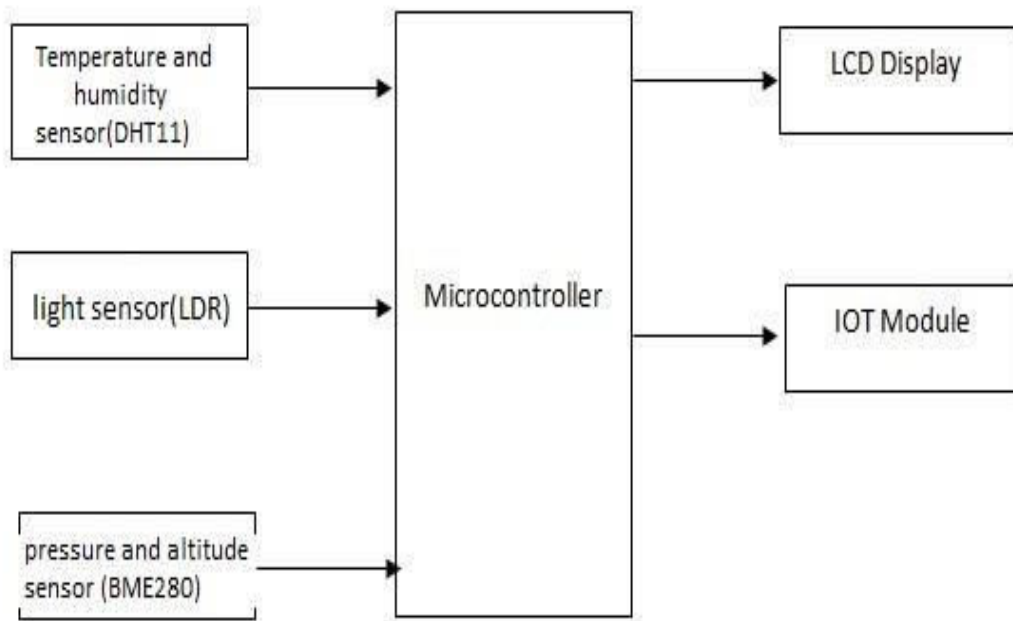


| components | GPIO pin numbers |
|---|---|
| OLDE Display - SDI | GPIO-21 |
| OLDE Display - SDI | GPIO-22 |
| BMP280 Display - SDI | GPIO-21 |
| BMP280 Display - SDI | GPIO-22 |
| DHT11 - data | GPIO-00 |
| LDR | GPIO-33 |

Block diagram (Figure 5)

| WI-FI LED | GPIO-16 |
|---|---|
| RED LED | GPIO-05 |
| BLUE LED | GPIO-32 |
| GREEN LED | GPIO-27 |
| YELLOW LED | GPIO-12 |

**Pin configuration and circuit**
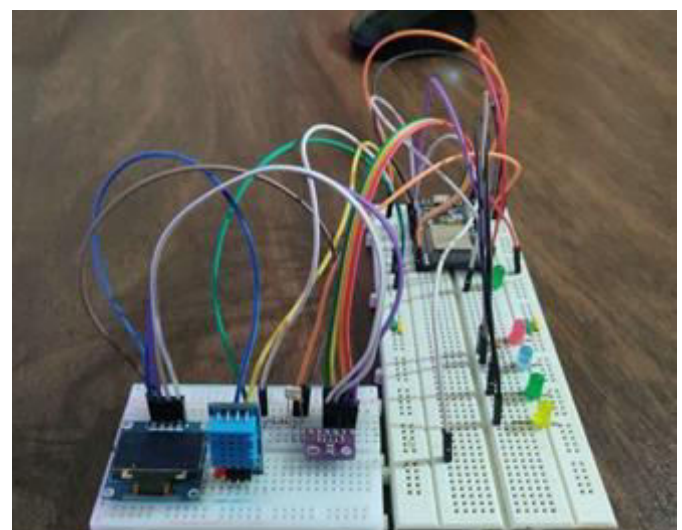


Hardware circuit connection (Figure 6)

The microcontroller needs to be powered by constant 5v 1A power supply via the vin and ground pin or using the micro-USB port, we will be using the USB type A to micro-USB

cable and a charger adaptor for powering as it is maintained under specified range, the microcontroller can maximum output of 5v,3.3v with the maximum current flow of 80mA so to limit the current flow 270 ohm resistors are used in series with the led for a stable output and all the connections are made in the breadboard, our project consist of a touch sensor which can be connected to any

Metalica surfaces to make it touch sensitive, the touch sensor measures the amount of charge present in the surface, this touch sensor is used to switch between the displays(screens) and the touch sensor is ground isolated from the supply , more over the microcontroller board has a built in voltage regulator so we can power it up with 3.3V to 12V supply

| Mode | Power consumption |
|---|---|
| Wi-Fi Tx packet 13dBm~21dBm | 160~260mA |
| Wi-Fi/BT Tx packet 0dBm | 120mA |
| Wi-Fi/BT Rx and listening | 80~90mA |

**ESP32 Power Consumption**

**Android Interface:**

**Blynk:** The system can display sensor data and those data will be sent to Blynk servers and will be visible from anywhere around the world. The sensor data completely shown on the Blynk app and we can also control the microcontroller from the application. Thisandroid app is free to build and can be download it on Google Play store and register with an email which can be used to login and view the data. Blynk application was designed and developed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data and visualize it. every time you press a Button in the Blynk app, the message will be transmitted to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a Blynk of an eye.

**Bynk Server:** This is the procedure need to be followed to access the data from a smartphone and the initial setup is also include which need to be done by developer. microcontroller need to be connected to the Wi-Fi or hotspot of the smart phone. name of the hotspot and password need to be included in the program via the Arduino ide, then the microcontroller uses the token code from Blynk lets the microcontroller to connect to the server of Blynk. the server of Blynk application will process the data and sends the data to the smartphone connection. Blynk server will check for internet connection. The information included to the code must be match with the hotspot information to allow microcontroller

to connect with the WIFI to be as a channel to exchange commands between smart phone and microcontroller. Remaining processes are just commands sent from Blynk application to microcontroller.

After the installation we will be in the login page there we can either use the email id and password to login or we can use the QR code to get access to the application to control and manage the microcontroller
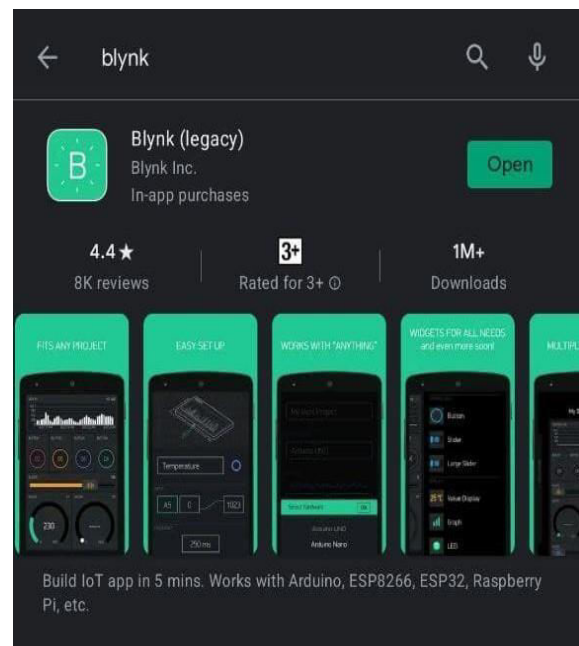


Installation (Figure 7)

We can start searching for Blynk on the play store in the android smart phone (use apple Appstore for iOS) once that's done, we just need to download and install
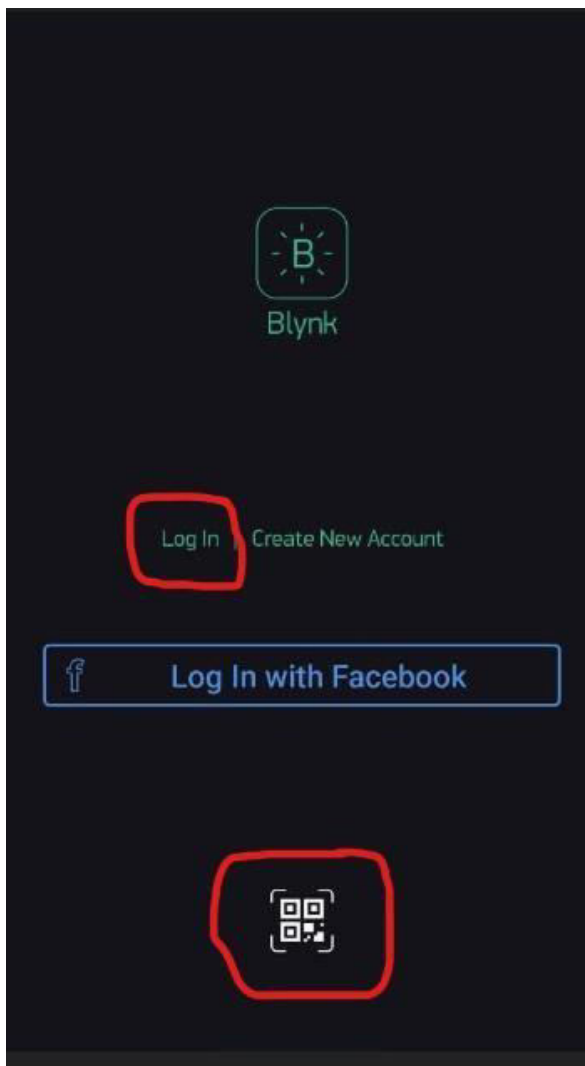
Setup page (Figure 8)



QR code (Figure 9)

Scanning this QR cord from the Blynk setup page will lead you to the project home page



Project home page (Figure 10)

Well, this is the home page as we can see there are 2 gauges in the 1$^{st}$ row the first one is the temperature Guage and the 2$^{nd}$ one is the luminance's Guage, below that we have the graph named data which shows the variation of parameters in a graphical way, we can inaugurally tune on and turn off parameters in the graph, as well we can view the past 3 mounts data on the graph by toggling the buttons given below The last row has one button called screen and the showing the value of the altitude parameter, using the screen button we can switch between displays wirelessly from the android application

Graph's (Figure 11)

As shown in figure 11 all the 4 parameters data can be accessed at a time to get a clear view of the weather condition. The buttons in the bottom row let us view the live data or the data which had been recorded in the cloud using the application we can only store 3 Monts of data so after every 3 months all the data can be exported to the google spread sheets which let us record a lot of data which can be used in many applications

**Code:** https://github.com/asterisk-ragavan/wetherstation/blob/main/project.ino
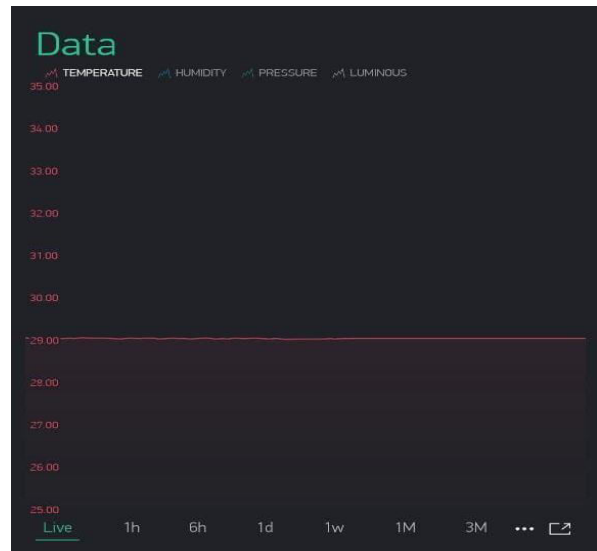


Figure 14 (temperature)



Figure 13 (Humidity)
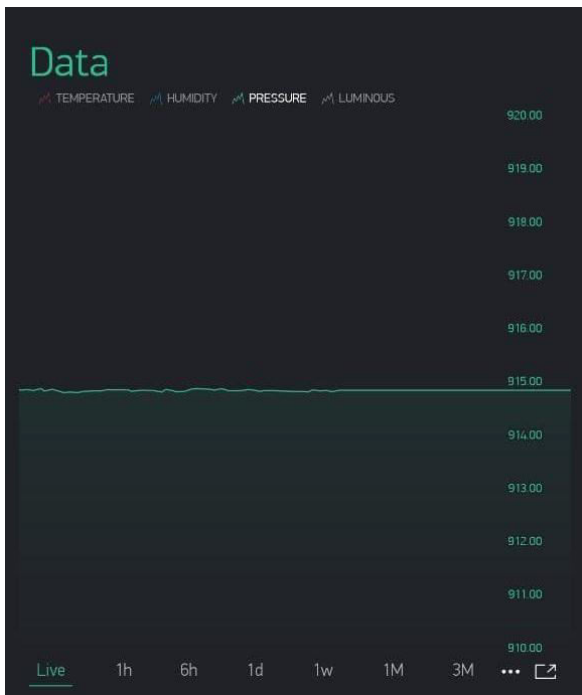


Figure 12 (pressure)
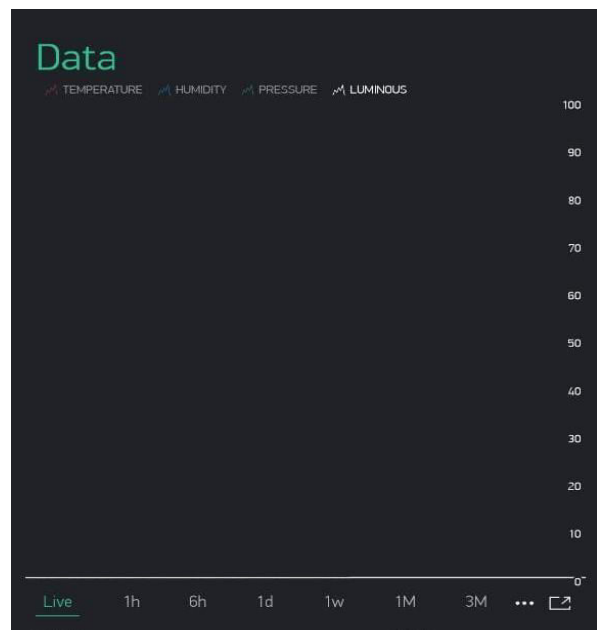


Figure 15 (luminous)

## Conclusion

As a conclusion, this project has cleared the objective that to build a system that can measure the weather parameters by the wireless system and IoT. The Weather station will be communicated by hotspot Wi-Fi and its data sent to the cloud and can be viewed from anywhere in the world. This weather reporting system will display the sensor data to the Blynk app that can be installed in the google play store or Appstore. The main importance of collecting the weather data is that we can predict the future climate conditions and the data which we collected can be used to find the climate changes as well which is a very important thing to be noticed and maintain it properly to keep our mother earth clean

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# PRECISION JUMBO DRILLING USING ULTRASONIC SENSORS WITH WIRELESS DISPLAY SYSTEM

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## ABSTRACT

*Jumbo drilling is a major task where accuracy often fails since large drillings requires minute accuracy, here is an attempt to develop a prototype drilling machine. Drilling assembly shall be mounted on a chasse with four wheels and drive. This vehicle Is completely wirelessly controlled by using Wi-Fi technology. Drilling angles are set through wireless controller and drilling depth will be continuously monitored and data will be displayed through an LCD. Sensor will be used to monitor the drilling depth and drill hole angle during drilling with Hc-sr04ultrasonicsensorand angle sensor.*

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*Keywords: Jumbo drilling, minute accuracy, prototype, Wi-Fi technology, LCD, Hc-sr04 ultra sonic sensor, angle sensor.*

## Introduction

Drilling and blasting is a well-known technique used for rock excavation in tunnelling or underground civil works. Justify, drilling operation is one of the critical stages of the overall excavation process with major influence in the efficiency of the next stages such as blasting, scaling, loading, hauling and support operations. In underground constructions, drilling is normally carried out by top hammer, rotary-percussive jumbo drills. The pre-dominant purpose of drilling in mines is to construct blast holes for tunnelling or mining, although subsidiary drilling is used to insert rock bolts or cable bolts, or to facilitate exploration or mine drainage. The type of rock drill used in mining is generally determined by the hole diameter required and the mechanical properties, principally hardness of the rock. In mining industry, drilling is a very important task. About 75% of the mineral materials are excavated underground using the drill and blast method.

1) Hence, the economic importance of efficient drill jumbos used for drilling task becomes evident. Differentty pes of drill jumbo shave been developed to accomplish the demand so f higher production rates and better efficiencies in activities such as hard rock mining and tunnel construction.

2) Most drill jumbos in operation today are manually operated.

3) The manual operation of drill jumbos has some disadvantages. For instance, the operation efficiency is low, because the operators need to manually move the drill to the desired locations of the holes on the mine face using several joysticks.

This is actually a "trials and errors" process due to the availability of several joints that can be actuated. Also, moving the drill feed to a specified angle is prone to errors, as it is done by the operator through visual inspection. A wrong angle of the drill hole may lead to undercutting or overcutting of rock mass, leading to significant increase in overall costs. The drill monitoring is a technique for predicting the risks at face by analyzing the mechanical quantities measured at hydraulic rock drill in the excavation of tunnels or rock mass for underground structures. Since drill monitoring can be conducted on real- time basis when excavating blast hole so rock bolt holes in tunnel excavation, it enables fast and quantitative prediction and evaluation of tunnel face. Though a number of studies have been conduct don the drilling data, the election of drilling parameter sand numerical quantification of

mechanical quantities for the evaluation of the ground characteristics have not been established yet. In this project, drilling tests will be conducted with rock specimens to identify drilling parameters and the correlation between the drilling data which was analyzed with the data obtained in the drilling test. The average values of the drilling parameters will be calculated using the average values of the sections of the drilling data, and the drilling mechanism will be verified with correlation analysis between the drilling parameters.

## Literature Survey

**Hans. E et al., (1995),** the researchers have studied a rotary blast hole drilling apparatus comprises rotary blast hole drill and a drill automation control system. The apparatus in cludesa pull-down motor and drill motor. The drill automation control system includes a number off unctional components including a user interface. Through the user interface, an operator sets a rotary to request point that determines an amount of to request applied to the drill bit by the drill motor. The control system further in cludesa detector, for detecting pressure in the pump during a drill operation, and a processor which is operative under the control of a program stored and it is responsive to the rotary torque set point and signals from the pull-down pressure sensor for generating an error signal. Systems and methods for automated drilling with a rotary blast hole drill will now be discussed in detail. After providing a detailed discussion of exemplary systems and methods of present invention, an exemplary drilling operation will be discussed.

**Stephen A. and Rudinec (2017)** have studied an all-electric mobile jumbo drill machine 100has been developed to operate in a mine environment and this machine configured to use provided AC electric power and on-board battery provided electric power and operated in amineenvironment.Utilizingonlyelectricpowerf orbothmovingallelectricmobilejumbodrillmach ine 100 from a first position to a second position within a mine environment and also to power the drilling operation. The all-electric mobile jumbo drill machine 100 eliminates theneedforaninternalcombustionengineformovi ngthemachinefromafirstpositiontoasecondposit ion. The mobile jumbo drill 100 includes a support structure 104 configured to support the equipment used for both moving the jumbo drill and equipment for a drilling operation.

**Naveen Koka (2017),** the research carried in aspect to drill system including one or more booms coupled to a portion of an operator cabin of a machine frame. As an example, the one or more booms may be coupled to a top portion of the roll over protection (ROPS) or falling objects protection structure (FOPS). The one or more booms mount to and may be slide ably coupled to the operator cabin to allow the booms to articulate between a first position and a second position. In this way, the one or more booms may be retracted for machine movement such as tramming.

**J.Navarroetal(2019),**there search carried on modern jumbo sequipped with Measure While Drilling (MWD) provide the position of the blast hole scollar and, from the drill ength and the azimuth and inclination angles (monitored outside the blast hole), the oretical end position of the blast hole. Since the trajectory of the hole during the drill is not measured, deviations are not accounted with the result that the actual spatial position of the blast hole is unknown. This paper investigates the quality of the drilling in underground blasting operations with a view to quantify the distance of the position assessed by the MWD system with respect to the actual end position of the blast hole logged. For that, a Pulsar Micro Probe Mk3 has been used to measure the actual trajectory of several production blast holes, drilled in semi-automatic mode, by measuring in clination and azimuth values at 1m intervals.

## 2.1 Objective

Designing a real time monitoring device, to determine the length of the drill hole and to determine the angle so fdrill hole and storing the data achieved while drilling operation.

## 3.1 Methodology

In jumbo drill where the minute accuracy is not attained, so we are adopting a sensor named Hc-sr04 i.e., ultrasonic sensor to check

the depth of drill hole. To know the angle drill, angle sensor is fitted in the jumbo drill. Figure 3a shows the methodology adopted
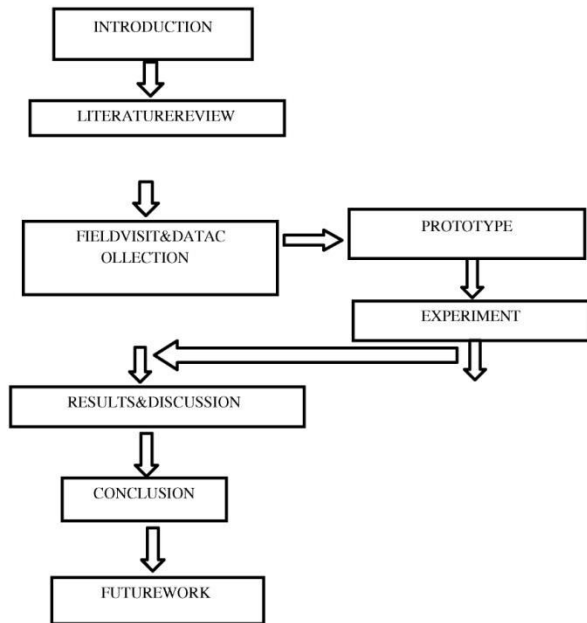


Figure3 a - Flow Chart of Methodology

### 3.1 L293D Motor Driver Module

### Category: Motor Driver Overview

**L293D**is a typical Motor driver or Motor Driver IC which allows DC motor to drive one it her direction. **L293D**isa16-pin IC which can control as to two DC motor s simultaneously in any direction. It means that you can control two DC motor with a single L293DIC.DualH-bridge Motor Driver integrated circuit(IC).Figure 3b. shows the motor driver
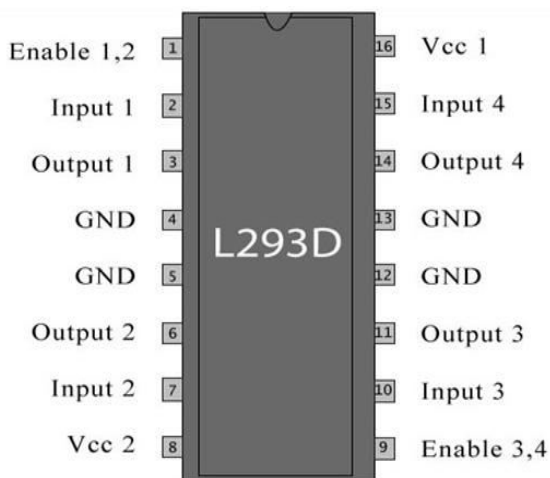


Figure3b. Shows the typical Motor driver or Motor Driver

**Description**

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge I Care ideal for driving a DC motor.

In a single L293D chip there are two H-Bridge circuit inside the IC which can rotate two DC motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293Dmotor controller.

There are two Enable pinsonl293d.Pin1andpin9,for being able to drive the motor, the pin1and9need to be high. For driving the motor with left H-bridge you need to enable pin1tohigh.

### 3.2 ESP32 Series

ESP32 is a single 2.4 GHz Wi-Fi-and-Bluetooth combo chip designed with the TSM Cultra-low-power 40 nm technologies. It is designed to achieve the best power and RF performance, showing robustness, versatility and reliability in a wide variety of applications and power scenarios. The ESP32 series of chips includes ESP32-D0WD-V3, ESP32-D0WDQ6-V3, ESP32-D0WD, ESP32-D0WDQ6, ESP32-D2WD, ESP32-S0WD,and ESP32-U4WDH,amongwhich,ESP32-D0WD-V3,ESP32-D0WDQ6-V3andESP32-U4WDHarebased on ECO V3wafer.

### 3.31     Block Diagram
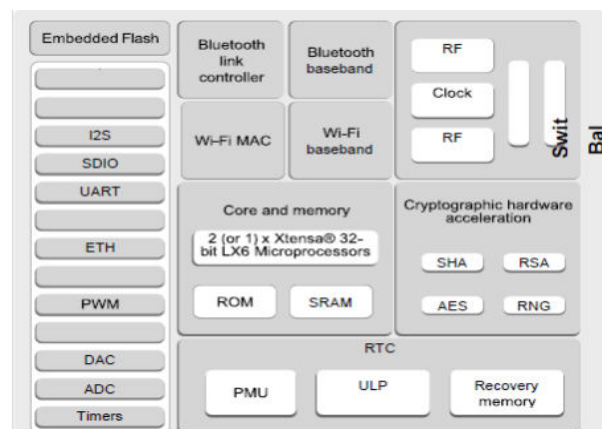


Figure 3c shows the block diagram of chip

### Humidity

The rotary position sensor should be stored in

a chamber at temperature of +60±2°C and relative humidity of 90-95% for 250±8 hrs. After removing from the chamber, the rotary position sensor should be kept in adryboxfor24 +8/-0 hours.

### Vibration

The rotary position sensor should be tested under the condition of the amplitude of 1.5mm, the frequency range from 10 to 55Hz (should be traversed in approximately one minute) and 2hoursin each of 3 mutually perpendicular directions (total 6 hours).

Then, the rotary position sensor should be kept inadryboxfor1-2 hrs

### High Temperature

The rotary position sensor should best or Edina chamber at the temperature of + 85 ± 3° C without loading for 250±8 hours. After removing from the chamber, the rotary position sensor should be kept in adryboxfor24 +8/-0 hours.

### Low Temperature

The rotary position sensor should be store dina chamber at the temperature of-40±3°C without loading for 168±4 hours. After removing from the chamber, the rotary position sensor should be kept in adryboxfor24 +8/-0 hours

### Rotational Life

The adjustment rotor should be continuously rotated within ±160° of effective electrical rotational angle, at the rate of one cycle for 6 seconds for 1 Million cycles under the conditionof+25±2°C of temperature without loading.

### 3.5 Project Requirements

1. Mainframe (MS Sheet and flats)
2. Wheels2inch
3. Drive motor 12VDC60 RPM
4. Drilling tool
5. Drilling motor 12V300RPM
6. Microcontroller node MCU
7. Distance sensor ultrasonic

**Drilling Operation of Jumbo Drill Machine**



**Figure3d. Shows the Side view of Jumbo Drill Machine**

### 4.0 Implementation

Totesttheprototypejumbodrillmachineusingultrasonicsensorwithwirelessdisplaysystem.Our project implementation will be carried out in our college underground mine model. Our project model would perform drilling with measured depth sensor and measured angle is also controlled by angle sensor, displaying all the actual values of live drilling depth and angle of drilling tools thus complete monitored operations are performed.

### 4.1 Result

- Designing a real time monitoring device, to determine the length of the drill hole and to determine the angles of drill hole and storing the data achieved while drilling operations

- Complete testing of model will provide us the results. Fabricated model would perform drilling with measured depth sensor by Gyroscope sensor, displaying all the actual values of live drilling depth and angles of drilling tools thus complete monitored operations are performed. Figure 4.shows the working of blynk app

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7
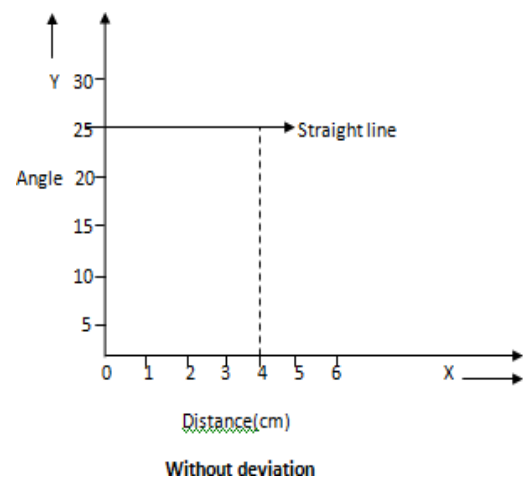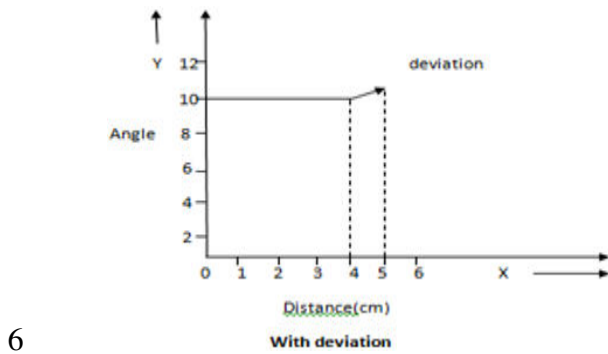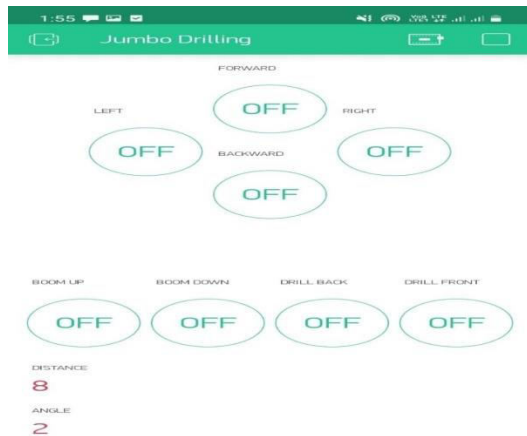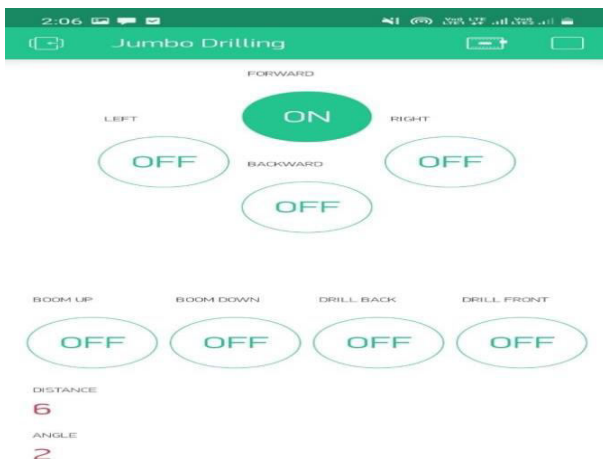
• The figure is from blynk app, which is taken from android phone which was through Wi-Fi connection, where the values can be viewed continuously.

### 5.0 Conclusion

A continuous monitoring device is developed to provide most accurate value so depth and angle of drill hole in underground mines. The device displays the values continuously to the required location. This wireless prototype jumbo drill machine will help the operator in underground mine to know the precision depth and angle of drill hole. He can operate it from far distance from the face. It also gives the better fragmentation because of accurate depth of all drilled holes. There is no deviation in drilled angle, so there won't be any large deviation due to this we can achieve better fragmentation of blasted material. All blasted materials have been equal size and it helps for further metallurgical process.

### 6.0 Future Work

Instead of laboratory experiment, these ideas can be implemented on full scale which can be used in real time mining operation. Using this proto type, the testing can be done on rock, as there is no sufficient time for implementing the laboratory scale on rock. We have tested on artificial model, have been cleared and tested was done. Using prototype, it can be implemented on the original rock and performance of the sensors can be studied.

Figure 4. Shows the working of blynk app

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# SUPERVISED MACHINE LEARNING TECHNIQUE FOR QUALITY ASSESSMENT OF WHEAT SEED

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## ABSTRACT

*Seeds are the basic input and raw material for attaining higher crop yields and sustained growth in agriculture production. These are the basic supply of protein and vitamins within the human food diet. However, wheat is one of the major higher proteins than major cereals. Because the quality of seed plays an important role in obtaining sensible yield however it's troublesome to seek out the good quality manually. To beat this downside, the Image Process technique and Machine Learning are accustomed to classify the seeds in step with their quality. Image analysis supported texture, morphology, and colour options of grains.*

*The paper presents a solution for quality analysis by Machine Learning. The attributes of datasets like perimeter, area, diameter, and centroid. The attributes of the texture dataset are Contrast, Correlation, Energy, Homogeneity are some of the characteristic parameters obtained from the images taken from the seed. By comparing each of the tested datasets (shape and texture) with the trained datasets using Machine Learning to classify the quality of seed.*

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*Keywords: Image Processing, Machine Learning, Quality of seed, State Vector Machnie.*

## I. Introduction

Wheat stands in second place after the rice as it is grown significantly all over India, since it is the commercial crop. It is a cultivated food crop in India (after rice), and feeds many scores of countries every day. It's a particularly vital staple food within the major states of Northern India. India accounts for approximately 9% of the whole wheat cultivation all over the world, countries like India, Nepal and Bhutan cultivated this crop abundantly. During the operation of the grain handling the data of the seed, quality is essential for various levels after these steps of operation are achieved. In the current scenario seed quality checking system, seed class and standards are swiftly evaluated by human observation [1]. However, this type of assessment is gradual and takes more time. Before boring seeds into the farm, it should be checked properly and then sowed. The analysing capacity of a seed quality supervisor can severely affect health and physiological state and work pressure, lack of expertise, working atmosphere such as low light, bad weather, etc [2]. In traditional methods, seed quality supervisors can identify the quality of seed by handpicking. A solution to this Digital Image Process provides an effective and accurate objective and accurate examination

Seed image assessment based on physical, structural, and for the assessment of structural features [3]. Hence, seed quality identification using Image Processing is very useful in the agriculture domain. gray features of seed is necessary for numerous applications in the seed industry along with classification of seed variety, assessing seed standard & detecting disease caused by insects. Image-processing alters the image of seed to make the image better, it also extracts information to analyze, recognize, and alter their size i.e., configuration, photo editing [4]. There are limitations in traditional seed testing methods because of human errors. With the help of this proposed method for the solution of quality assessment, we are using Image Processing, to achieve fast and accurate results.

### a) Image-Processing

This processing of images includes the handling of the representational process. Here images could embody improving the esthetical standard of the image, assessment of the knowledge of image, and condensation. A small indefinite amount ofiimage process are made into all photo-graphic components and procedures, due to restricted reaction aspects,

still, because of the method within them. Fashionable components are outlined with this perception of thoughts, and their reaction attributes are fastidiously built to compare the necessities of all benefits. So totally various feature color-films square measure out there for risk beneath day-light and beneath blazing lighting, to get a photo-graph in most cases within the image color-characters.

Most suitable image-process will be done out-with the digital-representational process. It is no longer not common to see pictures on digitized film employing digital-scanners; The current digital-image is then passed to improved distinction, color-balance, and image-sharpness [5][6]. The processed image will be o/p employing a digital-printing technology to get an image non-differentiable from a photograph made absolutely by chemical science, however enhanced image-tone and image-color replica factors [7]. These kinds of image-process, will happen with all the exceeding variety of hybrid seed, i.e., not fully chemical science and not fully digital and imaging change, is turning into more and more commonplace in client photofinishing. During this scenario, the purchasers could not receive completely negative & copies of their photos. However digital-files in the floppy-disk, a standard file types which are used at the time of writing for these floppy-disks for compression of image. So, the knowledge of a representative 35-mm '-ve' in digital means is concerning twenty mb, in the larger frames of television, whereas the .jpeg file is also generally forty thousand, that is nearly 3 less magnitude-order info than the 35-mm '-ve' in the order of magnitude but a film of standard National-Television-Standards-Committee broadcast tv. The latter-image is quite appropriate to the pc display show | little-prints, however not for increment too, say, to a sixteen × twenty in print, that to be relatable from any sensible 35-mm negative. The .jpeg format is presently fashionable shoppers World Health Organization wants to share their pictures to the net since the size of the file is more for the transmission over low information measure in the weak networks, transmission is not possible. The extremely condensed file-format additionally permits the completely o/p

of a thirty-six-exposure roll of thirty-five-mm frame to view on hardware disc. Hence all Image-Processing is done by with Digital-Image Processing-data, data of the technique concerned square measure on the far side of the scope of this entry.

### b) K-Nearest Neighbor (KNN)

K-Nearest Neighbor is one among the easiest Machine Learning algorithms, supported by the Supervised-Machine Learning technique. KNN algorithmic rule assumes the common factor between the new case/data and offered case/data and the data is placed in the class in which data are resembling. K-NN algorithmic rule holds all the offered case/data and categorizes the data with supported similarities. This suggests once new knowledge seems then KNN will be simply classified into a suite of similar data [8].

KNN algorithm uses the regression for the classification, however principally it's used for the grouping issues. KNN supervised algorithmic rule, which indicates that it doesn't have any assumption. It is called a lazy learner algorithmic rule as a consequence of it doesn't learn from the training set in real-time instead it reserves the new dataset and at the time of categorization, it executes associate degree changes on the training dataset[9]. KNN algorithmic changes at the training section and simply reserves the case/data set and whenever it has the new data, then it categories the case/data into the class of the same data with similar characteristics.

### c) Support vector Machine (SVM)

A support vector machine (SVM) is a supervised- machine learning technique classifies data of two-feature classification issues [10]. When giving associate degree SVM model sets of labels the training case/data for every group, to categorize into a new group. So SVM will be acting on a text classification downside. However, currently, you're assured in your dataset and desired to require it in a single iteration. SVM is a quick and dependable classification algorithmic program carries out with a restricted quantity in the case/data sets.

**Literature Review**

Mr. Sandip Ramdas Rao Mokle**:** [3] "Seed Quality Analysis Using Image Processing". In the referred paper, they have given an insight into the area of quality assessment of wheat by implementing the image processing in it and implementing it in the government seed banks. Sushma Sharma**:** [2] Reviewed article on "Image Analysis: A Modern Approach to Seed Quality Testing". In which sorting is mainly-based on distinct morphological, physical- -physiological characteristics. A strong technology is needed in the evolution for more precise, rapid, & non-fatal process of seed quality assessment. Ms. Mrinal Sawarkar: [3] "Digital-Image-Processing Applied to Seed Purity Test". This paper reports observation of various Digital-Image-Processing- Techniques to the grains quality assessment. It explains how imaging-technology is carried out in observing grain imbibitions, structural-behavior, examining the seed-size and other factors.

## Methodology

In this technique, the seed images are taken automatically by a high-definition camera to capture the image to be tested. These captured seed photos are modified and enhanced using appropriate convenient application software to produce the test data such as perimeter, area, diameter, centroid length, contrast, Correlation, Energy, and Homogeneity. Whenever we use this approach for various seeds, for different recognition or varietal studies, the seed morphology plays a significant role because the different seeds will have different structural and morphological characteristics among them due to their germination, so a minor modification algorithm is required for various seed and seed classes.

### 3.1.1 Area (AS)

It is described as some of the pixels residing inside the boundary of the seed.

### 3.1.2 Diameter

It's the mean average of the major-axis-length and minor

axis-length of the seed.

### 3.1.3 Centroid

Centroid is the mid-point of the seed and it acts

as geometric- center of the seed. The centroid of the seed is a locked point placed at the intersection of all of the hyper planes of symmetry inside the seed image. Centroid of a seed is the intersection of the major - axis and minor - axis of the seed.

### 3.1.4 Contrast

Contrast is the variations in brightness or color that form an image notable. In the observable approach of the actual world, the contrast describes the difference in the color and brightness of the object and other objects within the line of vision.
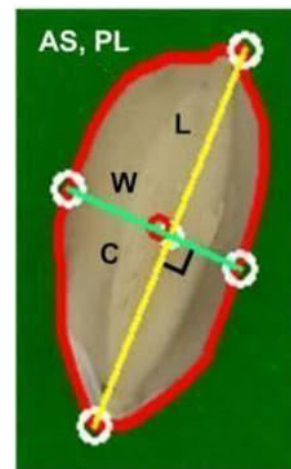


Fig 3.1 Image depicting feature extraction of the seed

Range = [0 (size (GLCM,1)-1) ^2]

Contrast is 0 for a constant image. The property Contrast is also known as variance and inertia.

### 3.1.5 Homogeneity

Homogeneity measures the compactness of the allocation of parts within the GLCM.

Range = [0 1]

### 3.1.6 Energy

Returns the total of square components within the GLCM.  Energy is described as uniformity and angular moment.

### 3.1.7 Correlation

Correlation calculates the joint probability function of the particular pixel pair.

Range = [-1 1]

Correlation is negative or positive 1 for

negative correlate images. Correlation is NaN for a continuing image.

In the foremost step, the seed to be tested is collected and is given as the input. Next step Pre-processing and modification of the seed, photos are done. So, noises in the seed photo are reduced. Then, convert the RGB image to grayscale. Next binary image is attained from the previously obtained gray image to aim the region of needs that is a pixel of need according to where they lie in color space and then shape and texture analysis is conducted
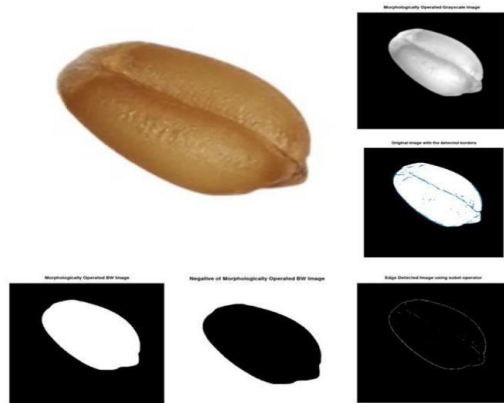


Fig 3.2 Various stages of Image Processing (Clockwise from upper left) a) Original image b) Morphologically operated grayscale image c) Original image with the detected boarders d) Edge detected using sobel operator e) Negative of Morphologically Operated BW Image f) Morphologically operated BW image

In the foremost step, the seed to be tested is collected and is given as the input. Next step Pre-processing and modification of the seed, photos are done. So, noises in the seed photo are reduced. Then, convert the RGB image to grayscale. Next binary image is attained from the previously obtained gray image to aim the region of needs that is a pixel of need according to where they lie in color space and then shape and texture analysis is conducted, In the above picture top left corner is original image and grayscale image in the top right corner, original image with detected border in the middle of right corner and sobel operator in the bottom right corner, and Negative of morphologically operated BW image at the center, morphologically operated BW image in the bottom left corner. after getting the output it is verified with the trained data by referring the KNN classifier. KNN technique, store all

the accessible data and classify a replicable data new character point formed on the common characteristics this means when the fresh characters appear it effortlessly classified into a well-suited group.
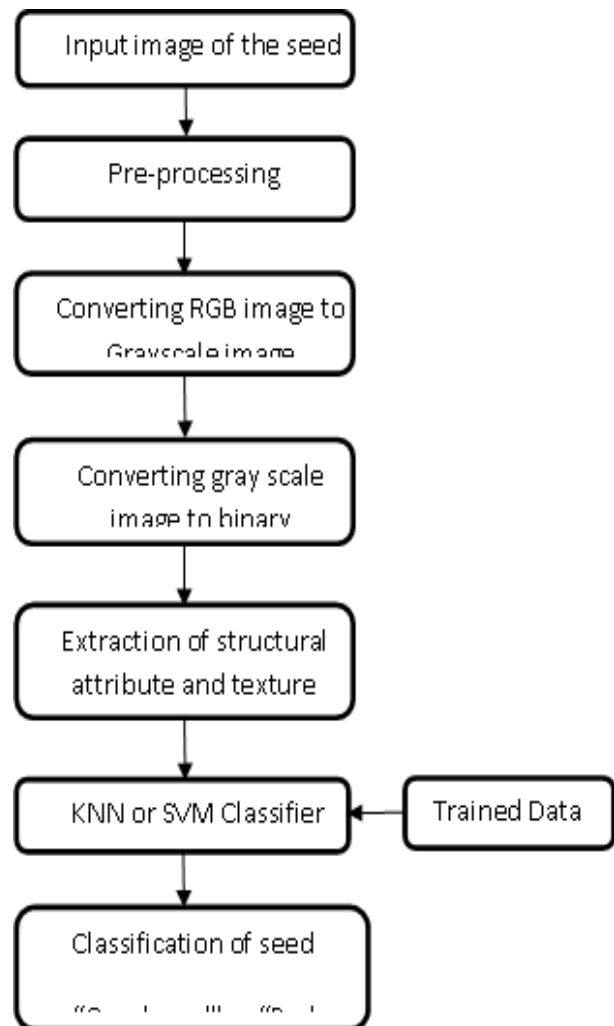


Fig 3.3 Flow Control Pre-processing and Classification of Seed

## IV Result

Thus, here classify's the Grade of Seed that is whether it is Good Quality or Bad Quality. Via this project, here going to examine the seed quality using Digital Image Processing Technique. The image processing algorithm is implemented by MATLAB.

For the purpose of experiment and assessment of quality of seed is done using KNN and SVM algorithm. Wheat is used as the seed for the testing of algorithm and so for created data set of 1200 good seed and 1200 bad seed. For representing the percentage of algorithm, the table 4.1 and table 4.2. To calculate the predicted results such as accuracy, F1 Score

and recall sensitivity are shown in confusion matrix in the table 4.3 and table 4.4.

| | Trial 1 (%) | Trial 2 (%) | Trial 3 (%) |
|---|---|---|---|
| Good Seed (300 Seeds) | 89 | 92 | 95 |
| Bad Seed (300 Seeds) | 90 | 89 | 93 |

**Table 4.1. KNN Results**

In Table 4.1 shows the three experiment trials for KNN algorithm in which 300 different good seeds and 300 bad seeds are tested in the 3 different trials. In the first trial for 300 good seeds and 300 bad seeds are tested in which 89 and 90 respective true values are obtained. In the second trial for 300 good seeds and 300 bad seeds are tested in which 85 and 78 respective true values are obtained. In the third trial for 300 good seeds and 300 bad seeds are tested in which 83 and 86 respective true values are obtained. The same testing method is done for SVM and the results are tabulated in the Table 4.2.

| | Trial 1(%) | Trial 2(%) | Trial 3(%) |
|---|---|---|---|
| Good Seed (300 Seed) | 79 | 85 | 83 |
| Bad Seed (300 Seed) | 83 | 78 | 86 |

**Table 4.1. SVM Results**

The figure 4.1 and figure 4.2 are the graph showingclassification efficiency of three different trails in KNN and SVM algorithm of the table 4.1 and 4,2
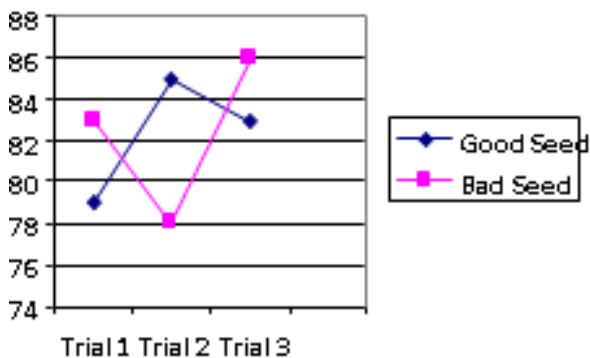


Fig 4. 1. Classification accuracy of KNN
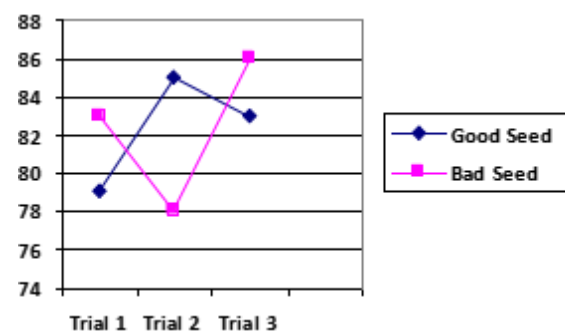


Fig 4.2 Classification accuracy of SVM

| Total Population =P+N =300+300=600 | Predicted Condition Positive (PP) | Predicted Condition Negative (PN) |
|---|---|---|
| Actual Condition Positive(P) | True Positive (TP) 267 | False Negative (FN) 45 |
| Actual Condition Negative(N) | False Positive (FP) 33 | True Negative (TN) 255 |

Table 4.3. Confusion Matrix for KNN results

Total number of samples tested is 200 out of those 100 good seeds and 100 bad seeds are taken. For KNN out of 100, 89 true positive and 11 false positive with the efficiency of 89% is obtained for good samples, and 15 false negative and 85 true negative with the efficiency of 85% is obtained for bad samples.

The confusion matrix of KNN algorithm based output is as shown in Table 4.3. This table shows the definite diagonal in the confusion matrix, to obtain:

Accuracy (Acc) = 87%

$F_1$score =87.25%

Recall Sensitivity (SEN)=85%

| Total Population<br>=P+N<br>=100+100=200 | Predicted Condition Positive (PP) | Predicted Condition Negative (PN) |
|---|---|---|
| Actual Condition Positive(P) | True Positive (TP)   87 | egative<br>9 |
| Actual Condition Negative(N) | False Positive (FP) 13 | True Negative (TN)  81 |

**Table 4.4. Confusion Matrix for SVM results**

Total number of samples tested is 200 out of those 100 good seeds and 100 bad seeds are taken. For KNN out of 100, 87 true positive and 13 false positive with the efficiency of 87% is obtained for good samples, and 19 false negative and 81 true negative with the efficiency of 81% is obtained for bad samples.

The confusion matrix of SVM algorithm based output is as shown in Table 4.4. This table shows the definite diagonal in the confusion matrix, to obtain:

Accuracy (Acc) = 84%

$F_1$score =84.46%

Recall Sensitivity (SEN)=81%

**Conclusion**

Seeds are the basic input for attaining higher crop yields, an attempt is made to resolve this issue image processing done to obtain the grading wheat seed by extracting the structural and morphological attributes through the image processing by doing the modification on the image of seed. Machine Learning is used to create a data base so that whenever the new set of seed image is given it classify it by comparing it with created data set.

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# OPTIMIZATION OF PROCESS PARAMETERS OF HYDRODYNAMIC JOURNAL BEARING BY MOGA APPROACH

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## ABSTRACT

*Optimization of a hydrodynamic journal bearing is most required because of their usage supports machineriethatch rotate at high speeds such as compressors and turbines. It is difficult to optimize the bearing parameters using conventional algorithms as they require non-linear optimization with constraints. Genetic Algorithms (GAs) are the class of algorithms and it is general-purposese algorithm that could achieve the process parameters with all the available constraints. In this work, the geometric parameters and their range such as variance ratio (0 - 1), journal radius (25 - 65), radial clearance (30 - 60), dynamic viscosity (0.026 - 0.046), surface pattern parameters (1/6) and surface roughness parameter (15 - 30) were used as an input for training the ANN model and to evaluate the performance that would result in optimal value of minimum fluid film thickness, frictional torque and critical journal mass of journal bearing. It has been carried out for the bearings having isotropic type of roughness patterns using the Multi Objective Genetic algorithm (MOGA) approach. Using Pareto optimal concept, the optimization of design parameters has been evaluated. The designed model using MOGA Approach shows a satisfying response compared to experimented data for the roughness pattern.*

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## Introduction

Hydrodynamic journal bearing shows a satisfactory performance for functioning of pumps, compressors etc. It operates continuously at high speed and heavy loads [1]. They have good load-carrying capacity, excellent stability, durability and low coefficient of friction. A shaft with a circular form called as a journal and it made to rotate in a fixed sleeve called as a bearing. It works on hydrodynamic principles, as the shaft rotated it creates an oil wedge that supports the shaft within the bearing clearances. Journal bearings are of many designs for compensating varying load requirements such as speeds, cost with many dynamic properties.The journalbearingsaremore criticaltoany rotary operationfromthepointofviewof durability and performance.Hence, the techniques for the development of enginebearinganalysis havebeen receivedattentionovertheyears.The design of such bearings rely upon thin-film hydrodynamic lubrication theory, which shown a separation of two surfaces in relative motion. In many of the real applications, the journal bearing designers face more problemfor the simultaneous optimization of several objectives together. Those of the objectives are often incomparable and conflicting. Bearing

parameters optimization is of non-linear optimization along with constraints [2], By conventional optimization algorithms it is difficult to solve this problem because of problems of convergence speed or accuracy. In increasing demand of initial and running costs for the bearings, to withstand the competition, so prompted engineers to apply optimization methods in the design of bearings.Hashimoto.et.al [3] studied the optimization model for the journal bearings with hydrodynamic case and applications of this to elliptical bearing design for machineries which rotates at high speeds.A problem can be defined as anoptimization problem with a pair of an objective functions,constraints and the variables of the function. The prime objective is to finding out the values of the variables that lead to an optimal value of the function, satisfying all the constraints.

The concept of multi-objective optimization is used in many practical situations rather than a single objective, a multiple objectiveswith a constraint parameter space, there by getting a name as multi-objective optimization. The problem in a multi-objective optimization can be mathematically represented as shown in Equation 1.

$$optimize\ f(r) = \begin{bmatrix} f_1(r) \\ f_2(r) \\ . \\ . \\ f_n(r) \end{bmatrix} subjected\ to\ c(r) \geq 0;\ n \geq 2$$

---------------------- (1)

Here, r is the parameter vector, f(r) is the objective vector and c(r) is the constraint vector.

The concept of genetic algorithms is new in the field of bearing analysis design, and a limited work has been carried out in rotor-bearing system using genetic algorithms. Artificial Neural Network (ANN) model have been developed which predicts the value of various stability characteristics in journal bearing design, based on geometric and operating conditions. A genetic algorithm was then applied to the trained ANN model to determine the geometric parameters that results in a nearest value.

## Methodology

The following methodology has been adopted for the development of the concepts of ANN and MOGA Approach.

### 2.1. Optimization of Journal Bearing

Clearly knowing the objectives of the work, methodology is framed targeting to develop the hydrodynamic simulation tool for the calculation of performance parameters of journal bearings in the accurate way. Then ANN and GA are developed to predict the performance parameter and to perform optimization of journal bearing respectively. Artificial Neural Networks (ANNs) and Genetic Algorithms(GAs) concepts together are used to develop an optimizing tool which can be used in investigating the relationship between various bearing parameters in a design

process. The following steps must be carefully designed in evaluating the performance of the designed parameters. They may be: 1. Selection of design variables 2. Hydrodynamic Simulation 3. Use of Artificial Neural networks and 4.Optmization of the process.

### 2.1.1 Design of ANN for Journal Bearing Optimization

The learning capabilities were achieved for a neuron by adjusting the weights according to a selected algorithm. The model of typically artificial neuron along with a multi layered neural network is shown in Figure.1. Flow of signal in the direction of inputs $x_1$, $x_2$, $x_3$………$x_n$ were considered as a single directional shown by arrows as a signal output (O). The outputO is shown as per Equation 2.

$$O = f(net) = f\left(\sum_{j=1}^{n} w_j x_j\right)$$

--------------------------------------- (2)

Where $w_j$ is weighted vector and the function f(net) could refer as a transfer function or activation function. The term 'net' is defined as the product of scalar of vectors of the weights and inputs (Equation 3).

$$net = w^T x = w_1 x_1 + \_\_ + w_n x_n$$

--------------------------------------- (3)

Where T is transpose of a matrix, output Oin simple form is stated as (Equation 4),

$$O = f(net) = \begin{cases} 1 & if\ w^T x \geq \theta \\ 0 & otherwise \end{cases}$$

--------------------------------------- (4)

Where $\theta$ is the level of thresholds.
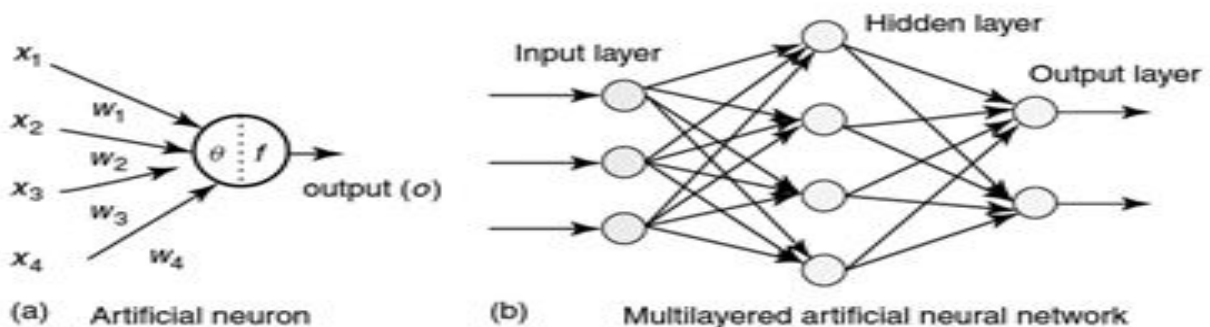


Figure. 1. Schematic of an artificial neuron and a multi layered artificial neural network

### 2.1.2 Genetic Algorithm

Genetic algorithms in brief are used as a class of algorithms in search spaces that could be of discontinuous and nonlinear. As compared to other optimization techniques, they do not rely on local derivatives for guiding the search process.

### 2.1.3 Objective Functions

These are the functions which could significantly specify the quantities to be maximized or minimized under the prescribed level of constraints. In the design of hydrodynamic journal bearing, three important objective functions used are mainly minimum oil film thickness ($\bar{h}_{min}$), critical journal mass ($\overline{M}_{CJ}$) and frictional torque on journal surface ($\overline{T}_{FJ}$). The objective functions for Multi Objective Genetic Algorithm (MOGA) connected to testing model of ANN are

f(1) = simulation (net1, r)

f(2) = simulation (net2, r)

f(3) = simulation (net3, r)

Where 'r' is the design variable vector and net1, net2 and net3 are the networks for the target vectors of $\bar{h}_{min}$, $\overline{M}_{CJ}$ and $\overline{T}_{FJ}$ respectively.

### Results and Discussions

The MOFT ($\bar{h}_{min}$), frictional torque on journal surface ($\overline{T}_{FJ}$) and critical journal mass ($\overline{M}_{CJ}$) for a journal bearing is computed in the hydrodynamic model for the following fixed geometric parameters of the bearing:

- Speed of the bearing = 3000 rpm
- Maximum load on bearing = 15000 N
- Aspect ratio, $\lambda = L/D = 1.0$
- Power law index, n = 1.0
- Supply pressure, Ps = 0.5 N/mm$^2$

### 3.1 Pareto Optimal Concept

In the multi objective optimization, a vector x=[x$_1$,x$_2$,...x$_k$] are considered as a more optimal than a vector y=[y1,y2,...yk] if x dominated y. The set of Pareto optimal called as a non-dominatedsolutions forms a Pareto surface P (Figure 2) maximization of required objective function can be obtained by assigning negative value so that the minimization of negative objective function is same as its maximization [2, 5]. Hence, maximization of objective function can be obtained from these entire Pareto front plots by neglecting its negative values.
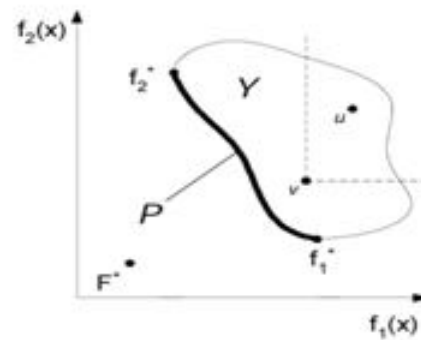


Figure 2: Pareto optimal front

### 3.2 Genetic Algorithm Implementation

**Table 1: The options set up for the MOGA approach [6, 7]**

| Sl. No. | Options | Specification |
|---|---|---|
| 1 | Population type | Double vector |
| 2 | Population size | 15*number of variables |
| 3 | Selection function | Tournament |
| 4 | Tournament size | 2 |
| 5 | Crossover fraction | 0.8 |
| 6 | Mutation function | Constraint dependent |
| 7 | Crossover function | Heuristic |
| 8 | Crossover ratio | 1.0 |
| 9 | Migration direction | Forward |
| 10 | Migration fraction | 0.2 |
| 11 | Migration Interval | 20 |
| 12 | Distance measure function | @distance crowding |

| 13 | Pareto front population fraction | 0.35 |
|----|----------------------------------|------|
| 14 | Maximum generation | 200*number of variables |
| 15 | Time limit | Infinity |
| 16 | Fitness limit | -Infinity |
| 17 | Stall generations | 100 |
| 18 | Function tolerance | 1e-4 |
| 19 | Plot function | Pareto front |
| 20 | Evaluate fitness function | In serial |

Since MOGA always performs the minimization of any objective functions, the maximization of required objective function can be obtained by assigning negative value so that the minimization of negative objective function is same as its maximization [4, 5]. Hence, maximization of objective function can be obtained from these entire Pareto front plots by neglecting its negative values.

### 3.3 Optimization Results

The optimization results of variance ratio ($V_{rj}$), journal radius ($R_J$), radial clearance ($C$) and dynamic viscosity ($\mu$) for the maximization of MOFT ($\bar{h}_{min}$) and critical journal mass ($\bar{M}_{CJ}$) and minimization of friction torque ($\bar{T}_{FJ}$) are presented in the form of Pareto front in Figures 4.10 to 4.18. These results are also tabulated in Table 2

### 3.3.1 Optimization results for isotropic roughness patterns

**Table 2: Pareto optimal designs for maximization of $\bar{h}_{min}$ and minimization of $\bar{T}_{FJ}$ for bearing with isotropic roughness pattern ($\gamma$ =1)**

| Design options | $\bar{h}_{min}$ | $\bar{T}_{FJ}$ | $V_{rj}$ | $R_J$ (mm) | $C$ (µm) | $\mu$ (Pas) | $\Lambda$ |
|----------------|-----------------|----------------|----------|------------|----------|-------------|-----------|
| 1 | 0.99951 | 689.27 | 0.90318 | 52.703 | 36.721 | 0.041772 | 18.3605 |
| 2 | 0.99331 | 633.84 | 0.83431 | 52.642 | 37.635 | 0.040657 | 18.8175 |
| 3 | 0.99322 | 531.31 | 0.71921 | 64.982 | 50.804 | 0.04153 | 25.402 |
| 4 | 0.99056 | 447.23 | 0.76356 | 64.868 | 54.991 | 0.041286 | 27.4955 |
| 5 | 0.98216 | 399.36 | 0.25258 | 62.39 | 56.055 | 0.040855 | 28.0275 |
| 6 | 0.95134 | 332.97 | 0.7994 | 53.376 | 52.794 | 0.040577 | 26.397 |
| 7 | 0.92696 | 277.67 | 0.89412 | 52.246 | 55.899 | 0.039546 | 27.9495 |
| 8 | 0.89716 | 272.36 | 0.7432 | 55.543 | 52.635 | 0.029697 | 26.3175 |
| 9 | 0.87225 | 247.52 | 0.90345 | 52.138 | 51.876 | 0.029763 | 25.938 |
| 10* | 0.85607 | 206.97 | 0.72659 | 53.616 | 58.182 | 0.029606 | 29.091 |
| 11* | 0.8371 | 188.17 | 0.29784 | 52.436 | 58.473 | 0.028274 | 29.2365 |
| 12 | 0.77639 | 185.64 | 0.69801 | 45.437 | 52.403 | 0.029241 | 26.2015 |
| 13 | 0.71987 | 170.38 | 0.26546 | 42.7 | 53.706 | 0.031181 | 26.853 |
| 14* | 0.71383 | 146.84 | 0.47549 | 45.164 | 58.354 | 0.027692 | 29.177 |
| 15 | 0.68117 | 140.26 | 0.25391 | 43.905 | 58.699 | 0.027559 | 29.3495 |
| 16 | 0.58604 | 128.65 | 0.21557 | 40.233 | 58.844 | 0.027414 | 29.422 |
| 17 | 0.47723 | 119.78 | 0.20508 | 35.894 | 59.293 | 0.027342 | 29.6465 |

Figure 3 (a) shows the Pareto front for the combination of objective functions $\bar{h}_{min}$ and $\bar{T}_{FJ}$ for the case of isotropic roughness pattern ($\gamma$ =1). Pareto optimality has provided 25 design options, among which the best ones are selected from the plot. The optimized values of the design parameter for first and second options are, $V_{rj}$ = 0.72659, $R_J$ = 53.616 mm, $C$

= 58.182 µm, $\mu$ = 0.029606 Pas and $V_{rj}$ = 0.47549, $R_J$ = 45.164 mm, $C$ = 58.354 µm, $\mu$ = 0.027692 Pas respectively.

Average spread in Figure 3(b) shows that optimization terminated after 182 generations. And the average spread is observed to be 0.16586.
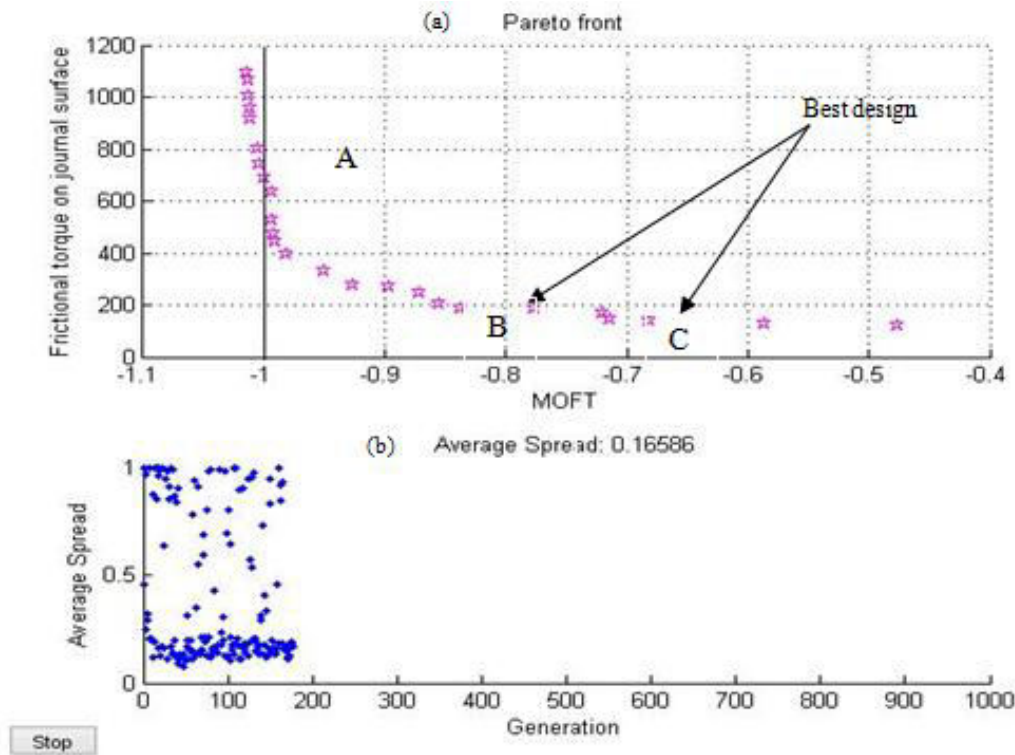
Figure 3: MOGA results for maximization of $\bar{h}_{\min}$ and minimization of $\bar{T}_{FJ}$ for bearing with isotropic roughness pattern ($\gamma$ =1) (a) Pareto front and (b) Average spread of individual.

**Table 3: Pareto optimal designs for maximization of $\bar{h}_{\min}$ and $\bar{M}_{CJ}$ for bearing with isotropic roughness pattern ($\gamma$ =1)**

| Design options | $\bar{h}_{\min}$ | $\bar{M}_{CJ}$ | $V_{rj}$ | $R_J$ (mm) | $C$ (µm) | $\mu$ (Pas) | $\Lambda$ |
|---|---|---|---|---|---|---|---|
| 1 | 0.99873 | 74.653 | 0.75739 | 51.03 | 32.238 | 0.041975 | 16.119 |
| 2 | 0.99784 | 77.613 | 0.879 | 50.211 | 33.582 | 0.041875 | 16.791 |
| 3 | 0.99088 | 86.219 | 0.87002 | 47.987 | 32.413 | 0.042148 | 16.2065 |
| 4 | 0.98616 | 91.979 | 0.86513 | 46.673 | 32.623 | 0.042206 | 16.3115 |
| 5 | 0.98445 | 95.339 | 0.64575 | 45.934 | 32.947 | 0.041306 | 16.4735 |
| 6 | 0.97631 | 102.95 | 0.93377 | 44.451 | 31.698 | 0.042353 | 15.849 |
| 7 | 0.97352 | 106.75 | 0.84917 | 43.728 | 32.537 | 0.041713 | 16.2685 |
| 8 | 0.95315 | 118.15 | 0.90812 | 41.66 | 32.279 | 0.043327 | 16.1395 |
| 9 | 0.95277 | 123.24 | 0.81268 | 40.803 | 32.381 | 0.041795 | 16.1905 |
| 10 | 0.94928 | 125.7 | 0.86462 | 40.4 | 32.207 | 0.041949 | 16.1035 |
| 11 | 0.94139 | 130.84 | 0.82761 | 39.532 | 31.674 | 0.042352 | 15.837 |
| 12 | 0.93069 | 135.35 | 0.90058 | 38.803 | 32.274 | 0.04261 | 16.137 |
| 13 | 0.92769 | 137.94 | 0.90393 | 38.383 | 32.202 | 0.042175 | 16.101 |
| 14 | 0.92439 | 139.68 | 0.84938 | 38.084 | 31.644 | 0.042712 | 15.822 |
| 15 | 0.91686 | 142.75 | 0.83815 | 37.578 | 31.85 | 0.042836 | 15.925 |
| 16 | 0.9143 | 143.3 | 0.73601 | 37.458 | 32.705 | 0.042057 | 16.3525 |
| 17 | 0.91257 | 146.76 | 0.9019 | 36.935 | 31.625 | 0.04134 | 15.8125 |
| 18 | 0.90662 | 148.82 | 0.9226 | 36.596 | 31.548 | 0.040674 | 15.774 |
| 19 | 0.90232 | 150.92 | 0.94987 | 36.253 | 31.547 | 0.040904 | 15.7735 |
| 20 | 0.89256 | 153.13 | 0.98112 | 35.898 | 32.193 | 0.042519 | 16.0965 |
| 21 | 0.88496 | 156.05 | 0.97222 | 35.409 | 31.713 | 0.043146 | 15.8565 |
| 22* | 0.87197 | 158.49 | 0.98601 | 35.002 | 31.54 | 0.044433 | 15.77 |
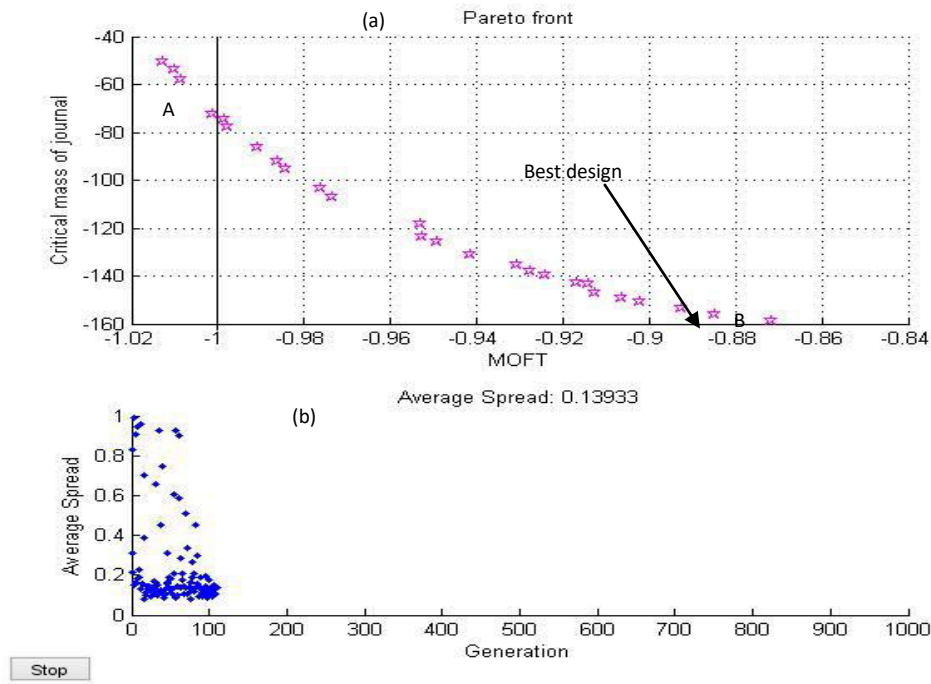
Figure 4: MOGA results for maximization of $\overline{h}_{min}$ and $\overline{M}_{CJ}$ for bearing with isotropic roughness pattern ($\gamma$ =1) (a) Pareto front and (b) Average spread of individual.

**Table 4: Pareto optimal designs for maximization of $\overline{M}_{CJ}$ and minimization of $\overline{T}_{FJ}$ for bearing with isotropic roughness pattern ($\gamma$ =1)**

| Design options | $\overline{M}_{CJ}$ | $\overline{T}_{FJ}$ | $V_{rj}$ | $R_J$ (mm) | $C$ (μm) | $\mu$ (Pas) | $\Lambda$ |
|---|---|---|---|---|---|---|---|
| 1 | 158.04 | 303.76 | 0.99454 | 35.003 | 37.935 | 0.041749 | 18.9675 |
| 2 | 157.95 | 291.54 | 0.98392 | 35.005 | 38.4 | 0.040773 | 19.2 |
| 3 | 157.83 | 274.29 | 0.98582 | 35.007 | 38.925 | 0.039169 | 19.4625 |
| 4 | 157.8 | 269.51 | 0.98725 | 35.004 | 39.875 | 0.04022 | 19.9375 |
| 5 | 157.72 | 260.59 | 0.98004 | 35.005 | 39.568 | 0.038345 | 19.784 |
| 6 | 157.67 | 256.52 | 0.98065 | 35.006 | 39.357 | 0.037468 | 19.6785 |
| 7 | 157.61 | 249.11 | 0.99433 | 35.007 | 39.751 | 0.037039 | 19.8755 |
| 8 | 157.52 | 245.3 | 0.98024 | 35.006 | 39.465 | 0.035942 | 19.7325 |
| 9 | 157.47 | 238.78 | 0.97582 | 35.009 | 40.437 | 0.036569 | 20.2185 |
| 10 | 157.27 | 233.05 | 0.98309 | 35.01 | 39.541 | 0.033782 | 19.7705 |
| 11* | 157.24 | 226.8 | 0.98701 | 35.006 | 40.058 | 0.033586 | 20.029 |
| 12 | 157.14 | 220.39 | 0.97385 | 35.005 | 40.523 | 0.033186 | 20.2615 |
| 13 | 156.91 | 213.23 | 0.95389 | 35.008 | 40.442 | 0.031481 | 20.221 |
| 14 | 156.76 | 208.08 | 0.98102 | 35.005 | 39.94 | 0.029448 | 19.97 |
| 15 | 156.18 | 193.54 | 0.94973 | 35.008 | 44.741 | 0.034935 | 22.3705 |
| 16 | 156.15 | 188.52 | 0.97997 | 35.007 | 45.612 | 0.03514 | 22.806 |
| 17 | 156.02 | 181.17 | 0.9766 | 35.005 | 46.265 | 0.034342 | 23.1325 |
| 18 | 155.78 | 174.48 | 0.93969 | 35.012 | 46.96 | 0.033612 | 23.48 |
| 19 | 155.61 | 171.91 | 0.95389 | 35.008 | 45.4 | 0.030318 | 22.7 |
| 20* | 155.51 | 162.95 | 0.9635 | 35.007 | 49.138 | 0.033527 | 24.569 |
| 21 | 155.2 | 150.43 | 0.94854 | 35.007 | 50.108 | 0.030753 | 25.054 |
| 22 | 154.89 | 145.85 | 0.94244 | 35.033 | 51.194 | 0.030552 | 25.597 |
| 23 | 154.75 | 138.22 | 0.94823 | 35.01 | 51.609 | 0.028356 | 25.8045 |
| 24 | 154.31 | 128.75 | 0.92635 | 35.013 | 54.3 | 0.027625 | 27.15 |
| 25 | 153.73 | 122.98 | 0.88337 | 35.023 | 56.894 | 0.027469 | 28.447 |
| 26 | 152.79 | 119.92 | 0.51698 | 35.035 | 57.862 | 0.026929 | 28.931 |
| 27 | 152.09 | 116.42 | 0.5154 | 35.125 | 58.633 | 0.026063 | 29.3165 |
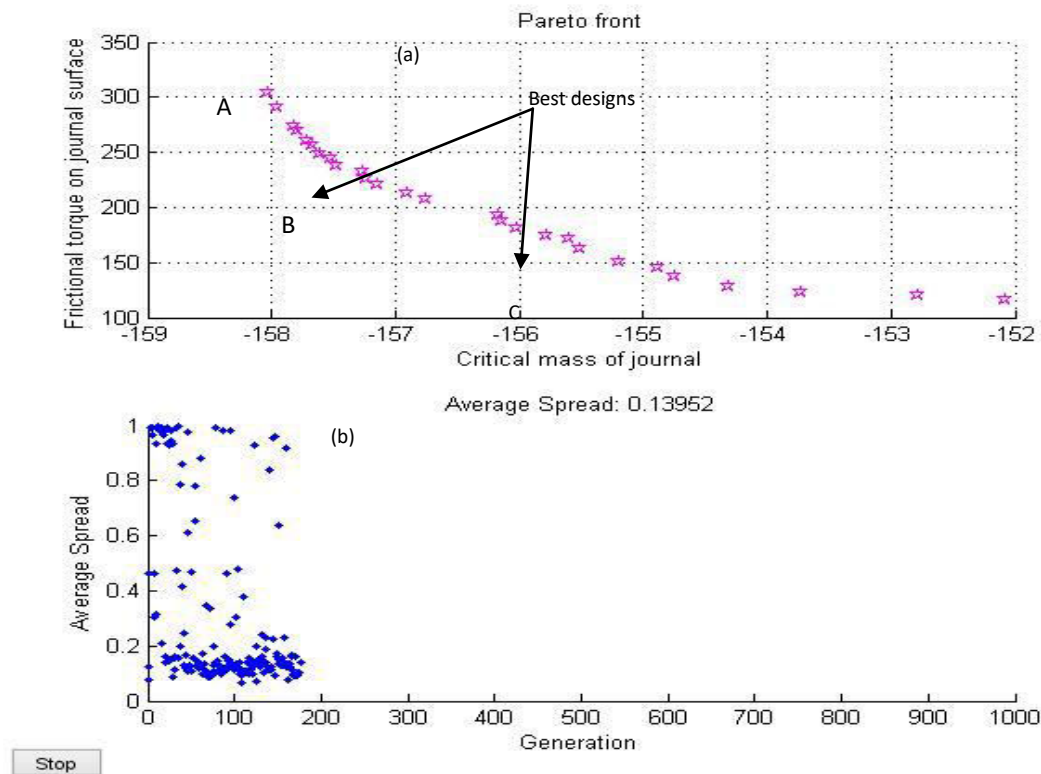
Figure 6: MOGA results for maximization of $\overline{M}_{CJ}$ and minimization of $\overline{T}_{FJ}$ for bearing with isotropic roughness pattern ($\gamma =1$) (a) Pareto front and (b) Average spread of individual.

## Conclusion

Genetic algorithm has been developed and customized to use the Artificial Neural Network simulation results of objective functions for the optimization process. The results shows a suitability of Artificial Neural Network (ANN) and Multi-objective Genetic Algorithm (MOGA) techniques of MATLAB is difficult and important task has been achieved. Achievement of regression value above 99% and shows a closer agreement between predicted and expected value of all the three output functions shows the suitability of ANN in Multi-objective Genetic Algorithm optimization problem. Using MOGA technique, the maximization of minimum oil film thickness and critical journal mass minimization of frictional torque has been carried out for isotropic type roughness pattern. Pareto optimal concept was utilized to predict the best design options for the maximization and/or minimization of two selected objective functions together. For maximization of minimum oil film thickness and minimization of frictional torque of bearing having isotropic roughness pattern, designer has two choices as per the priority given for the above objective functions.

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# A GREENER APPROACH TO HARVEST ENERGY USING PIEZO SPEED BREAKER

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## ABSTRACT

*The power saving, generating, and compensating is the deal of the day. A lot of effort has been spent to generate power from speed breaker and many methods are implemented for the same. This strategy for the Electrical force age needs mechanical input. This project is carried out by utilizing a straightforward drive system, for example, piezo and roller, some interfaced Electrical segments. The electro-motor force generator is a technique for creating power by outfitting the active energy of vehicles that rolls over the track. To vanquish this, we need to accomplish the methodology of ideal utilization of customary focal points for the preservation of energy. The tally of automobiles ignoring speed breakers on streets has extended these days. Such speed breakers are conscious for substantial autos, as it extends the data power and finally results in growing the power.The principal approach of the undertaking is to ease up the streetlamp and to light the towns using the snapping pressure over speed breaker in parkways and the side of the road.Accordingly, mechanical energy can be changed to electrical energy by employing a generator or dynamo which can be put away with the utilization of a battery. This energy is saved during the daytime can be deployed around evening time to light the streetlamps. Consequently, by exploiting this approach a lot of energy can be rationed which can be utilized to content future proposition.*

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*Keywords: Speed breaker, Piezo devices, Roller mechanism, Belt drive mechanism, Electro-mechanical unit.*

## 1. Introduction

An inventive and helpful idea of Creating Power from a Speed breaker to advance the circumstance and fulfill the need for power. As we realize that power is the type of energy and it is otherwise called the progression of electric force. In the former times before power era started tolerably more than hundred years prior, food was refrigerated in iceboxes, houses were lit with oil lamps, and rooms are warmed by coal-consuming or wood-consuming ovens. Power age was initially starting during the 1800s utilizing Faraday's dynamo generator. Nearly two hundred years after the fact we are as yet utilizing alike primary standards to create power, just on a lot larger scope. Currently we cut down some light on the exceptionally new and inventive idea i.e., producing power using SPEED BREAKER. Creating electric force using a speed breaker is another idea. The convenience of effective customary petroleum derivatives will be the fundamental hotspot for power age, however, there is an anxiety that they will get depleted in the long run by the following not many years. Such that, we need to investigate some

surmised, elective, new hotspots for power age, which are not drained by the not many years. Some other serious issue, that is spark off the energizing topic for now could be infection. It ensures each one of the living existences forms, all things considered, at the land, in water, and air. Force stations and cars are the massive infection developing locations [3]. Along these lines, we need to investigate distinct kinds of inexhaustible assets, which produce power without utilizing any enterprise petroleum derivatives, which isn't always growing any dangerous objects. There are going before such frameworks utilizing environmentally friendly power like OTEC (sea nuclear power transformations) and so on for power age. The most recent innovation which is applied to deliver the force is the" Force Mound" The number of automobiles on avenue is expanding quickly and if we convert a portion of the in all like hood power of these autos into the rotational movement of the generator then we can create a lot of power.

At present we are confronting a deficiency of power. Power can be started deploying speed breakers, unusual, right? The lead from this

thought will be to create power for the streetlamps and other use. When the vehicle is moving it produces different types of energy, due to grating between vehicle's haggle, rather than squandering this energy that is richly around us, we can use it to create ELECTRICAL ENERGY. It deals with the major of "Transformation of POTENTIAL ENERGY TO ELECTRIC ENERGY". Potential energy can be considered, as the energy put away inside an actual framework [1].

In this paper, we have proposed a lot less complex strategy by utilizing a piezoelectric transducer (PZT) which changes over the electric dashes into energy delivered from the movement vibration of the vehicle. This plan precludes the execution of any kind of mechanical hardware, accordingly making the framework simpler to embrace. An AC to DC rectifier is used to foster a versatile circuit to collect energy productively utilizing a switchable DC to DC converter. At the point when vehicles proceed onward the street, a lot of motor energy is created. Utilizing this vibration of the vehicle and the proposed inserted piezo-circuit executed on the surfaces of the parkway or streets, energy will be created which can be put away in the battery. Later on, the put-away energy can be utilized for working the side of the road streetlamps, and traffic light lights.

The requirements are as follows:

1. Roller.

2. Piezodevices.

3. Bearing.

4. Pulley.

5. Battery.

6. LightLoad.

## 2. Methodology Adopted

At whatever point an approaching vehicle disregards a speed breaker, the speed breaker is made in such a way that it redirects upward. This avoidance is delivered as heat energy. Utilizing a manufactured speed breaker with piezoelectric generators, part of this energy the vehicle develops speed breakers twisting is changed into electric energy through direct piezoelectric impact as opposed to being squandered as heat energy.

### 2.1 Roller Implementation.

Here, a roller is outfitted within the middle of a speed breaker, and a hold is given, so when a vehicle dismisses the speed breaker it turns the roller. This improvement of roller is utilized for turning the shaft of the D.C. generator with the assistance of a belt drive that is deployed to give diverse speed proportions. As the shaft of the D.C. generator pivots, it produces power. This power is put away in a battery. Then, at that point, the yield power is utilized to ease up the streetlights out and about. During the daytime, we needn't bother with power for easing up the streetlights so we make use of a control switch which is physically worked. The control switch is associated with the yield of the battery. The switch has an OFF/ON instrument that permits the current to gush when required [5].

The main boundary of the roller instrument that is utilized to build up energy from the momentum breaker is the grating between the wheels of vehicles and the roller. The main impetuses should be determined influencing the speed breaker and front vehicle wheel.



Fig 2.1 Roller system implementation

While moving the vehicle disregarding the roller, the erosion power between the vehicle's haggles roller, will turn the roller. A pulley associated with the roller will move the rotational movement to the generator pulley through the belt. Utilizing the sensors to quantify the voltage, current, and roller insurgencies then, at that point utilizing the yield to compute the force. The roller component framework execution is as displayed in fig 2.1.

## 2.2 Harvesting energy by using Piezo electric material.

Piezoelectric materials enjoy upper hands over other conventional energy transformation strategies and due to their electromechanical coupling impact, that implies the capacity to deliver electrical charge when exposed to an outer burden and then again capacity to create a mechanical deformity when under an electric field, they have drawn a ton of consideration these days. Piezoelectric materials are being utilized a ton as sensors and actuators. Quite possibly the main reason for the new fame of piezoelectric materials is additionally a direct result of their electromechanical coupling impact can be changed essentially. In 1880, Pierre Curie and Jacques Curie initially exhibited the direct piezoelectric impact that is interior age of electric charge by applying mechanical power. Long periods of study prompted the new lead zirconate titanate materials, additionally alluded as PZT materials, which are among the most regularly utilized piezo electric materials now a days. In the proposed model with the new plan, a piezoelectric composite plate gatherer installed in the asphalt is intended to gather the piezoelectricity, when vehicle is going through the asphalt. Because of the avoidance of the piezo electric layer, the anxiety delivered in the piezoelectric layer are high so the normal force age is generally high in our composite plate structure.

Piezoelectric materials can produce electrical energy from mechanical energy. The vibrations will be created from the contact between hindrances and vehicles then, at that point convert this mechanical conduct to power. The speed breaker is partitioned into three sections, the upper part, part with piezo electric material and lower part. The upper part can be disengaged from the lower part, and the lower part is fixed to the street [6]. In [12] piezoelectric sensors employed as an info supply to the converter it modifies over AC to DC supply. The converter yield is given to the battery as it's anything but a 12Vbattery, and its yield is given to the inverter. Inverter yield is given to their lay driver circuit and transfer driver is controlled utilizing regulator.
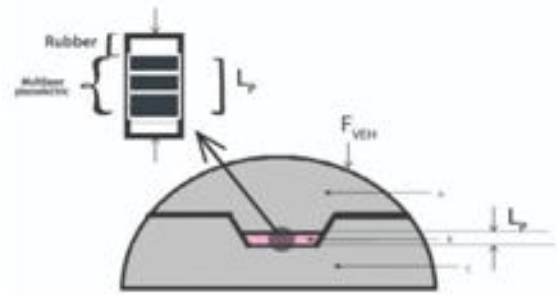


Fig 2.2 Piezo electric parameters

In the execution part, we will utilize piezoelectric signals which comprise of metallic segments like copper and piezoelectric material like quartz, sucrose, and so on the ringers are associated with the semiconductors utilizing interfacing wires to store the voltage delivered by the piezoelectric material by applying tension on it. Further, these semiconductors will be associated with the LED lights which will illuminate when exposed to the voltage delivered by the piezoelectric ringers. We will utilize semiconductors of microfarad esteem which ranges between 1 to 22mF. To get the tension on the piezoelectric signals to deliver voltage, these ringers will be under the speed breakers which is then fitted to a spring-based payoff component which will hit the bells at whatever point there's a pressing factor applied on the speed breakers and as the pressing factor is delivered from the signals, the payoff instrument will reestablish itself to its unique position. So that later on-again bell will be all set under tension from the speed breakers to create the voltage [3].

## 2.3 Comparison of roller and rack-pinion mechanism.

| Sl. No | Specifications | Roller mechanism | Rack-Pinion mechanism |
|--------|----------------|------------------|------------------------|
| 1 | Price | Cheaper | Average |
| 2 | Structure | Simple | Hard |
| 3 | Maintenance | High | Low |
| 4 | Efficiency | ~55% | ~75% |
| 5 | Arrangement | Simpler | Complex |
| 6 | Height | 5.0cm | 12cm |
| 7 | Dependent | Usually on roller | Usually on spring |

## 2.4 Block Diagram

At first, the arrangement was controlled by bike and the roller got the turning movement.

With that revolution, a solitary DC generator can illuminate a LED set up of 12V. Regardless of whether there is a counterclockwise spinning by the roller component, the negative voltage is changed over utilizing an extension circuit. The yield voltage and current rely upon the vehicle speed and weight, as the speed of the vehicle diminishes the yield voltage and current increment. The mean force readings have taken from our thought as the automobiles with consistent burden passes on the arrangement with various paces the comparing voltage and current has taken and plotted the graph between them which is practically straight [5].
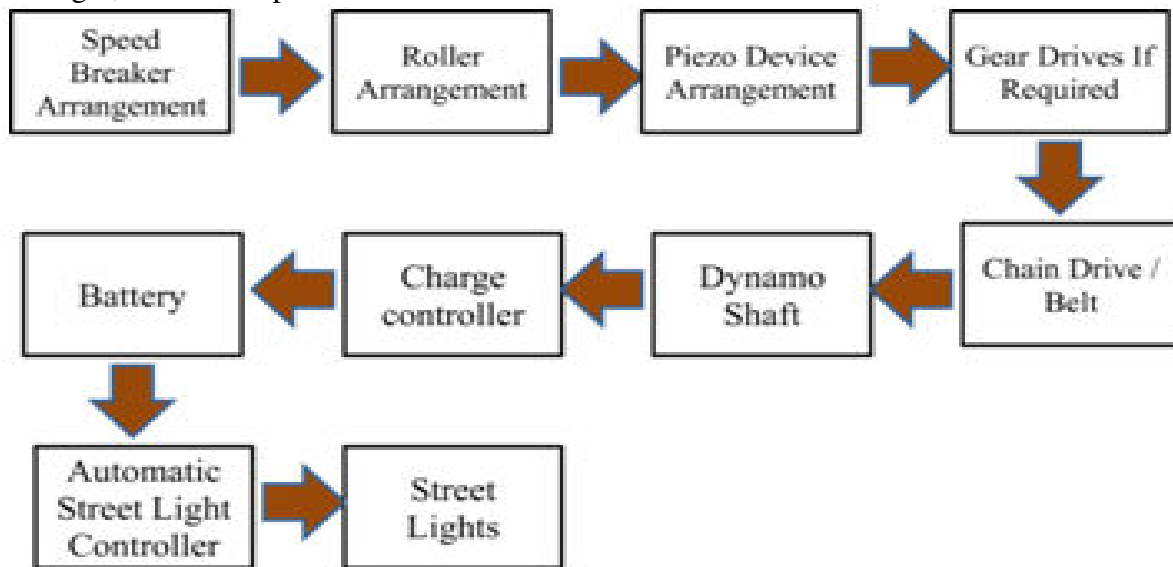


Fig 2.3 Block Diagram

### 3. Components

1. Roller: Steel metal with plastic coating

2. Piezo material-PZT

3. Ball Bearings

4. DC dynamo: 9V,0.8A

5. Battery: Li-ion,9V,3Ah

6. Load: 3V LED

- **Roller:** Rollers have been comprised of steel metal with plastic covering with length 9inch and breadth 2inch. This technique permits the dynamo that is associated with a rotor shaft to pivot and produce power.

- **Piezo device:** Piezo material-PZT, the yield of Piezo is AC which is changed over into DC utilizing a Bridge rectifier, here we have utilized four 1n4148 diodes of each 100mA ability to make connect rectifier. The voltage acquired from this one piezo association is around 1.1-2.8V.

- **Bearings:** Orientation utilized here is a metal ball of 1inch. The course is utilized to withstand a huge effect of the vehicle's power with the shaft mounted on the bearing, to have an appropriate lifetime to lessen systems of support costs.

- **Pulley:** Pulley utilized is a belt drive of 2inch and ½ inch where it diminishes the contact misfortune brought about by cogwheels and chain drives. The bigger pulley in our framework moves the movement from the roller known as the driver pulley and the more modest pulley joined to the generator which known as a determined pulley and associated together through the belt.

- **DC dynamo:** The dynamo is utilized to change over mechanical revolution movement into electrical energy, here we use DC dynamo of 9V,8W, 0.8A. The dynamo makes use of pivoting curls and attractive fields to change over mechanical rotation into a DC power through Faraday's laws of induction

- **Battery:** The battery utilized is a lithium-particle battery of 9V, 3Ah, power shifts with the development of vehicles out and

about and the pressing factor of the vehicles likewise differs because of the weight so we should store the created power for some time later lighting loads.

- **Light load:** The light burden utilized is of LED of 3V where the utilization of force will be low contrasted with other radiant light.

## 4. Advantages

- Economical and simple to introduce.

- It is eco-accommodating.

- The support cost is low.

- If it is executed for an enormous scope, a portion of the power request can be met, particularly in rustic regions.

- This can be carried out on hefty traffic streets and tollgates and can be utilized to control the streetlamps.

## 5. Conclusion

Nobody is content with the current condition of power in India. We need power for each little thing. More appropriate and reduced components to upgrade productivity. Thus, this is a little advance to advance the present circumstance by this project and promote something to civilization. Albeit less electrical yield is being produced. Producing power from the active energy of the moving cars has effectively executed. In the event that this idea is additionally advanced and is created in high potential.

The rollers which are utilized in this venture can be intended for substantial cars, subsequently expanding input force and eventually yield of generator can moreover be extended by deploying the different transmission framework which is more orderly technique for creating power.

- The squandered motor energy of vehicles at a speed breaker is used.

- The framework is non-dirtying.

- It is non-traditional kind of delivering energy.

- This project is one little advance to the way of that method of using energy from a few non-customary fuel sources.

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# EFFECTS OF CHANGING PROCESS PARAMETERS IN DIRECT METAL LASER SINTERING FOR ALSI10MG: A REVIEW

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## ABSTRACT

*Manufacturing technologies are producing finer products with the rise in newer manufacturing processes. Collaborations with the electronic and electrical industries have pushed the boundaries of conventional manufacturing. Additive Manufacturingis one such technology which is bridging the gap between conceptual design or idea to a final and finished product. Though the technology has not found its proper place in mass manufacturing yet, due to its logistical complications and setup cost, it holds the key to open the doors to moreergonomic and costeffective deigns and products. In this paper an attempt has been made to show the effects of changing process parameters in the DMLS technology. The review presents the challenges faced in DMLS technique when various processparametersare used during the printing of materials. Changes in material strength, microstructural differences and metallurgical defects are spoken in this paper.*

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*Keywords: Metal Additive Manufacturing, DMLS, Process Parameters, AlSi10Mg*

## Introduction

Direct Metal Laser Sintering (DMLS)[1]–[3] is an additive manufacturing technique, where the powder or sinter is fused together with the help of a power source, usually a laser, to create a three-dimensional object or prototype.

The entire operation takes place inside a chamber which is filled with inert gasses so that any form of oxidation during the solidification process is avoided. A computer software converts the three-dimensional design into a Standard Tessellation Language (STL) file. The file contains all the dimensions of the design and information of the support structures. Once the file is fed into the machine, the operator selects the thickness of the slices/layers.

Before starting the operation, the build plate temperature is pre heated so that the part does not distort due to non-uniform thermal expansion. A roller lays down a layer of metallic powder whose height was set by the operator. A cleaner plate goes over the powder to remove any additional height. The high-powered focused laser beam selectively scans and melts the powder in the X-Y plane, according to the cross-section of the design. As one layer is finished, the build plate moves down by a layer's height and a fresh coat of powder is added. This continues until the part is finished. Figure 1 shows the working of a typical DMLS machine. Figure 1 shows a schematic of the DMLS process.
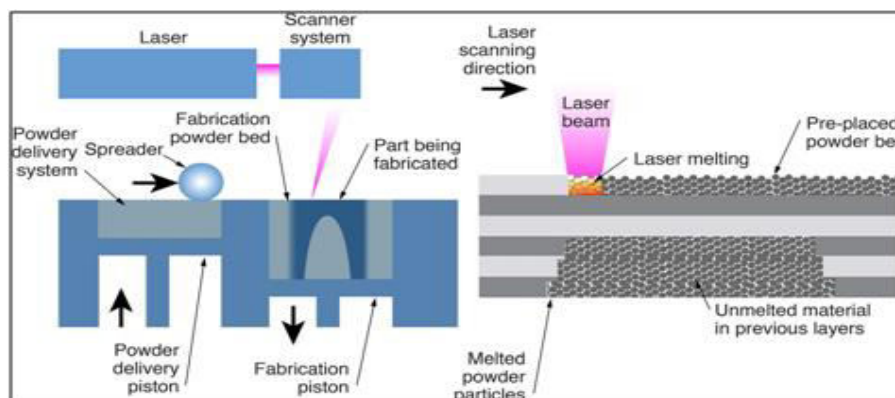
Many of the of defects (pores, cracks, laser spatter, surface irregularities, and shape distortions) are removed during post processing. This process is widely used to make prototypes of automotive and aerofoil parts due to its accuracy and ability to make complex geometry with ease.

Figure 1: Atypical DMLS process[4]

### AlSi10Mg

AlSi10Mg is an aluminium alloy with good hardness, strength and dynamic toughness. It is traditionally used as a casting alloy. Powder made up of AlSi10Mg is usually utilized in additive manufacturing, thanks to the high corrosion resistance, rarity and high mechanical strength of the ultimate components. The material has found popular use in metal additive research, structural components, brake callipers and heat sinks.

The following list gives the approximate composition of AlSi10Mg by weight:

Aluminium (Al) (balance) Silicon (Si) (9.0 – 11.0 wt-%)

Iron (Fe) ($\leq$ 0.55 wt-%)  Copper (Cu) ($\leq$ 0.05 wt-%)

Manganese (Mn) ($\leq$ 0.45 wt-%)  Magnesium (Mg) (0.2 - 0.45 wt-%)

Nickel (Ni) ($\leq$ 0.05 wt-%) Zinc (Zn) ($\leq$ 0.10 wt-%)

Lead (Pb) ($\leq$ 0.05 wt-%)  Tin (Sn) ($\leq$. 0.05 wt-%)

Titanium (Ti) ($\leq$ 0.15 wt-%)

### Influencing parameters of the DMLS process

Avinash et al performed a study on the available process parameters for the DMLS process and their issues with fabrication[5]. A list with the details of the process parameters is provided in Table 1.

**Table 1: Details of process parameters**

| Sl. No. | Process Parameter | Detailsof the parameters |
|---------|-------------------|--------------------------|
| 1 | Laser properties | ➤ Width of the pulse. This is the size or the length of the laser that is in direct contact with the powder.<br>➤ The pulsed mode.<br>➤ Frequency of the pulse<br>➤ The spot size. The shape of the spot may be circular or elliptical.<br>➤ The maximum output power of the pulse.<br>➤ Wavelength of the laser selected.<br>➤ The greatest power measured on a particular laser pulse. |
| 2 | Scan | ➤ The distance between the lasertravel. This is also termed as scan spacing or hatch spacing.<br>➤ 'Scan strategy pattern' is the laser scan pattern on the build surface like hatches, spirals zig-zag etc.<br>➤ The 'scan velocity' or the travel speed of the laser on the build surface. |
| 3 | Power material and their properties. | ➤ Thermal expansion coefficient<br>➤ Density of the material<br>➤ Surface roughness<br>➤ Enthalpy<br>➤ Material's thermal conductivity<br>➤ Melting point<br>➤ Particle size and its distribution<br>➤ Latent heat of fusion<br>➤ Solubility |

| | | |
|---|---|---|
| | | ➢ Surface free energy. <br> ➢ Vapor pressure Boiling point <br> ➢ Material absorptivity <br> ➢ Viscosity of melt <br> ➢ Particle morphology like circularity, aspect ratio, and elongation <br> ➢ Specific Heat capacity of the material <br> ➢ Diffusivity |
| 4 | Re-coater mechanisms | ➢ Deposition system parameters: <br> • Type of the re-coater (Soft or hard) <br> • Dosing <br> • Pressure applied on the build surface <br> • The speed of re-coater while making a new layer with respect to pattern of scan |
| 5 | Powder bed | ➢ Heat capacity of the powder <br> ➢ Initial temperature of the of the powder bed <br> ➢ Packing density of the powder <br> ➢ Emissivity of the powder <br> ➢ Absorptivity of the powder <br> ➢ Printing layer thickness <br> ➢ Thermal conductivity of the powder |
| 6 | Printing chamber while making the part | ➢ Flow velocity of shield gas to control the condensate removal and convective cooling <br> ➢ Viscosity of shield gas to balance convective heat transfer and to control free surface activity <br> ➢ Surface free energy of shield gas to control the melt pool shape <br> ➢ Thermal conductivity of shield gas to balance heat transfer <br> ➢ Shield gas employed - Helium, Argon or Nitrogen. <br> ➢ Convective heat transfer coefficient of shield gas for controlling convective heat transfer of cooling <br> ➢ Molecular weight of Shield gas employed to balance heat and control diffusivity in the part <br> ➢ Pressure of shield gas to control the oxygen content and vaporization of metal <br> ➢ Ambient temperature helps to control the preheat requirements control the residual stress and heat balance purpose <br> ➢ Level of oxygen to control changes in wettability, metal oxide formation and welding energy required <br> ➢ Heat capacity of shield gas to balance heat transfer |

**Effects of changes in process parameters**

**Tensile strength**

Praveen et al developed specimens with a combination of changing process parameters (Laser Power, Scan speed and Orientation).

They found that tensile strength increased with increase in laser energy density. Parts failed at 62 MPa for higher laser density parameters over the 58 MPa for the lower ones. Also, they found parts built at and inclination showed greater strength than the others[6].Kempen et al in their test for mechanical properties in

printed AlSi10Mg found that parts printed in the horizontal direction showed a higher strength over the vertically printed ones. Plain die casted samples showed strengths of 394 MPawhere as DMLS based materials showed a rise of 2% in strength[7].Thus, it can be said that if the material comes under higher intensity of the laser and gets sufficient amount on the laser scan then the melting and fusion of the powders take place properly which in turn increases the strength of the material.

## Hardness

Naveen Kumar et al tested for hardness, Vickers's, before and after post processing (Laser Shock peening) of Alsi10Mg printed sample. Un-peened samples showed a lower Vickers hardness number but was nearly consistent for increasing depths, averaging at 88.79HV. Peened samples had higher hardness for lower depths but showed a decrease in hardness as the depth was increased with an average of 109.7HV[8].MehranRafieazad et al in their experiment found that samples that were heat treated showed lower Vickers Hardness number with the highest hardness at 134.01HV[9]. A similar observation was made by Lore Thijs et al when they found difference in hardness between the top and side cross section for the same parameters. The hardness was recorded at 127HV. The authors said this happened due to the layer-by-layer additive method, morphology of the melt pools and the non-homogeneous grain structure established through the non-uniform thermal gradient across the melt pools which resulted in the formation of more porosities and defects on the side plane of the sample[10].

## Metallurgical defects and Microstructural changes

Under SEM imaging melt pools and porous regions can be observed. As the laser scans over the powder the powder melts and starts fusing. Now due to unequal cooling rate and difference in heat dissipation, the fusion is not proper. Amir Hadadzadeh et al in their attempt to find the difference between new and recycled AlSi10Mg DMLS samples found that there was a difference in cell size, number of dislocations and number of porous regions[11].

Figure 2 shows the and enlarged image of metal splatter due to high laser speed. MehranRafieazad et al in experiment of AlSi10Mg parts saw melt pools having semi-circular shape and overlapping of melt pools known as fish-scale patterns. The size of these melt pools depended on the three parameters of their experiment – laser power, hatch size and laser speed[9]. Kempen et al also observed clustered melt pools and porous regions around the facture area of their tensile components[7].
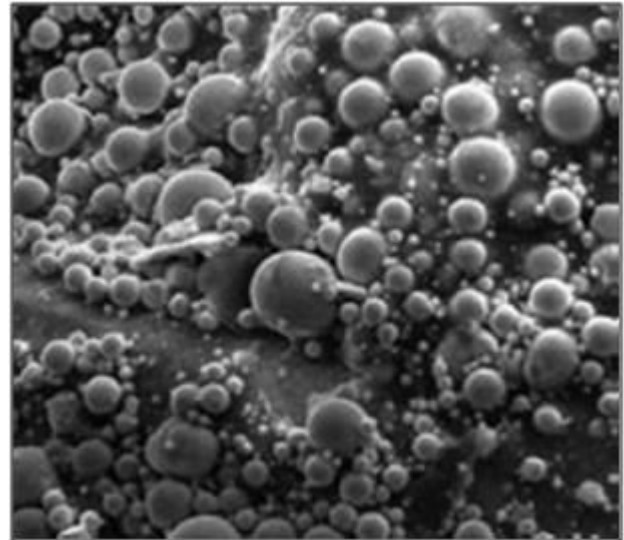


Figure 2: SEM imaging shows the metal splatter due to increasing of laser speed[12]

This clustering of the melt pool to form uneven shapes is known as a phenomenon called 'Balling'. Balling occurs when the powder particles after melting are not able to fuse together completely. During 'Balling' uneven heat dissipation takes place in the adjoining melted powders and they stick together and cool down to form a new shape. A schematic diagramprovide in Figure 3 for the balling phenomenon.
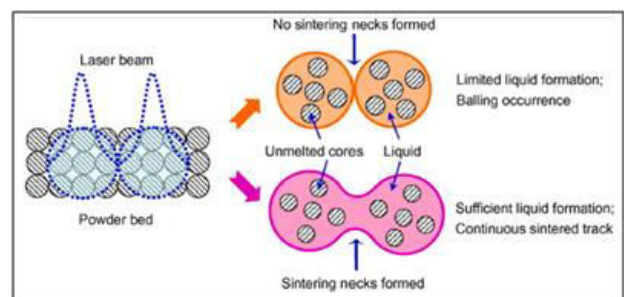


Figure 3: Balling phenomenon with coarse spherical balls[12]

Yan et at studied the changes in the microstructure along with mechanical properties for AlSi10Mg when made by AlSi10Mg. They observed that the microstructure got significantly affected by a variation in thermal gradient, solidification rate and cooling rate. Fine microstructure was observed in some areas of high cooing rate that resulted in higher undercooling[13]. Experiments performed by Fathi et al[14]resulted in similar results as Yan et al. Increased solubility of Si in Al due to high cooling rate resulted in dendritic structures. The solubility of Si was increased in Al due to the substantial high cooling rate of the DMLS process. This increased cooling resulted in faster solidification leading to the formation of dendritic cellular structures.

## Conclusion

The operating parameters based on which AlSi10Mg can be printed using the DMLS technology have been listed from the studies it said that metal additive manufacturing has a long way to go due to uncertain standards and operating procedures.With differential cooling rates having a strong impact on build quality a specific way of printing cannot be determined. Also, with such a large variation and combination of parameters it is tough to provide a proper standard for manufacturing with best results. More research is required for further improvement in themetal additive manufacturing technology.

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# POWER SYSTEM RESTORATION USING INTELLIGENT INTEGRATION OF HYBRID SYSTEM

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## ABSTRACT

*In the present scenario, power system restoration is indispensable to achieve a minimum deficit of power during an outage situation. Hence, to restore the power, a Hybrid Renewable Energy System (HRES) is proposed to promote green power management, resulting in a dramatic decline in Carbon dioxide emission. This is implemented by integrating solar photovoltaic systems and biomass, which attracts the energy sector to use green energy sources on a large scale. The power generated by the hybrid system is fed to the receiving end of the grid to compensate for the power losses in the transmission line. This system offers long-term performance, overcomes the unpredictable nature of renewable energy sources, and can be used as a practical backup solution to the public grid under brownouts or weak grids. In this work, the performance of the Solar Photovoltaic source is controlled using Brain Learning Based Intelligent Controller (BELBIC) is tested and developed.  This paper also addresses the harmonic pollution generated by the power electronic accessories incorporated in the hybrid system. The Total Harmonic Distortion (THD) is optimized using Harmony Search Algorithm (HSA), and the proposed system as a whole is simulated using MATLAB/Simulink platform with 2 MW capacity connected to the 120 VK grid located at 3 Km from the grid.*

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*Keywords: Hybrid Renewable Energy System, Harmony Search Algorithm, Total Harmonic Distortion, Photovoltaic System, Brain Learning Based Intelligent Controller (BELBIC).*

## 5.  Introduction

Electrical power is the life blood and is indispensable for human society. Self-reliance in electricity generation is vital for the wealth of the country. The utility of electric power has a broad spectrum, and the world is none without electric power. Power System restoration (PSR) is quite significant against power system operation and control. It is an indispensable tool to mitigate potential power blackouts. The PSR process includes generators, transmission network and restoring load services. However, technical constraints such as active power balance and frequency control, reactive power balance and overvoltage control, system stability, and load control cause brownouts in the power system network.

The random variation in the climate with the temperature rise paves the way to the effects of global warming with the accumulation of Green House gases (GHG) in the atmosphere. The cause for GHG is primarily carbon dioxide which results in the emission of pollutants. To avoid global warming, the consumption of fossil fuels must be minimized.  Apart from conventional fuels used for heating them, renewable energy sources are expected to play a significant role shortly; among them, solar energy and biomass have been used in various greenhouses all over the world [5].  To bridge the gap between electric supply and demand,

the tremendous potential of renewable energy sources (RES) in rural areas can be utilized.

This work incorporates the hybridization of combined solar photovoltaic and biomass to aid the power system restoration. The blended solar photovoltaic/ biomass is connected to a heat exchanger connected to the grid either in parallel or stand-alone mode [1].

In the proposed work, a Hybrid Renewable Energy System (HRES) is incorporated at the receiving end of the grid to overcome and reduce the power outage caused due to transmission losses. This work is organized such as, in the first section solar photovoltaic system and biomass are integrated which are uncontrolled, the second section shows the solar photovoltaic system controlled by using BELBIC and third subsequent section shows the power quality from the HRES is improved using a newly developed optimization technique control strategy called "Harmony Search Algorithm" (HSA). This work

investigates the performance of a Solar-Biomass hybrid power system with optimized Total Harmonic Distortion (THD).

## 6. Proposed Method

The power generated by the Solar Photo-voltaic source is fed to the battery bank and the power is processed using a Cuk converter and a 120o three-phase voltage source inverter. The biomass is equipped with a synchronous generator (SG) with an automatic voltage regulator (AVR). The PV system incorporates a semiconductor material; typically silicon is used in thin wafers. On one side of the semiconductor material, it has a positive incriminate and the other side is negatively charged. A semiconductor material, typically silicon, is used in thin wafers. The Cuk converter functions on soft switching techniques to ensure a smooth transition of voltage and current. Thus the conversion efficiency of the PV system is improved to a favorable level.
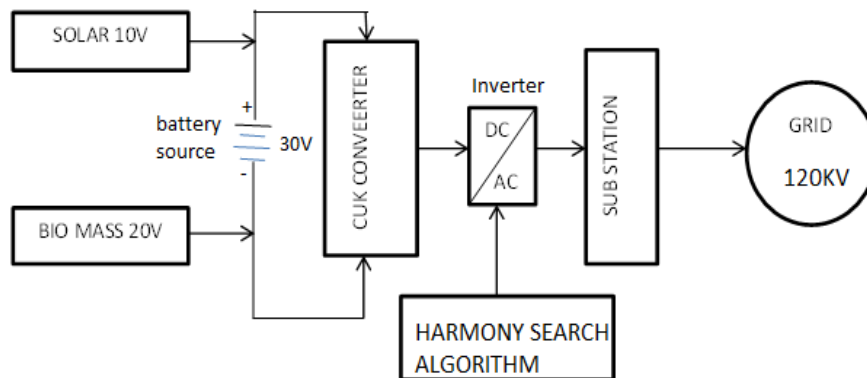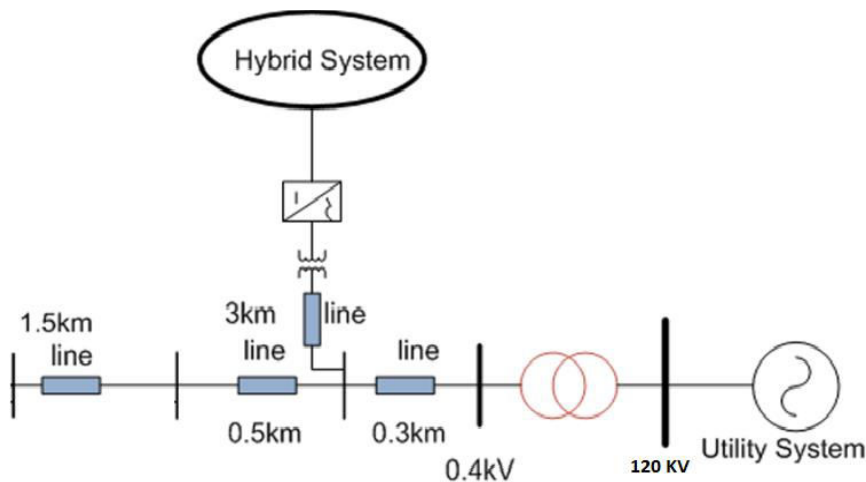


Figure 1: Block Diagram of the Proposed System



Figure 2: One line diagram of the interconnection of HRES and grid

## 7. Hybrid Renewable Energy System

With the cutting-edge growth in the renewable energy sector, the renewable energy source can be viewed as a potential solution for the current situation in fact; hybrid systems could look forth as a prior solution to such kind of issues [7]. A combination of different natural energy systems based on renewable source, working with some backup sources, is known as a hybrid power system. The Hybrid Renewable Energy System (HRES) integration is suitable for the reliable restoration of power system network. The HRES are promising sources for decreasing the depletion of fossil fuels and supplement energy to the rural hilly areas without disturbing the natural environment.

Solar energy is unpredictable in nature, hence they are uncontrolled due to their availability is entirely dependent on the climatic condition. Controlled sources are the sources, whose power production can be controlled. Biomass, biogas etc. can be considered as a controlled source of energy [1]. It is an appropriate choicet for electrification of remote villages. However, if more than one form of energy is to be used which can be solar/biogas/biomass;the photovoltaic power generation serves to decrease the consumption of non-renewable fuel [2]. When renewable energy is excess, the biogas is shut down and the power is used to pump water to a higher level, which can later be used for agriculture and micro-hydro generation [3].

### 3.1 Brain Learning Based Intelligent Controller

The Brain Learning Based Intelligent Controller (BELBIC) is dominantly used in the motor-drive control. It is developed based on the "Limbic System," of the human brain which holds responsible for the emotional learning in humans. The controller suggests the duty ratio of the Cuk converter based on the power fluctuations to minimize the Steady State Error (SSE) in the output voltage of the converter.

In this work, BELBIC acts as an intelligent controller for maximizing the efficiency of the solar photovoltaic system. BELBIC receives the rate of change in electric power as one of the feedback and controller output as another feedback. This resulted in the accurate tuning of the controller with the present state. The simulation model of BELBIC controller is shown in figure 3. The input of BLEBIC is voltage error and output is modulation index.
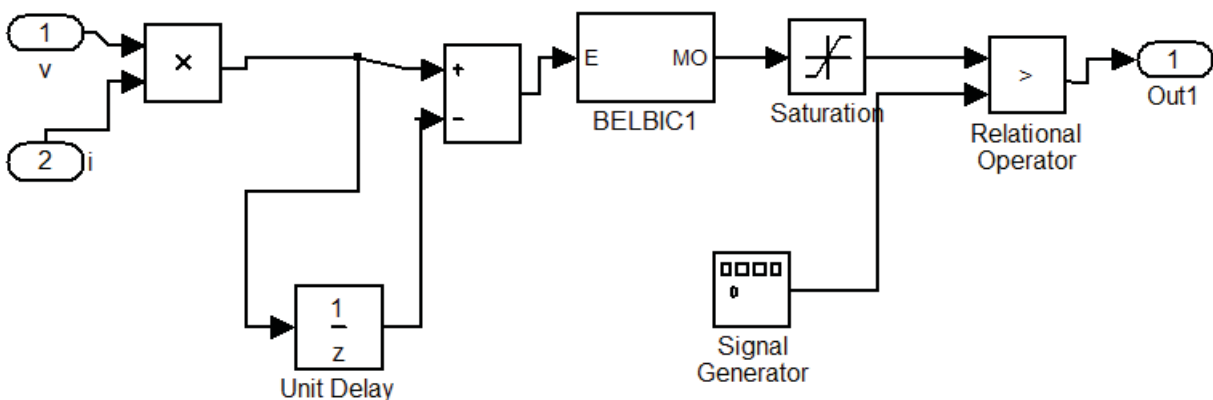


Figure 3: Simulation model of BELBIC

The figure 4 shows the simulation results using BELBIC for solar photovoltaic radiation of 300 W/m2. The X axis denotes time and Y axis indicates the weather condition and Cuk converter output voltage using BELBIC controller.
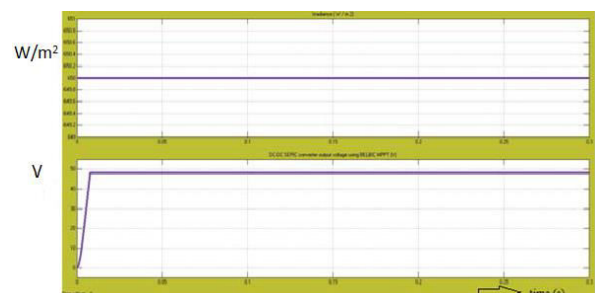
Figure 4: Simulation results using BELBIC

## 8. Optimizing HRES THD using HAS

The main hindrance in establishing the HRES system is the enormous capital expenditure and optimizing the harmonics of the output of HRES. However, there are various optimization techniques are available for determining the optimum Total Harmonic Distortion (THD). Harmony Search Algorithm (HSA) is one of the intelligent optimization tools which yields promising results when compared to its counter-parts.

### 4.1 Harmony Search Algorithm

The traditional optimization techniques algorithms such as gradient descent method and quasi-newton method would work only on the differentiable functions. However, the bio-inspired techniques used in this paper are not dependent on the function even if it is differentiable or not. The original intention researching on bird flock movement was to graphically simulate the graceful and unpredictable choreography of a bird flock which when analyzed turned out to be an optimizer called Particle Swarm Optimization (PSO) [10].

A meta-heuristic optimization technique algorithm inspired by playing music that combines rules and randomness to replicate natural phenomena. HS algorithm is stimulated by the functioning of orchestra music to find the best harmony between components, for finding an optimal solution. The music player's augmented their experience based on aesthetics standards while design variables in computer memory can be improved based on an objective function. The performance of music seeks the best state or excellent harmony determined by aesthetic estimation, as the optimization process seeks a global best state

THD value with less number of iterations. Perhaps HSA optimization tool is incorporated with the three-phase voltage source inverter to determine the optimum THD. Thus it is quite obvious that the power pollution is minimized using HSA.

Algorithm Parameters

Objective function: Mean (THD) in %.

Population size =20.

Number of variables = 4 (Kp1, Ki1, Kp2, Ki2).

Pitch Band width (bw) = 0.9.

Harmony Memory Considering Rate(HMCR) = 0.95

Pitch Adjustment Rate (PAR) = 1.

Range of variables = LB[0 0 0 0], UP[0.1 7 2 3]

Maximum epochs = 50

Global best solution: kp1=0.000000, ki1=2.401094, Kp2=2.000000,

Ki2=0.260736

Global best THD = 1.963194

Execution time = 408.88secs

## 9. Results and Discussion

The simulation results for various solar radiations are obtained by adjusting the PWM signals of the BELBIC controller. The proposed controller adjusts the pulse width of the control signal according to the requirements. BELBIC controller is used for improving the performance and simulation result analysis of the solar photovoltaic system. It is also inferred that the BELBIC controller yields satisfactory time response specifications as shown in Table 2. Hence it is observed from the table that the higher amplitude of oscillations are minimized and the settling time is faster.

**Table 1: Time response specification of BELBIC**

| Controller | Ripple (%) | Rise Time (s) | Settling Time (s) | Steady State Error (%) |
|---|---|---|---|---|
| BELBIC | 0 | 0.007 | 0.014 | 0 |

The proposed HSA controlled VSI, maintains reduced power pollution by enhancing the quality of voltage and power factor. This scheme eliminates the parasitic ringing in

transmission line current and improves the steady state and dynamic performance of the system.

The trade-off inference of the optimization technique gives guidelines to select on which technique are to be implemented in what situation. The parameters considered for estimation are population size, the maximum number of epochs, and global best solution of the control constants, best THD value and execution time [6].

The objective function for minimization is the THD calculation. The results obtained from different optimization technique as given below.

| Controller | Execution time | Best THD in % |
|---|---|---|
| PSO | 25315.08 | 1.918916 |
| GA | 20787.73 | 2.022101 |
| HSA | 408.88 | 1.963194 |

From the tabulation 2, it is inferred that a trade-off inference of implementing various optimization technique tool experiments and the results about the same is compared. The comparative results reveal that PSO offers least THD. However, the execution time is high compared with its other counterparts. Hence it is concluded that HSA provides minimum execution time and THD as compared to the other optimization tools.

**Table 2: Trade-off Inference of Optimization Techniques**

**Table3: Performance comparison with the proposed model of HSA controlled VSI**

| Parameters | Existing VSI | | VSI with HSA Controller | |
|---|---|---|---|---|
| | Input | Output | Input | Output |
| Power in watts | 900 | 798 | 900 | 866 |
| Voltage in volts | 600 | 512 | 600 | 564 |
| Efficiency in % | 88.67 | | 96.22 | |
| THD | 5.197825 | | 1.963194 | |

The Table 3 shows the performance comparison of existing VSI and shows the readings of power, voltage, at input and output stage for the existing VSI and VSI with HSA controller. It reveals that the proposed controller exhibits better efficiency than the existing.

The proposed Cuk Converter using MOSFET has been simulated in MATLAB simulation platform and the output response of Cuk converter is shown in figure 5.
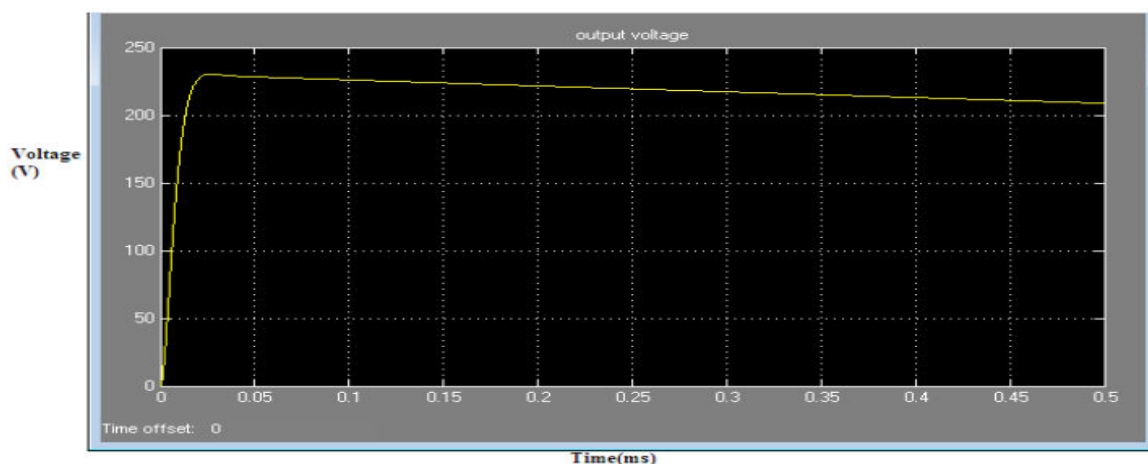


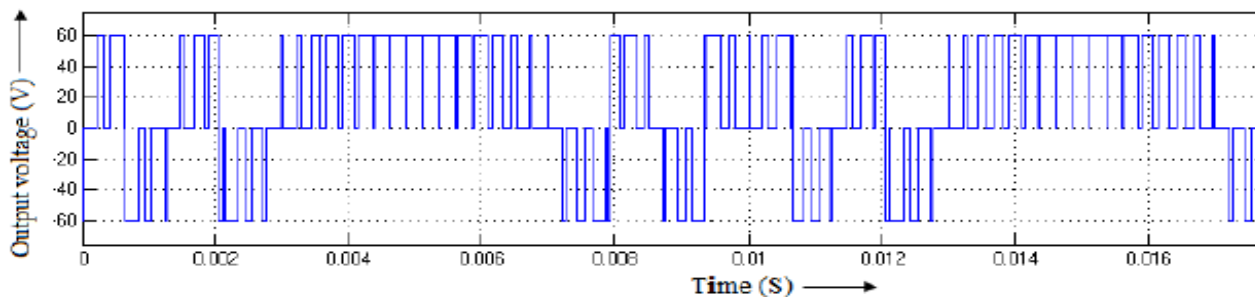Figure 5:  Output response of Cuk converter

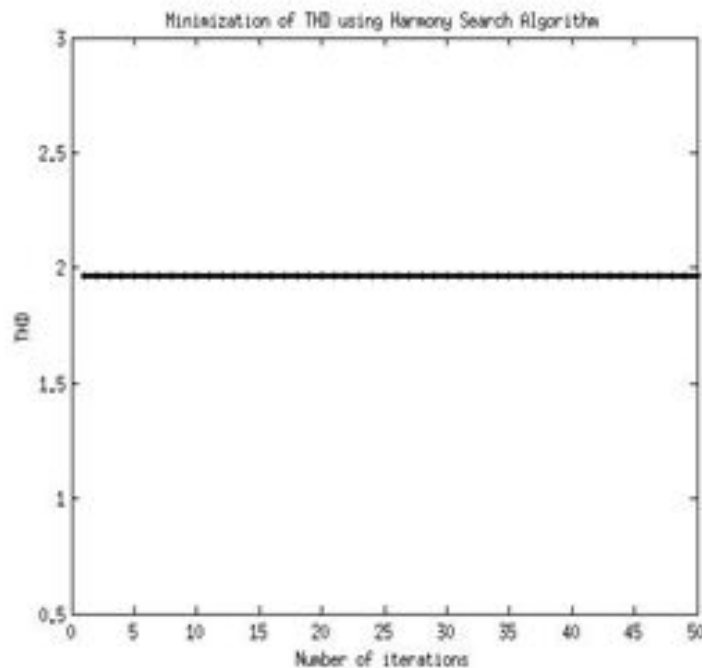Figure 6: Output response of 3-φ H Bridge VSI with HSA



Figure 7:  Convergence graph of HSA

The convergence graph reveals that the lowest time taking algorithm for settling, ease of implementation, required accuracy of the problem, speed and stable convergence rate, compatibility to online execution, performance of hard optimization problems, hence it is quite straight forward that Harmonic Search Algorithm (HSA) is judiciously chosen in this work. The PSO offers a lesser number of iterations compared to all the other algorithms. From the table.1, it is obvious that the PSO is the most memory efficient and the HSA is the most time efficient algorithm.  Hence it can be inferred that the efficient algorithm to use in this optimization can be the HSA, which resulted in lowest THD value.

## 10. Conclusion

This work focused on the attention on the degree of the capability of intelligent controlled HRES which is suitably tuned appropriately to meet the desired set specifications of the on-grid with optimum least power pollution. The implementation of the tuning schemes is incorporated using various optimization algorithms. Hence, from the analysis, it is obvious that HSA controlled HRES is compact, robust and cost-effective provides quality voltage, improves the dynamic performance of the on-grid and restores power system restoration of the public on the grid. Hence it is suggested that the proposed HSA based VSI controller can replace the conventional PWM control to achieve the optimal THD for power sector and industrial control applications.

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# STUDY ON SUITABILITY AND FLEXURAL BEHAVIOUR OF FOLDED PLATES COVERED WITH GGBS REPLACED FERROCEMENT CONCRETE

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## ABSTRACT

*The purpose of study is to evaluate suitability and flexural behaviour of Ferro-cement in folded plates. Ferro cement is one of the building materials that is emerging as a replacement for traditional RCC in many respects. Ferro cement is the future of lowcost houses and precast houses. Folded platessare the economical and aesthetic solution for longer span roofs. This project incorporates the benefits of both Ferro cement and folded plates. In ferrocement, cement is partially replaced with GGBS. The trough style Ferro cement folded plates of sizes0.6 m x 1.80 m x 0.15 m are cast in consideration of various journals & RCC folded plates when fixing dimensions. Properties of the materials used for experiments are tested and the compression strengthsof the mortar used is tested, the test is performed at 1:2 cement: sand ratio and 0.35 water cement ratio. The specimen is cast with a 2 mm opening stainless steel mesh and 2 layers are laid on the front and back sides of 6mm diameter 150m of spaced skeleton steel. Cast specimens are tested for 28 days in loading frames strength and the results are compared with analytical analysis the use of ANSYS for load v/s deflection and the suitability of the application of ferro-cement in folded plates are studied. The experiments results show good output, finally with low monetary and low selfaweight Ferro cement structures being a good alternative to RCC.*

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***Keywords:*** *Ferro-cement, Flexural behaviour, folded plates, ANSYS, suitability of ferro-cement in folded plates, skeleton steel.*

## 1. Introduction

### 1.1 Ferrocement

The term "Ferro cement" had been used by extension to other compositedmaterials, including those containing no cement or ferocious content [1-6].Ferrocement is a system of reinforced mortar or plaster spread over a metal mesh sheet, woven with extended metal or metal fibres and tightly spaced thin steel rods such as rebar, metal widely used iron or other form of steel [7-10]. Ductility was found to be strongly influenced by the form of mesh reinforcement [11].Many ferrocement beams displayed higher loads of serviceability compared to control specimens [12-14].Specimens reinforced with expanded metal mesh, on the other hand, frequently reached their serviceability loads before the first fracture appeared, whereas specimens reinforced with welded wire mesh developed the first crack before achieving their serviceability load[15-18]. The ultimate load is roughly twice that of the first crack load. The contribution of the bamboo strips to the mortar and wire mesh of the theoretical final load capacity of the slab is approximately three times higher corresponding to the experimental final load capacity [19-22]. Replacement of concrete with new advanced eco- friendly materials and wastes also help to decrease the demand and scarcity of existing materials [23].

### 1.2 Folded Plates

Folded plate roofs are composed of a series of rectangular reinforced concrete slabs (whose length is more than three times its width) placed inclined to one another and joined monolithically, one after the other, along their longitudinal edges. The unit as a whole is supported rigidly at its ends, by transverse diaphragms, as in the case of cylindrical shells. These structures are also called prismatic structures or hipped plates. These can be made into various shapes [24-27]. Since the structure is proposed to be folded using a pre-cut board, the dimensions of the square dome are reduced [28]. The geometric constraints of the folded plates, such as the conditions at the end and the intermediate supports, are modelled by very rigid springs [29]. The major objective of this study is to achieve high strength mortar also bending response above folded plate with covered with ferrocement under UDL. Compare experimental results between ANSYS Analysis at the end.

## 2. Material and Properties

### 2.1 Cement

Cement used for this study was having specific gravity 3.15. It confirms to IS 12269: 2013[30]. Properties of cement given in Table 1.

| Sl.No | Property | Test results |
|---|---|---|
| 1 | Normal consistency | 33% |
| 2 | Initial and Final setting time | 55 min & 295 min |
| 3 | Specific Gravity | 3.17 |
| 4 | Soundness (Le-Chattier Exp) | 1.00 mm |

**Table 1: Properties of Cement**

### 2.2 Ground Granulated Blast Furnace Slag (GGBS)

GGBS with Specific gravity of 1.24 used for this work.

### 2.3 Steel

Steel is an iron-carbon alloy with less than 2% carbon, 1% manganese, and trace amounts of silicon, phosphorus, sulphur, and oxygen. For research, a square mesh was employed given in Figure 1. Steel is the most dominant engineering and building object in the world. It is used in almost every aspect of our life, including automobiles and construction materials, refrigerators and washing machines, cargo ships, and surgical scalpels. Ultimate hexagonal mesh strength= 270 N/mm2. Yield strength of 6mm MS bar, FI= 250 N/mm2.
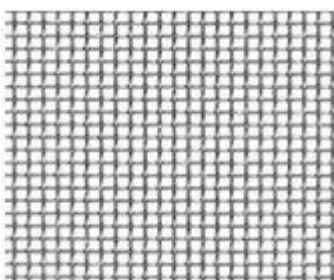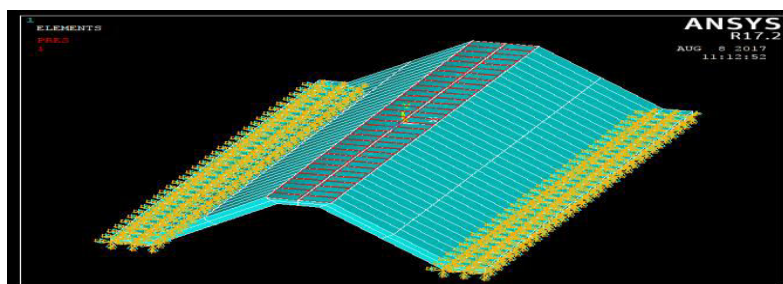


Figure 1: Square mesh

### 2.4 Sand

Sand with specific gravity sand was 2.62. It confirms to IS 2386: 1963 [31]. Properties of fine aggregates given in Table 2.

| S. No | Property | Test results |
|---|---|---|
| 1 | Specific Gravity | 2.60 |
| 2 | Bulk density | 1750 |
| 3 | Fineness Modulus | 2.77 |

**Table 2: Properties of Fine Aggregate.**

### 2.5 Water

Ordinary water with pH 7.40 was used for this study.

## 3. Numerical Analysis

Numerical analysis very important to compare results with experimental study results. In this work we analysis the folded plates with ferrocement model using Ansys Software. The numerical results (Maximum deformation and Ultimate load) compared with Experimental tested results.

### 3.1 Element types

The types of elements for this used for study model are given in Table 3.

| Cement mortar | Solid 65 |
|---|---|
| Steel reinforcement | Beam 188 |
| Mesh | Shell 181 |

**Table 3: Types of elements in ANSYS**

The Solid65 factor has been used to model the concrete. Beam 188 is a linear (2-node) 3-D beam element with six degrees of freedom at each node. Shell 181 is ideal for the study of thin to moderately thick shell structures.

### 3.2 Modeling

The Modelling of the folded plate in ANSYS is done in volume arbitrary using key points. Folded plate model with boundary condition shown in figure 2. Folded plate after meshing shown in figure 3.
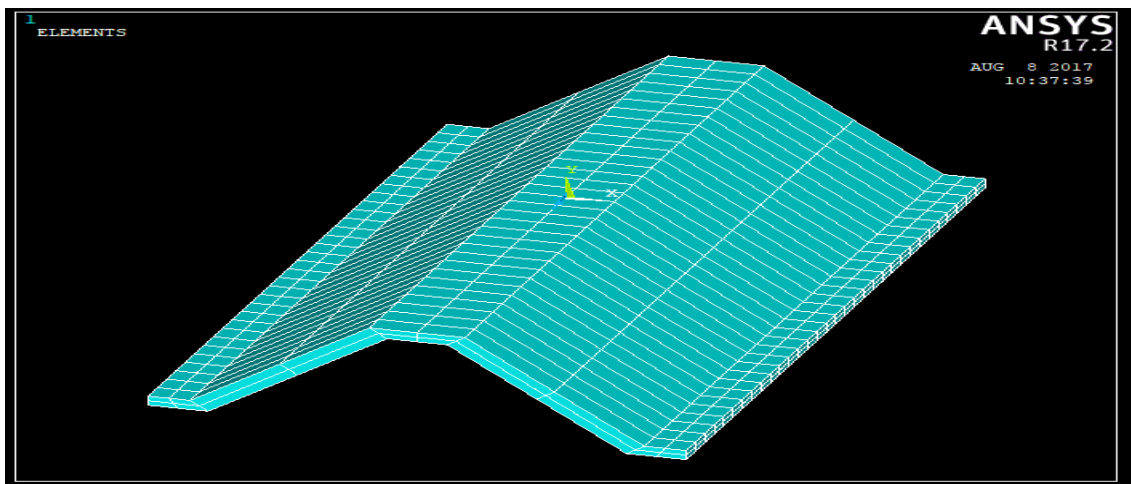


Figure 2: Boundary conditions

Figure 3. Meshing of folded plate in ANSYS After application of ultimate load 23 KN load in Ansys Software, the following nodal deformation we got with maximum 15 mm deflection of folded plate under ultimate load. Nodal deformation at Ultimate load shown in figure 4.
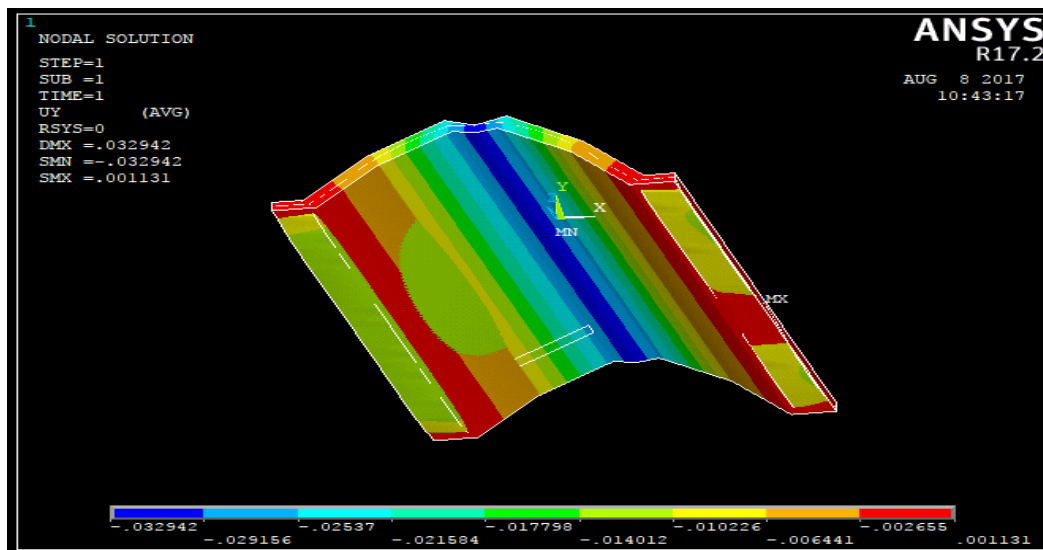


Figure 4: Nodal deformation

### 4. Experimental Investigation result

The object of the work is to cast and test ferro cement type folded plate specimens. Compression strength of Ferro cement is studied, with mix proportion 1:3 & water-cement ratio 0.35 which is adopted in specimens is tested. The folded plate size 0.6 m x 1.8 m x 0.15 m has been chosen. Using slab – beam theory, theoretical predictions of RCC folded plates are compared with Ferro cement folded plates in deflection under flexure are calculated. Also compared the ratio of loads between the first crack load and ultimate load. As the Ferro cement is composite material, the total experimental work is carried

### 4.1 Compressive Strength of Mortar

The compressive strength of the Mortar casted ratio was calculated using the average strength of three cubes.Specimens used for this study are (70.6x 70.6x 70.6) mm mortar cubes. Compressive strength results are given in Table 4. Mortar cubes with 10 % replacement of GGBS has given high compressive strengths compared to others.so that we have adopted 10% GGBS as cement replacement in our experimental work.

| S. No | GGBS replacement | Compressive strength (MPa) |
|---|---|---|
| 1 | 10 % | 61 |
| 2 | 20 % | 55 |
| 3 | 30% | 57 |

**Table 4: 28 day's compressive strength of mortar cubes**

## 4.2 Casting & Testing of Ferro Cement Folded Plate Specimens

Two specimens are tested with dimensions of 0.6m x 1.82m x 0.15 m with thicknesses of 25mm and 6mm mild steel rods as a skeleton reinforcement with a spacing of 150mm c/c (as shown in figure) with a stainless steel mesh with a spacing of 2mm are placed on both sides of the skeleton reinforcement with a cover of 9mm. Specimen reinforcement in folded plate used for work shown in figure 5.





Fig 5: reinforcement in folded plate

## 4.3 Manufacturing of Test Models

The mortar was placed in the frame within a few minutes of the final mixing, and the concrete was compacted in the frame using manual compaction. Since the chicken mesh is put during the casting of the specimen, a mortar with trough force should be used to ensure correct compaction of the material. Steel troughs were eventually used to finish the surface. After the mortar has been in place for 24 hours,

After the formwork was destroyed, the specimen was shielded with gunny bags to prevent water evaporation. Prior to the date of investigation, the specimens were healed by ambient healing using gunny bags. During the test, the specimens were painted with a white lime water solution to make cracks visible..The positions of the deflection gauge on the bottom of the specimens were labelled. Casting of specimen covered with GGBS replaced ferrocement shown in figure 6.



Fig 6: casting of specimen coved ferrocement

## 4.4 Experimental Setup

### 4.4.1 Loading Systems

Application of consistently distributed load: A 100-ton jack manual is used to apply uniformly distributed load to specimens on a ridge plate.The load was assessed by a test ring with a capacity of 10 tonnes.A cylindrical steel plate of 8 cm diameter was used to transmit the load from the jack to the specimen

### 4.4.2 Setup Test Models for Testing

The test model was shifted to its place on the loading frame using an electrical crane with a capacity of 100 tonnes.The specimens rest on the top of the test frame for simply assisted edge condition. Placing of folded plate in loading frame given in figure 7. Ferrocement folded plate during testing shown in figure 8.



Figure7:  placing of specimen on loading frame

Figure 8: During testing of Ferrocement folded plate

Mechanical dial gauges with a travel length of 50 mm and an accuracy of 0.010 mm have been mounted for the test model.Figure 5.8 indicates the location of the deflection dial gauge for the test models.   Location of deflection of folded plate shown in figure 9.



Figure 9: Shows the View of location of Deflection

### 4.4.3 Test Results

A test ring was registered after a zero reading of the dial gauges. The load has been recorded.The weight was then gradually increased to the manual jack, and load values from the test ring were taken. The deflection readings were recorded after each loading. The operation was repeated until cracks appeared, and the load at which the cracks started was recorded. The crack propagation was then sped up by adding more loading. Excessive deflections followed this stage. Load and Deflection results of specimen 1 and 2 are given in Table 5 and Table 6.

| S. No | LOAD 'kN' | Deflection 'mm' | Remarks |
|---|---|---|---|
| 1 | 0 | 0 | - |
| 2 | 1.33 | 2.8 | - |

| | | | |
|---|---|---|---|
| 3 | 2.66 | 4.95 | - |
| 4 | 4 | 5.64 | - |
| 5 | 5.33 | 9.08 | - |
| 6 | 6.66 | 9.73 | First crack load |
| 7 | 8 | 11.72 | - |
| 8 | 9.33 | 13.2 | - |
| 9 | 10.66 | 15.8 | - |

**Table 5 load deflection behaviour for specimen 1**

| S. No | Load kN | Deflection 'mm' | Remarks |
|---|---|---|---|
| 1 | 0 | 0 | - |
| 2 | 1.33 | 1.22 | - |
| 3 | 2.66 | 2.03 | - |
| 4 | 4 | 4.03 | - |
| 5 | 5.33 | 4.18 | - |
| 6 | 6.66 | 5.00 | - |
| 7 | 8 | 6.08 | First crack |
| 8 | 9.33 | 6.67 | - |
| 9 | 10.66 | 7.32 | - |
| 10 | 12 | 9.05 | - |
| 11 | 13.33 | - | - |
| 12 | 14.66 | - | - |
| 13 | 16 | - | Ultimate load |

**Table 6: load deflection behaviour for specimen 2**

## 5.  Discussion of results

### 5.5.1 Observation of Crack Development

The Experimental Crack Pattern of the folded plate shown in Fig., For Simply Supported. Generally, for RCC trough type folded plate crack is observed in transverse section at tension zone which is on bottom side of the plate since moment carrying capacity is week in longitudinal direction rather than transverse section.

### 5.5.2 Load deflection behaviour

Ferro cement trough type folded plate crack is, initially started at bottom in transverse section similar to the RCC folded plate but after that it is observed that is also get cracked in longitudinal section with increased deflection when compared to the RCC since Ferro cement is flexible member.

### 5.5.3 Comparison of first crack load and ultimate load

For the tested 2 specimens the first crack load is observed at 8 kN& 6.6 kN /m respectively and the ultimate load is observed at 16 kN&

14.4 kN respectively. Longitudinal Crack pattern of both specimen one and two given in figure 10.



Specimen 1



Specimen 2

Figure 10: longitudinal crack pattern

### 5.5.4. Comparison of Experimental and Analysis Results:

Comparison result of Folded ferrocement plates performance in Numerical and Experimental Investigation given in Table 7.

| S. No | ANSYS | Experimental |
|---|---|---|
| ultimate load | 23 KN/m | 16 KN/m |
| max deformation | 15 mm | 9.05mm (8.0 KN/m) |

**Table-7: Comparison results**

### 6. Conclusion

The below conclusion we arrived at the end of this work

❖ Even at greater loads, ferro cement systems have a high ductile structure that fails only by cracking, not by instantaneous failure.

❖ Use of Ferro cement in folded plates due to good results as folded plates are effective for a longer period of time. Ferro cement has rendered the components smaller for carrying the load because Ferro cement elements are high on stress as reinforcement is spread.

❖ For the tested 2 specimens the average first crack load is observed at 8 kN/m and the ultimate load is 16 kN /m respectively. The analytical values are nearer to the experimental values

❖ Ultimate load is 25% higher than the first crack load in experimental observation.

❖ The cracks observed in the folded plate of ferrocement begin at the tension zone.

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## DESIGN OF STEP-DOWN AC TRANSFORMER FROM 230V TO 60V AC

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### ABSTRACT

*In the Expeditiously changing technologies in the power industry ,new references labeling new technologies .Based on this reality, we need to track up the international affairs and schemes taking place in the modern transformer design field .Dependable and meticulous solution methods is demanded by the complexity of transformer design .Engineers must guarantee that conformance with the enforced criteria is met while keeping manufacturing costs low while designing tranformers.Transformer is the common device which is found in electrical system that links the circuits which operates at different voltages .*

*Transmission and distribution of electrical energy are the primary part of the transformer. Designing of a step-down transformer from 230V to 60V AC is done by hardware designing, MATLAB programming and MATLAB simulation. Design is based on computer optimization techniques.  Hardware designing is completed by taking the output of O.C and S.C test.*

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### Nomenclature

| | |
|---|---|
| ø | The main flow, Wb |
| Bm | Wb/m² is the maximum flux density |
| Agi | m² gross core area |
| Ai | Area of the Net core |
| Ac | Copper window surface area, m² |
| Aw | m² of window area |
| D | M is thedistance between core centers |
| d | m is the circumscribing circle's diameter |
| Kw | Factor of Window space |
| $f$ | Hz Frequency |
| Ei | Emf per turn,V |
| Tp | Primary windings have a certain number of turns |
| Ts | Number of turns in secondary windings |
| Ip | Current in primary windings, A |
| Is | Current in secondary windings,A |
| Vp | Primary winding terminal voltage,V |
| Vs | Secondary winding terminal voltage,V |
| ap | Conductor area of primary windings,m² |
| as | Secondary winding conductors area,m² |
| li | In iron,li is the average length of the flux path and m is the maximum length of the flux path |
| Lmt | Length of mean turn of transformer windings,m |
| Gi | Active iron weight,Kg |
| Gc | Copper weight,Kg |
| gi | Weight per m³of iron |
| gc | Weight per m³of copper,Kg |

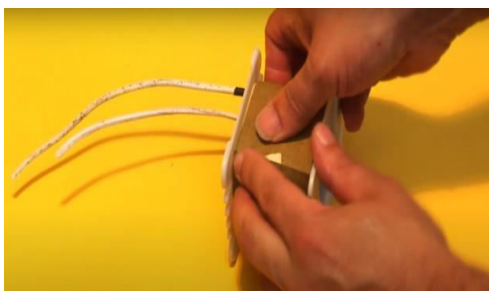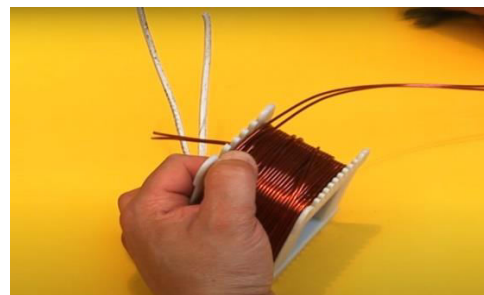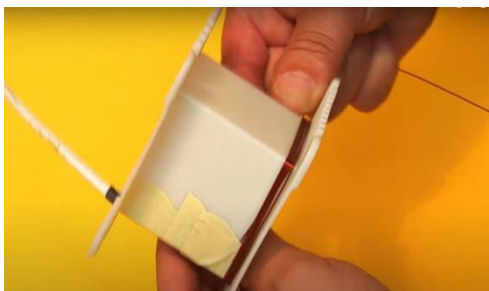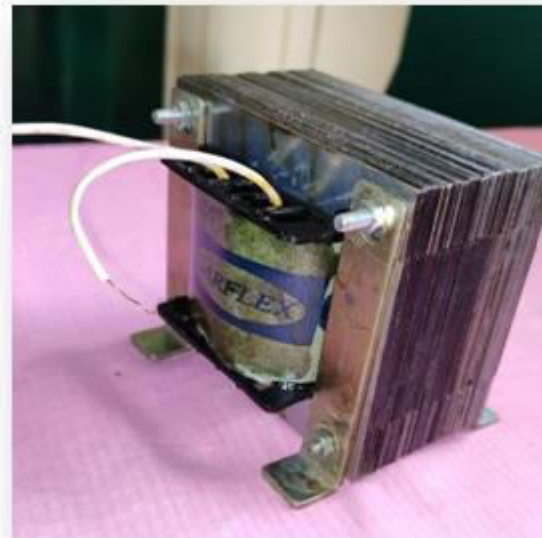| | |
|---|---|
| Pi | Iron loss per kilo,W |

### Introduction

A transformer is a common component found in electrical systems that connects circuits that operate at different voltages. These are used in situations when there is a need for AC voltages to transition from one voltage level to the next. In AC circuits based on electrical geology, the transformer can either reduce or increase the flow and voltage .In a wide, the transformers are arranged into two kinds to be specific electronic and force transformers. Electronic transformer works at exceptionally low voltages and are appraised at low force levels. The employments of this electronic transformer are TVs PCs Disc/blue ray players. Force transformers is alluded to the transformer with high force and voltage appraisals. These are widely utilized in age of force transmission, appropriation and utility frameworks which increments or diminishes the voltage level.

Cycloconverters are called as recurrence transformers that changes over the air conditioner power with one information recurrence to various yield recurrence. Also, employments of it is to change over the extent of AC power. In our day by day quick running life we need the utilization of electrical and electronic gadgets. In which it requires a force

supply. Similarly, we employ a 250v 50Hz AC supply, but this force must be converted into the requisite structure with the required characteristics or voltage for exhibiting supply capacity to various types of devices. Venture down converters, move ahead converters, voltage stabilisers, AC to DC converters, DC to DC converters, and DC to AC converters are examples of force electronic converters. For instance, micro converters are often utilized in creating installed frameworks which are utilized in instantaneous applications.
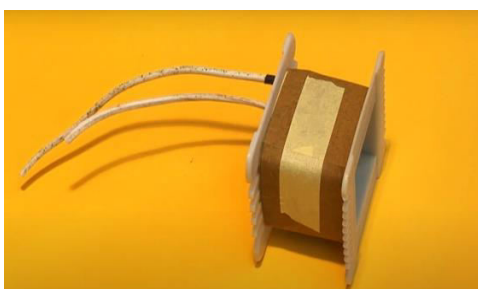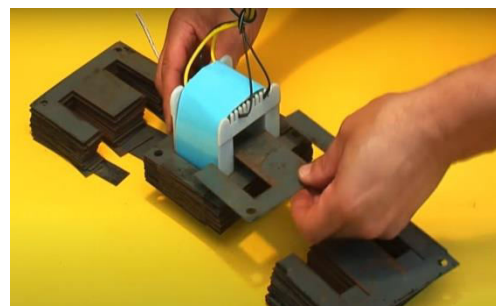
### Design of Step-Down AC Transformer

Development of step-down AC transformer is finished by utilizing the two curls twisted on the iron center of transformer. The proficient transformer generally incorporates the ferromagnetic center. As the material transforms into polarized utilizing the essential curls and sends the energy to the secondarycoil.





By finding 2-3 creeps of large steel washer we get ferromagnetic curl. To create the loops in the transformer we can utilize attractive wire with 28 checks. Which is a dainty copper wire with protection covered.







By covering the wire firmly in the zone of the washer we can make essential loops. By checking the quantity of windings and taking note of down the number, we can likewise twist it as layers. When the winding is done, keep the two finishes open for associating the force source and cover it with veiling tape in the zone of the wires to keep up them in position. The windings in the auxiliary curl ought to be remains, while planning venture down AC transformer. By the recipe of the change we can compute the genuine sum which is relied upon required voltage.

Required center shape is framed when these overlay stampings are associated together. For instance, one component of standard shell-type transformer of E-I center is framed when two "E" stampings in addition to two end shutting "I" stampings are firmly butted together while development to diminish the hesitance of the air hole at the joints delivering an incredibly soaked attractive transition thickness.

### Model of Step-Down Transformer

### Matlab

MATLAB is a network lab in a nutshell. MATLAB is a software programme that allows you to conduct functions such as network control, capacity charting, and calculating information execution. Making user interfaces and interacting with programmes written in C, C++, Java, and Fortan Python. It is also used by researchers and professionals in control design, and it allows you to prepare images.

### Design of Step-Down AC Transformer using Mat lab programming

% **Design of a Step-Down Transformer From 230V to 60V AC.**

clc

clear all

%input data

fprintf('#########################\n');

fprintf ('INPUT THE SPECIATIONS OF THE TRANSFORMER\n');

fprintf('#########################\n');

Vp=input ('terminal voltage of primary winding in V\n');

Vs=input ('terminal voltage of secondary winding in V\n');

f=input ('frequency in Hz\n');

P=input ('Output power in watts\n');

windowspacefactor=input('Windowspacefactor \n');

t=input ('thickness of lamination in m\n');

Ke=input ('Eddy current constant \n');

V=input ('volume of magnetic material m³\n');

gi= ((7.8) *(10^3)); % the unit of gi in kg/m^2

gc= ((8.9) *(10^3)); %the unit of gc in kg/m^3

stacking factor= 0.9;

delta= (2) *(10^6); % the unit of delta in m^2m;

fprintf ('current density in A/m²=%.3f\n', delta);

length=4.9; % the unit of length in cm

breath=3; % the unit of breath in cm

% to find current in primary and secondary windings in amps

primarycurrent=((P)/(Vp));

secondarycurrent=((P)/(Vs));

fprintf ('current in primary windings=%.4f amps\n', primarycurrent);

fprintf ('current in secondary windings=%.4f amps\n', secondarycurrent);

Rp=((Vp)/(primarycurrent));

fprintf ('Resistance of primary winding=%.3fohms\n', Rp);

Rs=((Vs)/(secondarycurrent));

fprintf ('Resistance of secondary winding=%.3fohms\n', Rs);

% to find the core area of the transformer in sqcm

corearea=((length)*(breath)); % the unit of corearea in sqcm

fprintf ('Core area of the transformer=%.4fsqcm\n', corearea);

Et=((42)/(corearea));

fprintf ('Emf per turn=%.4f\n ', Et);

Tp=((Vp)*(Et));

Fprintf ('Number of Turns in primary winding =%.8f\n', Tp);

Ts=((Vs)*(Et));

```
fprintf ('Number of Turns in secondary
winding =%.8f\n', Ts);

ap=((primarycurrent)/(delta));

fprintf ('area of conductors of primary
windings=%.8f cm²\n', ap);

as=((secondarycurrent)/(delta));

fprintf ('area of conductors of secondary
windings=%.8f cm²\n', as);

Agi=((corearea)*(1.1));

fprintf ('gross core area=%.4f cm²\n', Agi);

Ai=((stackingfactor)*(Agi));

fprintf ('net core area=%.4f cm²\n', Ai);

AT=((Ts)*(secondarycurrent));

Ac=((2*AT)/delta);

fprintf ('Total copper area in the window =%.4f
cm²\n', Ac);

fprintf ('windowspacefactor=%.3f\n',
windowspacefactor);

Aw=((Ac)/(windowspacefactor));

fprintf ('Window area=%.4f cm²\n', Aw);

Bm=1.1;

fprintf ('Maximum Flux Density= %.1f
wb/m²\n', Bm);

mainflux=(Bm)*(Ai);

fprintf ('Main Flux = %.3f wb \n', mainflux);

K=1.2;

d= (sqrt (Ai/K));

fprintf ('Diameter of circumscribing
circle=%.3fcm\n', d);

D=(1.7*d);

fprintf ('Distance between core
centers=%.3fcm\n', D);

% to find overall height and length of the frame

a=(0.9*d);

Ww=(0.7*d);

fprintf ('Width of the window= %.4f\n', Ww);

Hw=(Aw/Ww);

fprintf ('Height of the window= %.4f\n', Hw);

H=(Hw+(2*a));
```

```
fprintf ('Overall Height of the frame= %.4f cmt
\n', H);

W=((2*Ww) +(4*a));

fprintf ('Overall Length of the frame= %.4f cmt
\n', W);

%to find the weight of iron and copper

Gi=2; %the unit of Gi in kg

fprintf ('Weight of Iron =%.1fkg \n', Gi);

Gc=0.550; %the unit of Gc in kg

fprintf ('Weight of Copper =%.4fkg \n', Gc);

%to find the Losses of the transformer

Pc=(0.00000000000236*(delta^2) *Gc);

fprintf ('Loss in copper per kg=%.3f watt\n',
Pc);

Pe=((Ke)*(f^2) *(Bm^2) *(t^2));

fprintf ('Eddy current loss =%.8f watt \n', Pe);

Ph=((Ke)*(V)*(f)*(Bm^1.6));

fprintf ('Hysteresis loss=%.8f watt \n', Ph)

Pi=(Pe+Ph);

fprintf ('Loss in Iron per kg= %.6f watt \n', Pi);

totallosses=(Pc+Pi);

fprintf ('Total losses of Transformer=%.3f
watt\n', totallosses);

%to find the efficiency for the transformer

input power=(P+totallosses);

efficiency=(((P)/ (input power)) *100);

fprintf ('Efficiency of the Transformer=%.3f\n',
efficiency);

fprintf ('#####################\n');
```

**Output of Matlab Program**

```
#####################

INPUT THE SPECIATIONS OF THE
TRANSFORMER

#####################

terminal voltage of primary winding in V= 230

terminal voltage of secondary winding in V=
60

frequency in Hz= 50
```

Output power in watts= 300

Windowspacefactor= 0.33

thickness of lamination in m= 0.00032

Eddy current constant= 0.001

volume of magnetic material m³= 0.0524

current density in A/m²=2000000.000

current in primary windings=1.3043 amps

current in secondary windings=5.0000 amps

Resistance of primary winding=176.333ohms

Resistance of secondary winding=12.000ohms

Core area of the transformer=14.7000sqcm

Emf per turn=2.8571

Number of Turns in primary winding =657.14285714

Number of Turns in secondary winding =171.42857143

area of conductors of primary windings=0.00000065 cm²

area of conductors of secondary windings=0.00000250 cm²

gross core area=16.1700 cm²

net core area=14.5530 cm²

Total copper area in the window =0.0009 cm²

windowspacefactor=0.330

Window area=0.0026 cm²

Maximum Flux Density= 1.1 wb/m²

Main Flux = 16.008 wb

Diameter of circumscribing circle=3.482cm

Distance between core centers=5.920cm

Width of the window= 2.4377

Height of the window= 0.0011

Overall Height of the frame= 6.2695 cmt

Overall Length of the frame= 17.4123 cmt

Weight of Iron =2.0kg

Weight of Copper =0.5500kg

Loss in copper per kg=5.192 watt

Eddy current loss =0.00000031 watt

Hysteresis loss=0.00305161 watt

Loss in Iron per kg= 0.003052 watt

Total losses of Transformer=5.195 watt

Efficiency of the Transformer=98.298%

## Matlab Stimulation

Incitement programming helps the conduct of a framework. We can utilize incitement programming to assess another plan, determine issues to have a current plan, and test a framework under conditions that are difficult to duplicate, like a satellite in space.

Demonstrate and invigorate dynamic framework conduct with MATLAB, Simulink, State stream and Sims cape. Demonstrating is an approach to make a virtual portrayal of a true framework that incorporates programming and hard product.

### Circuit Diagram
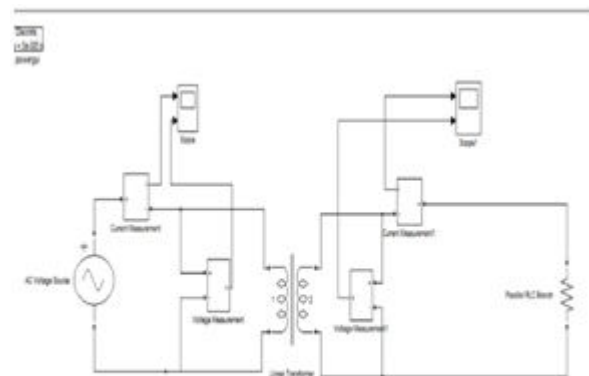


### Input Waveform of Design of transformer in MATLAB Simulink
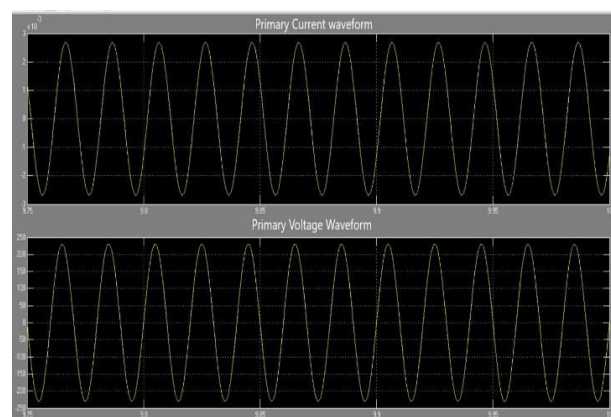


### Output Waveform of Design of transformer in MATLAB Simulink

### Test of Transformer

- Open circuit test
- Short circuit test
- Load test

### Open Circuit Test

1) With auxiliary side of the transformer open and auto transformer in the base situation on the stockpile to the circuit.

2) Now by shifting the yield variac of the autotransformer apply appraised voltage (230V) to the transformer.
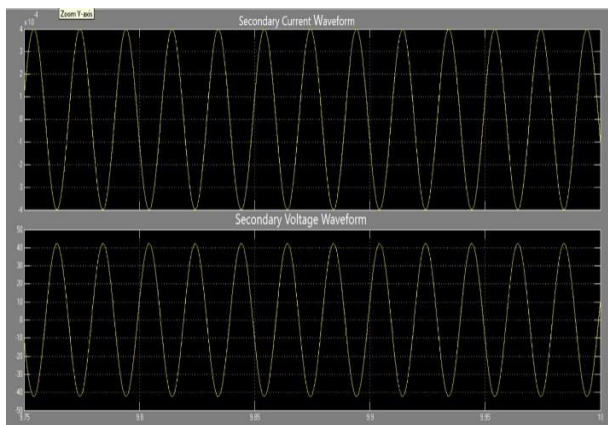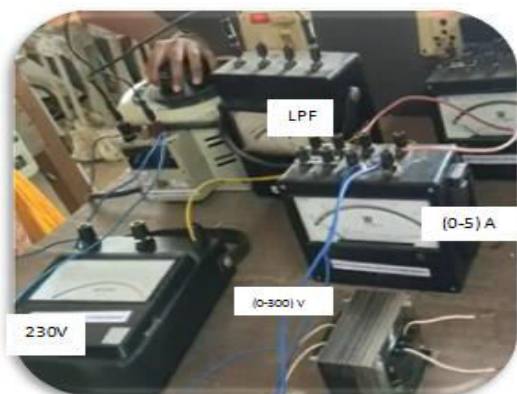
3) Note down the readings of the relative multitude of meters in the even column.

4) Reduce the yield variac to least position and eliminate the stock.

### Circuit Diagram
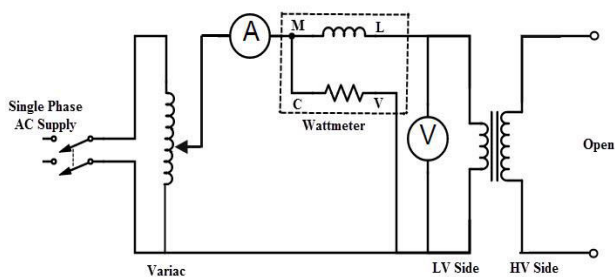




### Tabular Column

| Vo(volts) | Io(amps) | W(watts) | W*K(watts) K=1 |
|---|---|---|---|
| 230 | 1.28 | 0 | 0 |

### Short Circuit Test

The test is conducted on the transformer's high-voltage (HV) side, with the low-voltage (LV) side or optional short-circuited.

### Circuit Diagram
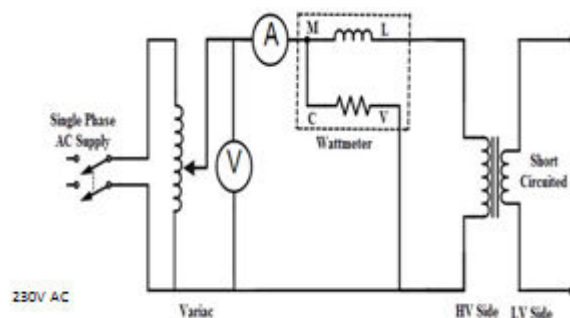




### Tabular Column

| Vsc(volts) | Isc(amps) | Wsc(watts) | Wsc*K(watts) K=1 |
|---|---|---|---|
| 59.2 | 1.3 | 5 | 5 |

### Load Test

The immediate burden test performs on the single-stage transformer to decide the voltage guideline and productivity of transformer

Direct burden test used to decide the exhibition of transformer at different burdens. The light burden associated at the optional twisting of transformer as shifting burden.

## Circuit Diagram
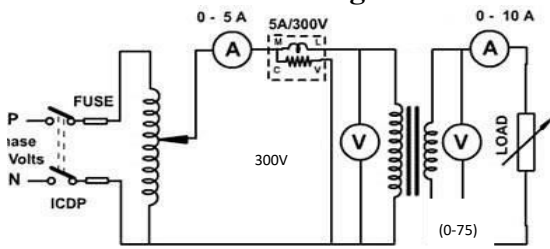


## Tabular Column

| Vsc(volts) | Isc(amps) | Vsc(volts) | Isc (Amps) |
|---|---|---|---|
| 230 | 1.3 | 59.6 | 4.8 |

## Conclusion

* Our contemporary work has been focused on the plan of value single-stage venture down transformer and our vision can likewise stretch for planning energy orderly machines as a further degree

* We have additionally been finished our plan of Step-down Transformer by utilizing MATLAB re-enactment.

* We have finished our plan of Step-down Transformer in Equipment planning just as in MATLAB programming in hypothetically and basically.

* The primary reason for planning a stage down AC transformer was that it will helpful for the instructive field. This made us to persuade and rouse to do the undertaking.

* The freedom of the undertaking is stressing MATLAB programming for the plan of step-down transformer in its fundamental form. This outfits a fantastic help for the understudies who are looking for freedom to get familiar with the plan of step-down transformer.

## References

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+ Kei Eguchi, Ratanaubol Rubpongse, Akira shibata, Takaki Ishibashi, Frazin asadi(CPESE 2019: 6th International Conference on Power and Energy System Engineering, Okinawa, Japan, September 20-23, 2019).

## Appendix

✓ Maximum flux density (Bm)=1.0-1.2 wb/m².

✓ Current density=1.1-2.2 A/m².

✓ Stacking factor=0.9.

✓ Distance between core centre's(D)=0.05916m.

✓ circumscribing circle diameter (d)=0.0348mt.

✓ Factor of window space (Kw)=0.33.

- ✓ Frequency(f)=50Hz.
- ✓ Current in the primary and secondary windings(I)=0-5 A.
- ✓ Area of the conductors of primary windings (ap)=Ip/current density.
- ✓ Area of the conductors of secondary windings (as)=Ip/current density.
- ✓ Length of mean turn of transformer windings / Lmt/li (mean length of flux route in iron)=1.0-1.2 m.
- ✓ Weight per m³ of iron, Kg(gi)=7.8*10³ kg/m².
- ✓ Weight per m³ of copper, Kg(gc)=8.9*10³ kg/m³.
- ✓ Eddy current coefficient(kh)=0.001 for silicon steel.

**Authors**

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- ➤ Madhukar S, Vinay kumar R , Bhavana GT and Sujana Nare currently pursuing theirBachelor of Engineering (Electrical and Electronics Engineering) in Dr. TTIT, KGF.

# DESIGN AND IMPLEMENTATION OF CONTACTLESS HUMAN BODY TEMPERATURE MEASUREMENT AND AUTOMATED SANITIZER DISPENSER

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## ABSTRACT

*In these critical days of the COVID-19 pandemic, itisdifficult toknowwhether apersonis infectedwith thevirus or not. Because the virus will spread from person toperson through air medium which results in rapid spreading.During the sanitizing process or checking a person for theinfection of the virus an anotherperson i.e. the one whochecks,needstobeclosertotheonewhoneedstobechecked , at this time the one who checks is in danger to theinfectionofvirus.Inordertoovercomethissituation"Implementation of contactless human temperaturesensorand automated sanitizing dispenser" can be used. By usingthis idea we can use a machine without an human being andreducethenumberofaffectedpersons.As per our idea, here we are using an contactlesssensors rather than a contact sensor in order to avoid thecontactbetweenthetwomembers.Whenapersonisinstructed to stand at the defined place, which is suitable forthe sensorto sense.Thesensorsensesthetemperature ofthe human body andgeneratesthe   signal andtransfersthesignaldata totheARDUINOwere itconvertssignaldataintoan digital datain a suitable way ofdisplaying itonthe LCD.After this process the person is allowed to passifhe has normal body temperature ,andsanitized by theautomatedsanitizerdispenser, Ifthe temperature oftheperson is more than the normal temperature the buzzer willgive an alertsound, and the person is not   allowed  topassthrough.*

_____

*Keywords:: Contactlesssensors, ARDUINO, LCD, Buzzer, Ultrasonicsensor, Driver, DC Buckconverter, Solenoidvalve*

## 1. Introduction

World is going towards a terrible circumstance because of theCoronavirus infection (COVID-19). Where the majority of thenations are experiencing this illness just as everybody is in perilstructurethisinconspicuousinfection Foundationlikeorganization,transportationframe works,andlocalarea pandemic. These plans may consolidatea hiddenexaminationtoendeavortospotpeoplethatc ouldsimilarlybeoverwhelmingtopreventthesprea d of COVID-19infections[1].

Assessmentoftemperatureareconsistentlyoneapie ceoftheexaminationtoworkoutifan individual encompasses a raised temperature probably achieved by a COVID-19 contamination. One strategy to measurea private' surface temperature is that the utilization of " non-contact" or non-contact temperature checking devices, like heat imaging structures or non-contact infrared measuring systems the use of different temperature assessing devices, like oral thermometers, needsreal contact which might extend the hazard of spreading sullied. The open smart composing up holes mistreatment warm imaging systems and non-contact infrared thermometer to acknowledge raised temperature [2].

Advantagesof                     Contactless TemperatureAssessmentDevices

- Sincecontactlessgadgetscanquicklyquantifya ndreportatemperatureperusing,countlessindiv idualsarehabituallysurveyedexclusivelyatsect ionfocuses.

- Contactlessinfraredthermometersrequireinsig nificantcleaningbetweenusage.

- Usingcontactlesstemperatureassessmentsyste msmayhelpinreducingtheperilofcontaminatio nspread.

Cleaning or sanitizing a factor or half like hands orwholebodyisseenasSanitizationTherearea handful ofvariedwayswereSanitizationareeverycurrently andonce moredoneincluding actinic radiation Sanitization,SoapSanitization,AlcoholSanitization, and Bleach Sanitization then on from the higher thansystems,alcoholwasfoundtobemorehelpfulfo rindividuals sinceit's delicateorharmlessonskinsurface,breaks down with success andkillsmostofthediseases,microorganisms,and besides takes earth inourgrip.As alcoholdearly-wonformassscalesanitizationofstructuresor rooms and liquor iscompletely ignitable and needsaware amassing to avoid catastrophe could also bean enormous hindrance. As alcohol equally makes hands dry since it absorbs moistness, and what is more it wants development of creams. Least centralization of alcohol close sanitizers have to be compelled to be more clear than 70% for sufficiency against diseases .Contact with a privatecan also began by another time and over reaching the hand sanitizer holders to support a drop of sanitizer during this manner there' want for non-contact primarily based hand sanitizer device [3].

## 2. Problem Statement

By using contactless temperature sensor and automated sanitizer dispenser, we are proposing this project for initial assessment to try to identify people who may be infectious to avoid the spread of viruses like COVID-19 infections without employing manpower.

## 3. Objectives

- To get accurate result.

- To design a project to get higher efficiency.

- To design a touch less hand sanitizer dispenser.

## 4. Proposed System

### 4.1 Proposed Work

Our proposed project does not require any humanefforttomeasurethebodytemperatureortodi spensethehandsanitizerthus by fully making this systemautomated and apreventivemeasureincontrolling COVID-19.The proposed project can be installedat the Entry point of Hospitals, institutions,factories,industries,shopping Malls,Airports,Railway stations, Bus stands, public placesany person gettingin is welcomed by an voice message to stand in front of thesensor if the temperature is normal ie $97^oF$ to $99.6^oF$ the systemprompts the person to place his hand to get the sanitizer andthanks him[4].If thetemperatureis above$100^oF$thenthesystemalertsbyturningthebuz zer.

The system has HC-SR04 an ultrasonic sensor that sensesthepresenceofthehumans.MLX90614asinf rared(IR)contactlessthermometersensor.incorrela tionwiththetypicalthermometer it shows solid focuses like contactlesshelpful perusing,widechoiceoftemperatureestimation,an dprecision[5].MLX90614 is interfaced to Arduino Mega2560. A 16x2 LCD is used to display the temperature and otherinformation, ISD1820 Voice Recording / Play back IC is usedtoprovideVoiceinstructions.ASolenoidvalve isusedtocontrol flow of sanitizer. The system is dual powered that is itoperatesonAC mains aswellasbattery incase of powerfailure.
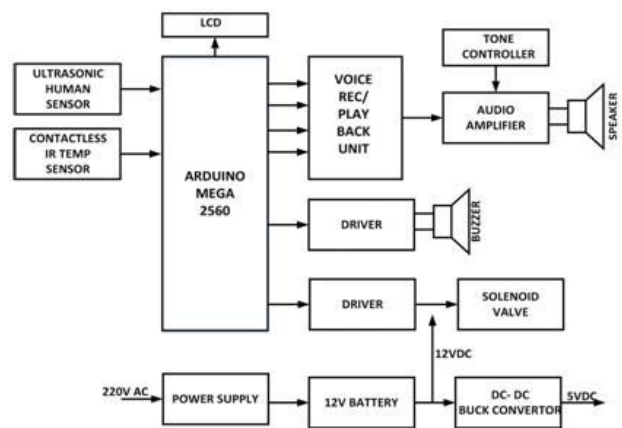
### 4.2 Block Diagram



Fig 1: Block Diagram

## 5. Methodology Adopted

- Sketch IDE (Integrated Development Environment) 1.8.1 or higher version Programming Arduino is used as Software forProgramming.

- Hardware module is constructed to measure the temperature of a Human body using digital thermometer contactless MLX90614 Infraredsensor.
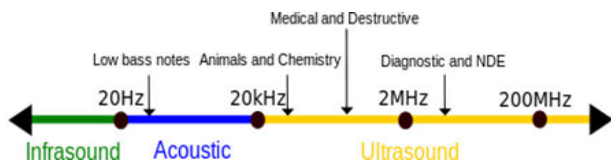
- Hardware and Software areembedded.

### 6. Hardware of Proposed System



Fig 2: Inside and Top View of Hardware Module

> ### Hardware Description

### 6.13Arduino

The Fig.2showed above gives the depiction aboutArduino may be a device for making PCs which will recognizeand control a more noteworthy measure of the genuine worldthanyourPC.It'sanopen-sourcegenuinefiguringstagemaintained astraightforward microcontrollerenvironment formakingprogrammingfortheboardandanewd evelopment.

> ### ATmega 2560 Microcontroller

The ATmega2560 providesthe subsequent features: 256K computer memory units of In-System Programmable Flash with Read-While-Write limits, four Kbytes EEPROM, 8Kbytes SRAM, 54/86 acknowledge clarification I/O lines, thirty two slick clarification running registers, Real Time Counter (RTC), six bendy Timer/Counters with assess modes and PWM, 4 USARTs, a byte organized 2-rope Serial Interface, a 16-channel, 10- digit ADC with elective differential knowledge stage with programmable increment, programmable Watchdog Timer with Internal Oscillator, a SPI interface , IEEE physically communicated sickness. 1149.1 pleasant JTAG take a look attake a look at interface, extensively used for moving toward the On-chip right machine ANd programming and six programming selectable strength saving modes is as shown in Fig 3.By connection a 8- digit computer architecturemainframe with In-System Self-Programmable Flash on a powerful chip, the Atmel 2560 is also a staggering

microcontroller that provides an particularly versatile and price convincing response for a few of embedded management applications.



Fig 3: ATmega2560 Microcontrollers

### 6.2 MLX90614

The MLX90614 is an Infra-Red thermometer utilizedfor non-contact temperature estimations. IR touchy thermopileidentifier chip and accordingly the sign molding ASSP both areincorporated in TO-39 can. due to its low clamor intensifier, 17-pieceADCandincredibleDSPunit,ahighprecision andassuranceofthethermometerisaccomplishedas displayedinsidetheaboveFig4.



Fig 4: Infrared Thermometer

### 6.3 Ultra Sound

This HC-SR04-Ultrasonic Range Finderisatotallyfamoussensor that's discovered in lots of programs in which it calls formeasuring distance and detecting the objects. The module hastwo eyes like tasks with inside in the front which prepare worktheUltrasonictransmitterand Receiverasshownin theFig5.

Fig 5 : Ultrasound sensor range



Fig 6 : Ultrasonic SensorHC-SR04

### 6.4 LCD



Fig 7 :LCD

A liquid Display (LCD might be a minimal expense, low-powergadgetwhichisequippedforshowingtextand pictures.LCDsareincrediblynormalusedininserte dframeworks,sincesuchframeworksfrequentlydo n'thavevideo screens like individuals who come standardwithworkareaframeworks.Itarenormalfo undinvariousnormalgadgetslikewatches,faxandi mitation,machinesand numbercrunchers.LCDInitializationasdisplayedi nsidetheaboveFig7.

### 6.5 Driver

A Darlington pair is 2 semiconductors that go probablyas one semiconductor yet with a predominant current expansion.The DarlingtonTransistor named afterit's trailblazer,SidneyDarlington may be an absolutely novel coalition NPN or PNPbipolarintersectionsemiconductors(BJT)ass ociated.TheEmitterof 1semiconductoris associatedwiththe lowerpartoftheinversetosupply

amoredelicatesemiconductorwithagreater current increase will be used in applications wherecurrentenhancementorexchangingissignifi cant.

### 6.6 Solenoid Water Airvalve

12V/24V DC electricalmagnet Water Air Valve Switch (Normally Closed) Controls the movement of fluidor air and go most likely as a valve between hard-hitting water or any fluid. There are 2 3/4" (Nominal NPT) outlets. Commonly, the valve is closed. preciselyonce 12Vdc is applied to the two terminals, the valve opens and water pushes through as shown in the fig 8.



Fig 8: Solenoid Water Air Valve

### 6.7 Buzzer

A ringer or beeperis a sound device , which can bemechanical,electromechanical,orpiezoelectri c.Ordinarybusinessesof ringersandbeepersfusealertdevices,timekeepers andinsistenceofcustomerinputlikeatick or keystroke.

➢ Piezoelectric



Fig 9: Piezoelectric Buzzer

A piezoelectric subtletiesare routinely pushed throughstrategyforstrategiesforafalteringelectroniccircuitorparticularsoundsignsource,pushedwith apiezoelectricintensifier . Sounds generally wont to recommend that a catchhas beenpressedareatick, acircleorasign.

The piezo signal produces sound dependent on inverseof the piezoelectricity . the time of pressure form or pressingfactorbymeansofmethodofmethodsfortheproductofelectricalability allthroughapiezoelectricfabric isthatthebasic guideline. These signals are regularly utilized caution apurchaser of an occasion practically like an exchanging activity,counter sign or sensor input. they're additionally used in cautioncircuits as shown in the fig 9.

### 6.8 ISD1820



Fig 10: ISD1820

The voicerecordingmodule is based on the ISD1820, a multi-messagerecording or playback device. It offers single-chip voice recording, no memory and a playbackcapabilityof8-20 seconds. The model is 3.2k which is the full 20 second scale for the recorder, thisusing the module is incrediblyeasyand you can organizethe controlthrough ReadyMotion or througha microcontroller like Arduino, STM32, Chip Kit, etc. From these you can easily control recording, playback and repetition as shown in fig 10.

### 6.9 PAM8403

The PAM8403 might be a 3W,class-D enhancer. ItgiveslowTHD+N,allowingittoaccomplishsuper multiplication.Thenewchanneloutconsiderablyle ssconstructionpermitstheinstrumenttocontrolthes

peakerstraightforwardly,requiringnolow-passyieldchannels,subsequently saving gadgetworthand PCB region.Withtheindistinguishablequantitiesofouto fentrywaysparts,theeffectivenessof the PAM8403 mightbe a clusterhigherthanthat of Class-AB cousins. It can intensify the battery life, whichmakes it well-suitable formovable applications. The PAM8403is outthereinSOP-16bundle.

### 6.10 Battery

The lead-destroying battery as shown in the fig 11 was developed in 1859 by the French physicist Gaston Planet and is the most common type of battery-controlledbatteries. Despite an incredibly low energy level for theweight and volumeof the espresso, its ability to deliver high currentsof water suggeststhat the cells have a moderately enormous weight capacity.With itsalmost negligiblecosts,thiscomponentis very attractive for use in vehicles in order to supply the required high current by means of an automaticstarter motors.



Fig 11: Battery

### 6.11 Power supply

Apowersupplymightbeaunitthatprovisionspow ertosomethinglikeatleastoneelectricburdens.Th eforcesupplycircuitincorporatesatleastonetransf ormers,rectifierdiodes,capacitors,resistors,ands emiconductorsalongwithawireorelectricalswitc handpotentiallyaswitchaswellaspointersasdispl ayedinFig12.
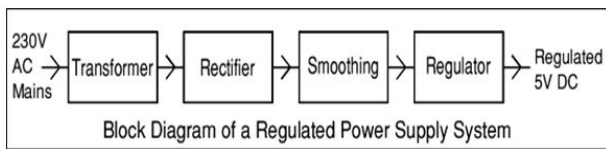
Fig 12: Block Diagram of a Regulated Power supply system

## 7. Software Requirement

### 7.1 Sketch

Sketch IDE (Integrated Development Environment) can be a remarkable program that runs on your PC and gives you the license to record the Arduino board renders during essential language issued after processing language. Themagic happens as soonas youhit the button that moves the sketch onto the board,

the code formed is changed to the C language and passed to the AVRGCC compiler, a critical part of the open source programming is doing thefinal translation into the speech captured by the microcontroller. Thislatest development is prettybig considering how the Arduino works in your life by covering the complexities of microcontroller programming.

## 8. Result

Aspertheproposedproject,wehavesuccessfullyImplemented,AutomaticContactlessBodyTemperatureMeasuringandSanitizerDispensingSystem.The output displayed on the LCD and the measured temperatures are as shown in the below tables.

| SL.NO | Time interval | Time taken to measure temperature for a person | Temperature of humanbody displayed on LCD | Output of voice record |
|---|---|---|---|---|
| 01 | 4.20 sec | 12.62 sec | 32.9°C, 91.2°F | Welcome, place your hand for sanitizer, Thank you |
| 02 | 4.34 sec | 12.42 sec | 30.9°C, 87.6°F | Welcome, place your hand for sanitizer, Thank you |
| 03 | 4.42 sec | 11.58 sec | 29.5°C, 85°F | Welcome, place your hand for sanitizer, Thank you |
| 04 | 4.58 sec | 12.34 sec | 30.1°C, 86.3°F | Welcome, place your hand for sanitizer, Thank you |

**Table 1: Normal Body temperature**

| Sl .no | Time Interval | Temperature of Human body Displayed on LCD | Output of Voice Record |
|---|---|---|---|
| 01 | 6am | 30.9°C, 87.6°F | Welcome, Place your hand for sanitizer, thankyou. |
| 02 | 9am | 31.7°C, 89°F | Welcome, Place your hand for sanitizer, thankyou. |
| 03 | 12am | 33.1°C, 91.6°F | Welcome, Place your hand for sanitizer, thankyou. |
| 04 | 3pm | 32.9°C,91.2°F | Welcome, Place your hand for sanitizer, |

| | | | thankyou. |
|---|---|---|---|
| 05 | 6pm | 30.4°C,86.8°F | Welcome, Place your hand for sanitizer, thankyou. |
| 06 | 9pm | 29.5°C,85°F | Welcome, Place your hand for sanitizer, thankyou. |

**Table 2: Human Body Temperature measured at different timing**

| SL.NO | Different Condition | Temperature of human body displayed on LCD | Output of Voice Record |
|---|---|---|---|
| 01 | Cold Condition | 19.7°C,67.46°F | Welcome, Place your hand for sanitizer, thankyou. |
| 02 | Normal Condition | 30.1°C,86.2°F | Welcome, Place your hand for sanitizer, thankyou. |
| 03 | Hot Condition | 38.5°C,101.3°F | Welcome, Place your hand for sanitizer, thankyou. |

**Table 3: Human Body Temperature measured at different Conditions.**

### 9. Advantages

- Non-contactgadgetscanrapidlyquantifyandshow atemperature perusing so an outsized number of individualsareregularlyassessedindependen tlyatthe entrypoint.

- Non-contactinfraredthermometersrequireinsignif icantcleaningbetweenemployments.

- Alertson High Temperature.

### 10. Disadvantages

- It requires an external source (Battery) when power failureoccurs.

### 11. Applications

- Residential.

- Commercial.

- Industrial.

### 12. Conclusion

In this paper, the Contactless Human Body Temperature Measurement and Automated Sanitizer Dispenser is designed and Implemented. The measured temperature is displayed through the LCD, if the temperature is normal ie 97°F to 99.6°F the system prompts the person to sanitize his hand. If the temperature is above 100°F then the system alerts by turning the buzzer. Our project does not require any human effort to measure the body temperature or to dispense the hand sanitizer thus by fully making this system automated and a preventive measure in controlling COVID-19 virus.

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# ANALYSIS AND DESIGN OF TALL BUILDING

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## ABSTRACT

*Present study is focused on the design and performance of a multi-storied residential building. Static and dynamic analysis of various models using different structural systems and are examined using ETABS software. The performance analysis of tall building for different models are performed to find the optimum structural system by using lateral loads. This paper discusses the analysis adopted for the evaluation of tall buildings under the effect of wind force and earthquake using ETABS. Tall building of height 360ft has been analyzed for Bangalore region India standard code of practice IS-875(part 3) and IS-1893 is used for analysis. Hear, the lateral story displacement, story shear and drift are analyzed in different direction.*

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*Keywords: ETABS, Lateral story displacement, Story shear, Story drift.*

## I. Introduction

At every step that tall building design takes toward the sky, today's structural engineers and architects coming across new complications. As the height of tall buildings rises with developments in the field of structural system design and the use of high-strength materials, their strength to weight ratio, slenderness and flexibility increase, and their rigidity decrease and thus their susceptibility to wind loads increase. Wind loads, which cause large lateral deflection, play a key role in the design of tall buildings and can be even more critical than earthquake loads.As a result, the wind loads to which tall buildings are subject have become an important problem. Since the weight of the structural system in the early tall buildingsmadeverticalforcesmorecriticalthanlateralforces,windloadswerenot considered important. In time, with developments and innovations in structural systems and the increase in the strength to weight ratio of the structural elements, the weight of buildings decreased and wind loads began to be important. Consequently, because the tall buildings being constructed today are lighter, slenderer and more flexible than their predecessors, they are more prone to lateral drift with low damping, and wind-induced building sway has been transformedinto one of the most important problems encountered by tall building designers, becoming a basic input to the design

Tooppposelateralearthquakeloads,sheardividersa renormallyutilizedinRC confined structures, while, steel propping is the regularly utilized in steelstructures.Intheprevioustwodecades,variou sreportshavelikewisedemonstrated the compelling utilization of steel propping in RC outlines. Steel supporting of RC structures began as a retrofitting measure to fortify earthquake-harmed structuresor to expand the heap opposing limit of existing structures. The bracing methods adopted in the past fall into two main categories, namely external bracing and internal bracing. In the external bracing system, existing buildingsareretrofittedbyattachingalocalorglob alsteelbracingsystemtothe exterior frames. In the internal bracing method, the buildings are braced by incorporating a bracing system inside the individual bays of the RC frames. The bracing may be attached to the RC frame either indirectly or directly.

Bracingisaveryeffectiveglobalupgradingstrateg ytoenhancetheglobalstiffness and strength of steel un-braced frames. It can increase the energy absorption of structures and/or decrease the demand imposed by earthquake loads whenever hysteretic dampers are utilized. Structures with augmented energy dissipation may safely resist forces and deformations

caused by strong ground motions. Under awesome earthquake ground movements, the flexibility of steel minute opposing frames may bring about incredible lateral drift impelled nonstructural damage. In steel frames, the inter storey float proportion should be constrained inconfiguration because of the weak seismic execution to oppose earthquake identified with geometric non linearity and brittle failure of beam-to-column connections. Steel braced frame is one of the structural systems used to resist lateral loads in multi-storied buildings. Steel bracing is economical, easy to erect, occupies less space and has flexibility to design for meeting the required strength and stiffness. Braced frames are often used to resist lateral loads but braces can interfere with architectural features. The steel braces are usually placed invertically aligned spans. This system allows obtaining a great increase of stiffness with a minimal added weight, and so it is very effective for existing structure for which the poor lateral stiffness is the main problem.

Bracings are usually provided to increase stiffness and stability of the structure under lateral loading and also to reduce lateral displacement significantly. Steel bracing members are broadly utilized as a part of steel structures to reduce horizontal displacement and disperse vitality during seismic movements. Mega steel supporting give a great way to deal with reinforcing and hardening steel structures. Utilizing these supports the creator can scarcely modify the stiffness together with flexibility as required due to buckling of braces in compression. Because of the high productivity and monetarily, braced steel frameworks are broadly utilized. Propped steel framework ineffectualifthebracesinlinearstage.Thedeviated reactioniscreatedwhenatthe nonlinear stage begins while, the lateral stiffness starts to decrease. Steel bracing is a highly efficient and economical method of resisting horizontal forces in a frame structure. Bracing is efficient because the diagonals work in axial stress and thereforecallforminimummembersizesinprovidi ngstiffnessandstrength againsthorizontalshear.

Abracingsystemimprovestheseismicperforman ceofthe frame by increasing its lateral stiffness and capacity. To oppose seismic loads, supported steel frames have numerous propping frameworks, for example, concentric bracing system, eccentric bracing system, knee bracing system and mega bracing system. The mega bracing system (MBS) is considered as viable solution to augment both global lateral stiffness and strength of steel frames. MBS is most cost-effective than other types of bracing. Mega-braces can be installed without business interruption within the building thus preventing loss of use (downtime) caused by the structural retrofitting strategy. MEGA Brace is aproprietary mechanical or hydraulic strutting system increasing the overall load capacity of the waling beam. The Mega beam can also be used as the waling in raking strut systems.

## II. Related Works

Ashitha V Kalam, Reshma C proposed a paper on Dynamic wind analysis of RC bundled tube in tube structure using Etabs [1]. From the results it is clear that bundled tube in tube structures response against heavy lateral loads of entire building. From the study it can be concluded that by providing shear core at the central portion of each tubes in bundled tubular structure can improve the efficiency of the structure.

Mr. RaeedAslam Bhatkar, Prof. Narayan Gorakh Gore proposed a paper on Comparative study of outrigger and diagrid structural system [2]. They have concluded that the performance of the diagrid structural system is evidently superior to Outrigger and conventional rigid frame with shear wall structural systems.

Saurabh Kanungo & Komal Bedi have done project on Analysis of tall structure with X-type bracing considering seismic using analysis tool Stadd pro.[3]. From the results it is seen that The steel bracing system has not only improved displacement capacity of reinforced concrete structures, but also the lateral stiffness and strength capacity of the structures by increasing its shear capacity. X-bracing of steel bracing types has found in the most efficient in terms of story displacement and story driftreduction when bracing is provided on two parallel sides of thebuilding.

Pavana V and Dr. Shreepad Desai proposed a paper on Performanceanalysisofthestructurewithdiagridf orseismicloading [4]. The introduction of diagrid systems in tall structures is found to increase the seismic performance of the structure. From the comparison of diagrid system with shear wall system it is found that the lateral displacements in diagrid models are much lesser than the shear wall models. The lesser lateraldisplacements in diagrid show the enhanced resistance of the buildings against lateral seismic force. The storey drifts is also smaller value in model with diagrid system than shear wall system. Thus the diagonal elements of the diagrid effectively counter the drifts from earthquake forces.

### III. Methodology

1. Planning building.

2. Model the building in "ETABS" software.

3. Static analysis (Equivalent static analysis).

4. Dynamic analysis using response spectrum method using IS-1893 code book.

5. Result and discussion ‣ Conclusion of the project.



Figure 1:Plan of the Building

Planning of building is done by theusingofsoftware "**AUTOCAD**". AUTODESK. in 1982, "john walker" automatic and cad for computer aided design,whichmeansdesigningof variouspartsatmicro/macrolevel inwithhelpofcomputereasily.It **is** a software for designing (2d/ 3d) by autodesk ,draw to scale. One of the main benefits of AUTOCAD is that it allows you to drawtoscale.
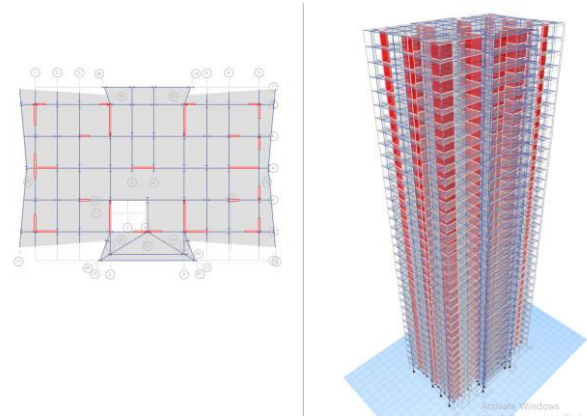


Figure 2: Modelling of the Building using ETABS

Modeling of thebuilding is done using"ETABS". ETABS stands for extended 3d (three-dimensional) analysis of building systems.softwareETABS is an engineering software product that caters to multi-story building analysis and design.

### Analysis of the building

### Wind analysing using wind speed as per IS code book.

Wind load analysis as per is 875 (part 3)-1987.wind forces acting on a given surface is equal to the wind pressuresmultipliedbytheeffected area. armed with pressure and drag data, you can find the wind load usingthefollowingformula:force=areax pressurex cd.

### Static (Equivalent static analysis)

Static analysis is an essential procedure to design a structure. Usingstaticanalysis,thestructure'**s** responsetotheappliedexternal forces is obtained. Moreover, the static analysis is performed when the structure is subjected to external displacements, such as differential support settlements.

### Dynamic analysis using response spectrum method.

Dynamic analysis using response spectrum method using IS-1893-(2002) code book. Response-spectrum analysis (RSA) is a linear-dynamic statistical analysis method which measures the contribution fromeach natural mode of vibration to indicate the likely

maximum seismic response of an essentially elastic structure.

### Building Description.

‣ Building is designed for 36 floor with amenities.

‣ Total area of the building is 9120sqft.

‣ Area dedicated for plants and balcony 2480sqft.

‣ Material property - M25 & Fe345.

‣ Section property used for beams: ISLB250

‣ Section property used for columns : WPB300X400, WPB360X370, WPB500X300, WPB700X300

### IV. Result

As the analysis is done using ETABS software . The loads and load combinations are taken according to IS 456-2000 codebook. Since it is a tall building, by providing shearwall and bracings building will give satisfactory results to the lateral and longitudinal forces.The analysis made by static analysis method and response spectrum method.
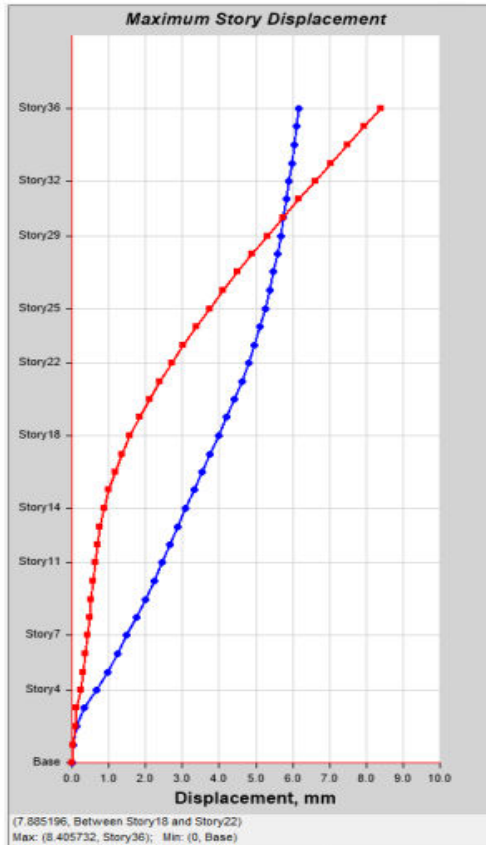


Figure 3: Maximum storey displacement
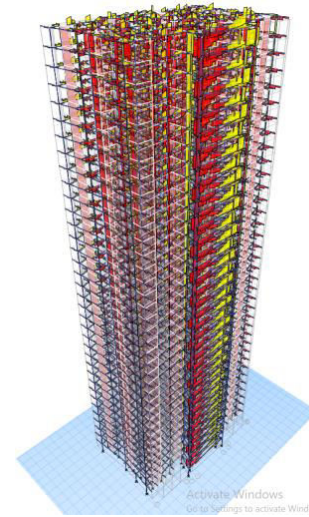


Figure 4: Shear force diagram
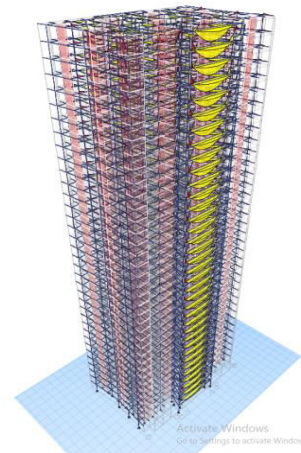


Figure 5: Bending moment

### V. Conclusion

As per the study made the following conclusion have Benn arrived at Provision of shear wall had given satisfactory result for the building compared to the building with out shear wall. Providing shear wall incase of the tall building were the story shear, story drift, displacement & time period can be brought well in to control. The displacement is higher for the building without shear wall when compared to the building with shear wall. Story drift values depends on stiffness of the building if stiffness of the building is high the story drift value is less. Base shear as the stiffness increases base shear increases due to increase in the structural rigidity contributed by resisting elements like beams & shear wall.

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# DEVELOPMENT AND OPTIMIZATION OF HYBRID POWER GENERATION AND STORAGE TO PROMOTE CLEAN ENERGY

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## ABSTRACT

*Energy resources must be utilized to their full potential in order to lessen reliance on fossil fuels, while also addressing economic, environmental, and societal constraints. This has piqued interest in increasing research and development as well as investments in the renewable energy industry in order to meet rising energy demand while reducing reliance on fossil fuels. Because of the abundance, availability, and convenience of harnessing the energy for electrical power generation, wind, hydro, and solar energy are becoming increasingly popular. Solar PV and turbines are used in stand-alone power generation systems to produce and store energy for later use. Solar has limitations in that it cannot produce electricity at night or during the cloudy season. To overcome this limitation, we will combine wind, solar, and hydropower such that if one source fails, the others will continue to provide electricity in all weather conditions. It is a hardware design for a small independent stand-alone power age framework that utilizations wind, hydro, and sun based assets. Here this system can be used in enterprises and homes where wind and solar energy is obtained through turbines and PV-cells, and rainwater is permitted to flow through a mini-turbine, which produces electricity during the rain. Finally absolute energies will be obtained all the while for charging the batteries and is used for fulfilling the electrical requests of homegrown and rustic regions. Uninterrupted power can be supplied in industries and factories using an inverter.*

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**Keywords:** *Environmental and social constraints, Wind, hydro and solar energy, Stand-alone power , PV-cells, Mini-turbine, Uninterrupted power*

## 12.    Introduction

India is currently experiencing a peak demand shortage of roughly 14% and an energy deficit of 8.4%. India is presently experiencing increased energy constraint, which is impeding the country's industrial expansion and economic advancement, and this has necessitated the construction of new power plants that are heavily reliant on the import of highly volatile fossil fuels. The growing use of conventional fuels, combined with environmental degradation, has sparked interest in developing environmentally friendly renewable energy sources.

Because natural resources are abundant and free, renewable energy is regarded as the future source of power generation. Hybrid power systems are often cost-effective and dependable. In general, load demand in rural and hilly locations is low, and solar and wind power are commonly employed energyresources to supply the load. Other resources, such as biomass, tidal, hydro, and geothermal, can be used in conjunction with these to fulfill the changes in load demand.

The non-conventional source of power is dependable, pollution-free, and in-expensive. Alternative strength assets for traditional energy resources must include non-conventional strength resources. Non-traditional energy sources can be combined to produce the greatest amount of production throughout the day. The major goal is to develop an integrated hybrid renewable energy system that combines wind, hydro, and solar energy. Solar PV or turbines are used in stand-alone power generation systems to produce and store energy for later use.

Solar energy is limited in its ability to generate electricity at night and during cloudy seasons, so to overcome this limitation, we will combine wind, solar, and hydropower to ensure

that if one source fails, the other sources will continue to generate electricity, even in extreme weather conditions.

Hybrid systems have a lot of benefits. When solar, hydro, and wind power production resources are combined, the system's reliability and energy service are increased. This means that if one of the resources is unavailable, the service will be provided by the other.The requirements, stability, and cheaper maintenance are also positives, resulting in less downtime during routine maintenance or repairs. Furthermore, renewable energy resources aid in the decrease of pollution emissions.

### 13. Objectives

- To propose a hybrid model of solar, wind and small hydro for storing and to utilize the power.

### 14. Proposed System

### 4.3 Block Diagrams
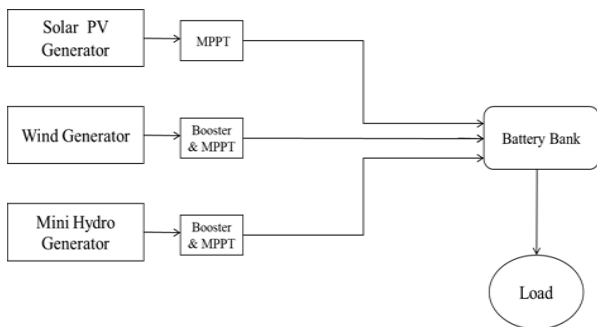


Fig.1. Factory Unit

### 4.4 Working

The working of our components is that we have used solar, wind turbine (both horizontal and vertical) and a mini hydro

- Solar panel - In this the conversation of energy takes place when the sun rays falls on the solar panel ,where the electron moves in the PN junction due to this flow of electron it generates electrical power. The generated electrical power is fed to battery through MPPT controller, Where MPPT(Maximum power point tracker) is used to compares the voltage between the solar and battery.

- Wind turbine - Here the energy is obtained from the movement of air or harness of the

wind ,when it strikes the turbine blades, it rotates which is coupled to the dc generator to produce power, ie (mechanical power to electrical power). This electrical power is fed to battery through booster circuit, Booster circuit is used in order to step-up the voltage if needed.

- Mini hydro - Here working principle is same as the wind turbine, where the energy is obtained from the kinetic energy of water, which is made to strikes on the blades to rotate which is coupled to a dc generator in order to generate power.This electrical power is fed to battery through booster circuit, Booster circuit is used in order to step-up the voltage if needed.

Once the battery is charged, it can be utilized for various purpose.

### 15. Methodology Adopted

- Initially we studied hardware components for the resources availably required for the project

- Implementation of hardware models.

- Installation of wind turbine , Solar panel , Mini hydro with suitable generators, batteries and required components

- Connecting all these generating sources to the booster device to step-up the voltage when required.

- After these, we connect the sources to the battery.

### 16. Hardware of Proposed System



Fig.2.Outlook of the hybrid model

## 17. Hardware Description

### 6.14    Solar Panel

Photovoltaic modules establish the photovoltaic cluster of a photovoltaic framework that produces and supplies sun based power in business and private applications [1].



Fig.3.Solar Panel

A single solar module would make simply a proportion of power; a large portion of the establishments are various modules A photovoltaic system routinely joins an assortment of photovoltaic modules as shown in Fig 2, an inverter, a battery pack for limit, interconnection wiring , and then again a sun arranged after.There are many application which are common in solar energy collection ie, solar water heating systems used for agriculture.Now solar has become cheaper than the ordinary fossil fuel since, The price of sun oriented electrical power has been on falling in some more nations [1].

Organizations have attempt to started an inserting gadgets PV modules. This gives the performing of greatest force point following (MPPT) for every module separately and to distinguish the shortcoming in the module by checking the presentation data. [2]. We use MS 1220 (micro sun) which contributes power of 20W. It is portable (The size of the panel is 30X32 ) for the  proposed model.

### 6.15 Wind Turbine

Wind is made by inconsistent warming of the earth's surface, the air, anomalies on the world's surface, and the earth's revolution about its own axis. The amount of wind flow is determined by a number of factors, including the earth's rotation speed and temperature differences between locations.[3]. Wind energy is the energy created by the blowing wind. As a result, electricity generating from non-conventional resources such as wind is becoming more common, and this sort of power generation is extremely clean and safe.

Wind turbines are divided into two categories

1.   Horizontal Hub wind turbine

2.   Vertical Pivot  wind turbine

The horizontal hub wind turbine has advanced in the production of electricity from wind as shown in Fig 3However, work on a vertical axis wind turbine, as shown in Fig 4, has recently begun due to its additional advantages over horizontal axis wind turbines, such as the fact that it doesn't need a yaw component and can deliver power paying little mind to wind bearing. Vertical axis wind turbines are less expensive to manufacture than horizontal axis wind turbines, and they also have lower maintenance costs[5].



Fig.4.Vertical Wind Turbine



Fig.5.Horizontal Wind Turbine

## 6.16 Small Hydro Turbine

Mini hydro is a sort of hydroelectric force that utilizes the regular progression of water to produce energyThe installation of this small hydro can offer power to a remote residence or a small hamlet, or it can be connected to the electric power system. Small hydropower has the potential to become a popular, renewable, and long-term energy source [9].

As shown in Fig 3, a little hydro generator converts the potential of water flow into electrical energy using mechanical equipment. With the small hydro, we can produce a 10W output. Because of the irregularity of the power, the booster circuit may be necessary to boost to a specific voltage[10].
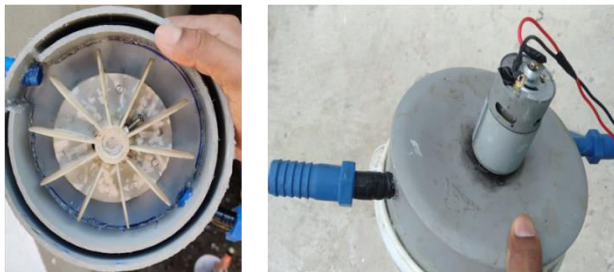


Fig.6.Mini Hydro Turbine

## 6.17 Battery Bank

Here we are using Lead acid batteries , which is the large-capacity rechargeable batteries. These are the first type of rechargeable battery compared to other battery in these batteries the energy density is low ,what's more, it as the capacity to give high current flows which implies the cells have aa huge proportion of ability to weight , these component with the minimal expense ,makes them to use in numerous applications to give high flows.these batteries are majorly used for storage of power for a backup supplies in stand-alone power systemLead acid battery as displayed in the Fig 6 are worked with various individual cells containing layers of lead [2].



Fig.7. Battery

When deep cycled or depleted, lead acid batteries are heavier and less sturdy than nickel (Ni) and lithium (Li) based frameworks (utilizing the greater part of their ability). Lead acid batteries have a medium life period and have the best charge maintenance of all battery-powered batteries[2]. The lead corrosive battery performs well in cool temperatures and beats the lithium-particle battery in freezing temperatures.

## 6.18 Booster Circuit

A boost converter is a DC to DC changer. Here the converter output voltage is notequal or bigger to that of the input voltage. The yield voltage size depends upon the obligation cycleThese converters are additionally alluded toas step up and step down transformer and these are obtained from the essentially comparable to venture up and venture down transformer. The input voltages are ventured up or down to a reformist level than that of input voltage.. The accompanying articulationshows the low of a transformation..
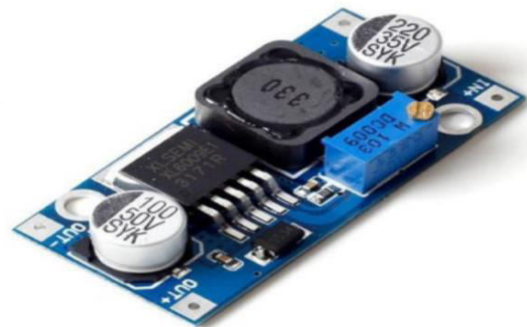


Fig.8. Booster Circuit

Input power (Pin) = Output power (Pout)

Here yield voltage is more when compared to the input voltage (Vi<Vo) in step up mode. Therefore, output current is lesser than the input current.

Vi < Vo and Ii > Io

Here Input voltage is greater when compared to the output voltage in step down mode (Vi > Vo). Therefore, the output current surpasses the input current

Vi (greater than) Vo and Ii (lesser than) Io the energy is released. The yield circuit of the capacitor is ordinary .as more sufficient than the time obvious of a RC circuit is more on the

yield stage. The monstrous time reliable is isolated and the trading timeframe and affirmation that the expected state is a consistent yield voltage.

Here there are two variant of functioning principles.

1. Buck converter.
2. Boost converter.

It's a DC to DC changer with some yield voltage size. It very well can be more unmistakable or lesser than the degree of the info voltage. The buck help converter is comparable to the flyback circuit, in place of a transformer,a single inductor can be used The buck support converter has two sorts of converters : one is a buck converter and the other is a lift converter. The yield voltage level of these changer is more basic than the data voltage range, the basic buck support converter is portrayed in the graph under.

### 6.19MPPT Charge Controller

Maximum power point tracking , otherwise called power point tracking (PPT), is a strategy maximizing power extraction from wind turbines and photovoltaic (PV) solar systems under all situationsThe power point tracker is a DC to DC converter with a high frequency. They change the DC contribution from the sun oriented board(solar panel) to high-frequency AC prior to changing over to a different DC voltage and current that correctly coordinates with the board to the batteries. MPPTs work at high sound frequencies, generally between 20 and 80 kHz. High frequency circuits have the advantage of being able to be designed using a very high frequency transformer and compact components. Because components of the circuit 'broadcast' like a radio transmitter,

creating radio and TV interference, the design of a high frequency transformer is difficult.

PPT inspects the output of the PV module, analyzes that with voltage of the battery, and decides the suitablepower that the PV cell can make the battery to charge, then, that point changes over to the suitable voltage to get the most current to the battery. It can able to control a DC load that is straightforwardly associated to the battery.

How it works: MPPT evaluates assesses the yeild of the PV cell, compares that to the battery voltage, and afterward decides the suitablepower that the PV cell can provide for charging the battery and converts it to the suitable voltage to obtain the suitable current to the battery. In the manner to control a DC load that is directly associated with the battery



Fig.9. MPPT Controller

### 18. Conclusion

Renewable energy development and use, such as wind, solar, and hydropower, is an effective solution to address the energy crisis and pollution issues. In this study, a PV/Wind/Small Hydro hybrid model is built that can gather sun radiation, wind velocity, and potential energy of water flow throughout the year to charge the battery and use the electricity.

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# ON OPTIMAL DRIVING SYSTEM BY USING WIRELESS HELMET

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## ABSTRACT

*In this current world where technology is growing up day by day and scientific researchers are presenting new era of discoveries, the need for security is also increasing in all areas. At present, the vehicle usage is basic necessity for everyone. Simultaneously, protecting the vehicle against theft is also very important. Traditional vehicle security system depends on many sensors and cost is also high. When the vehicle is stolen, no more response or alternative could be available to help the owner of the vehicle to find it back. The main goal of this project is to protect the vehicle from any unauthorized access, using fast, easy-to- use, clear, reliable and economical face recognition technique.*

*In this propose system using a wireless communication between bike to helmet , bike to signal section, bike to caution boards. The system will be comprised of a helmet module including microphone and a bike mounted base unit. The system will make use of different wireless communication protocols like radio frequency protocols, Bluetooth protocols and Zigbeeprotocols.*

*It is a project undertaken to increase the rate of road safety among motorcyclists several countries like India enforcing regulations to wear a helmet while riding. The idea is obtained when the increasing number of fatal road accidents over the years in cause for concern among motorcyclists. The accident detection system communicates the vibration values to the processor which continuously monitors for erratic variation. When an accident occurs, the related details are sent to emergency contacts by utilizing a SMS alert. Using the global positioning system the vehicle location is obtained.*

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**Keywords:** *Face recognition, Helmet, Signal Selection, Ratio Frequency protocols, Bluetooth protocols, Zigbee protocol, Accident detection, Erratic variation, SMS alert.*

## I. Introduction

Philippines, as we know today, has evolved in terms of communication, transportation, entertainment, and other aspects that improved the lives of the Filipino people. The rapid advancement of these aspects is through the help of emerging technologies. Most people today rely on technology because of the advantages it brings which make our lives easier. Security in today's world has also become more advanced because of technology. In preventing thefts for instance, various types of security systems have been developed. There are CCTVs (Closed-circuit Television) which can be found in most commercial establishments because of its high effectively in preventing and solving crimes, burglar alarms used by commercial establishments which help prevent burglary thefts unauthorized access by setting off a loud alarm, button alarms which automatically alert the nearest police station that crime was attempted or is currently taking place, and many more.

There are also different kinds of authentication that are used to increase security features in different kinds of finger print devices.

The number of cases of vehicle that is being stolen in the Philippines is mostly on motorcycle vehicles based on the online news portal of TV5 (InterAksyon.com, 2015). The Highway Patrol Group (HPG) of the Philippine National Police (PNP) reported to the Senate that there were more motorcycles stolen in Metro Manila than cars in the first quarter of 2015 (InterAksyon.com, 2015). Having an authentication to the vehicle can increasingly prevent car thefts.

Motorcycle vehicle theft is one of the most common incidents of stealing in the country. The Philippine National Police has been registering a periodic increase in cases of stolen motor vehicles and motorcycles across the country, there are more cases of motorcycle vehicle theft compared with car theft incidents, which can be  easily stolen when parked unattended.

Having an authentication before starting the motorcycle can be used to increase its security but there are still instances that it is still stolen. The most common way of stealing a motorcycle is by lifting it off of the ground and loading it into a van (Aurelio, 2014). Through that method, the thefts can steal the motorcycle quickly and quietly with less chance of getting caught (Siler, 2012).

## II. Related Work

A literature review is brief summary of previous research on a topic [10,31,33]. The literature review surveys scholarly articles and other resources relevant to a particular area of research. The work should enumerate, summarize and objectively evaluate the previous research The authors Dr.B.Paulchamy et al in [1] have designed an method called **Design of Smart helmet and bike management system**. The main purpose of this smart helmet to provide safety for rider. This implement by using advance feature like alcohol detection ,accident identification location tracking used as a hands free device, solar powered, fall detection .This makes not only Smart helmet but also feature of Smart bike. The authors Nataraja N et al in [2] have designed an method called **Design of Smart helmet.** This paper reported in avoidance of accidents and develophelmet detection system. The presented system is an intelligent/safety helmet. A module affixed in the helmet such that, the module will sync with the module affixed on bike and will also ensure that biker has worn helmet. Additional feature of accident detection module will be installed on the bike. The authors Aditi varade et al in [3] have designed a method called **Smart helmet using GSM and GPS.** The presented system includes SONAR ranging module, vibration sensor , three modules GPS receiver (NMEA), Microcontroller (AT89851), GMS modem (SIM 9000), and an alarm. It enables intelligent detection of an accident at any place and report about the accident on predefined number. When the distance is too short between the vehicle and obstacle thus alarm will be "ON" as an indicator to move vehicle in other accident which is safer but when a vehicle as accident despite of an alarm ,immediate vibration sensor will detect the

signal and microcontroller sends the alert message through the GSM model including the location to the predefined number.The authors U Vasuderan et al in [4] have designed a method called **Smart helmet controlled vehicle .** The idea is obtained when the increasing number of fatal road accidents over the years is cases for concern among motocydists the accident detection system variations when an accident occurs, the related details are sent to the emergency contacts by writing a SMS alert. Using the global positioning system the vehicle location is obtained. The authors Nilesh M. Verulkar et al in [5] have designed a method called **Smart helmet** the system will be comprised of a helmet module including stereo speaker and microphones, and a bike mounted base unit. The system will make use of different wireless communication protocols including Zigbee and another radio frequency (RF) protocols and they developed another one also ie.., when the rider or driver driving a bike he don't know where speed breakers are there . By using RF technology they will find out where the speeds breaker are there. Here they have used arm microcontroller which is placed in the bike module .Along with voicerecognitionunitwhichrecordstheleft, right and stops that .It include four block diagram such as helmet section , bike section ,traffic signal section and speed breaker section. The authors K Venkala Rao et al in [6] have proposed a method **called IOT based smart helmet from accident** .This paper proposes a smart helmet from the accident detection using sensor and Arduino with IOT as domain. The main feature of the designing this helmet is to not only to make the helmet smart but also to provide the safety to rider. The authors Akshatha et al  in [7] as designed a method called **Smart helmet for safety and accident detection using IOT .** this paper presented to motivates us to think about making a system which ensures the safety bike by making it mandatory to wear the helmet by the rider to prevent head injuries that make idea to immediate death prevent drunk and drive scenario by testing the breath of the rider before the rider and also to provide proper medicalattention, if net with an accident by notifying the concerned person with the

location details The authors Kshisagar Rajat et al in [8] have designed a method called **life saving device a smart helmet.** The aim of this unique helmet is to provide safety to the bike rider. With the help of proper switch mounted in helmet the two wheeler would not start without helmet safety of rider is assured if an accident as occurred our system will give information to the ambulance about the accident so they can take certain measures to save the life of the person who met with an accident. It is developed usin Arduino . we place sensor in numerous sides of helmet going to identify the fake user and spammer intwitter.

Mrs. Jayalakshmi. S. L., The authors Basil Mir et al in [10] have designed a method called **Bikers protection through Smart helmet and shunt detection t**his paper reported in motivating us to create a system which can enhance the safety of bikers, by ensuring the use of helmet . we intend putting together a safety system that when installed on a motocycle makes certain that the engine ignition occurs only after the rider is wearing helmet. And also in case the rider crashes a message with the location of the rider is sent to a nearby hospital and also the family members of the rider we also intend to detect various stunts performed by the biker and notify the nearby police station using a tilt sensor,GPS and GSM .The authors Sherif Kamel Hussein et al in [11] have designed a method called **Microcontroller Based Smart Helmet Using GSM Technology in Construction sites**. The idea of the newly presented system is to give information about the worker wearing the helmet and to decrease the number of causaties by fall . the design is based on a connected helmet , tracked by GPS, using the wireless technique for communication ,sensing environmental conditions, sense human conditions, and make smart actions . most of the tasks that the helmet is doing are make smart actions . Most of the tasks that the helmet is doing are accomplished by using same peripherals like GPS module , GSM module , heart rate sensor, digital humidity with temperature sensors. And lock sensor. The authors Shabuin et al in [12] have designed a method called **Intelligent safety for motorcyclist thing Raspberry Pi and open**

**CV.** The system automatically detect motorcycle riders and determines that they are wearing safety helmets or not .The system extrarct moving objects and classifies them as a motorcycle or other moving object base on features extracted from their region properties using K-Nearest Neighbors (KNN) classifier . The heads of the rider on the recognized motorcycle are then counted and segmented based on projection profiling .The system classifier the head wearing a helmet The authors Harshitha HN et alin [13] have designed a method called **Intellectual helmet for accident reduction** .The reported system is an a intelligent/safety helmet .A module affixed in the helmet, such that the module will sync with the module affixed on bike an will also ensure the that bike has worn helmet. Additional feature of accident avoidance detection module will be installed on the bike.The author Nitin Agarwal el ai in [14] have designed a method called **Smart helmet** .This paper reported in having a control system built inside a helmet . Smart helmet for motorcycle is a project undertaken to increase the rate of road safety among motorcyclist . The bike will not get start without wearing helmet by the user .The authors Sonali Katkar et al in [15] have designed a method called **Smart helmet for alcohol detection and accident avoidance** .This paper presented in a unique idea which automatically checks whether the person is wearing the helmet and has non alcoholic breath while during GSM and GPS technology and also different sensors like alcohol sensor flow sensor ,tilt sensor, bumper switch ,limit switch or used provision for cell phone charging isprovided

## III. Proposed KBDC approach

In this following section, detail proceedings of the proposed In this paper, our aim is to use A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. A system architecture can consist of system components and the sub- systems developed, that will work together to implement the

overall system. There have been efforts to formalize languages to describe system architecture, collectively these are called architecture description languages (ADLs).
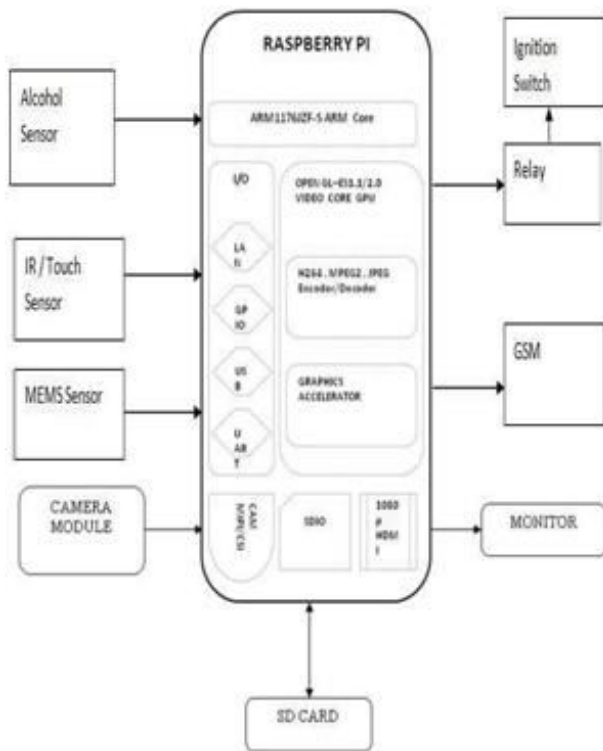


Figure 1: Architectural depiction of Proposed System.

### 3.1 Technologies Used Alcohol Sensor

From the above figure 1 Architecture **the MQ3 gas sensor** is **alcohol sensor** which is used to detect the alcohol concentration on your breath. This sensor provides an analog resistive output based on alcohol concentration. When the alcohol gas exist, the sensor's conductivity gets higher along with the gas concentration rising. It is suitable for various applications of detecting alcohol at different concentration. It is widely used in domestic alcohol gas alarm, industrial alcohol gas alarm and portable alcoholdetector.

### IR Sensor

From the above figure 1 Architecture IR Sensor is used to examine whether the person is wearing the helmet or not. IR Sensor is the digital input device. Normally it consists of the values as 0's and 1's .Its range is up to 5V

### Mems Sensor

From the above figure 1 Architecture Memes are based on thehandlebarcontrolofthevehicle.Itisananalogin putdevice. It contains 3planes such as x, y, and z directions by using tilt you can built the applications such as fall detection, balancing robot etc it contains ground voltage and ST. Here 5v pin of the sensor is interfaced with the ground and y plane is interfaced with the RA2 of the microcontroller.

### Camera Module

From the above figure 1 Architecture High Definition camera module compatible with all Raspberry Pi models. Provides high sensitivity, low crosstalk and low noise image capture in an ultra small and lightweight design. The camera module connects to the Raspberry Pi board via the CSI connector designed specifically for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to theprocessor.

### Raspberry PI

From the above figure 1 Architecture The Raspberry Pi hardware has evolved through serval versions that feature variations in memory capacity and peripheral- device support. This block diagram depicts models A,B.A+, and B+. Model A,A+ and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A,A+, and the Pi Zero ,the USB port is connected directly to the system on a chip(SoC).On the Pi 1. Model B+ and later models the USB/Ethernet chip contains a five –points USB hub, of which four ports are available, while the Pi 1 Model B only provides two.On the Pi Zero, the USB port is also connected directly to the SoC , but it uses a microUSB(OTG)port.

### GPIO

The GPIO [General Purpose Input/Output].A powerful features of the Raspberry Pi is the row of GPIO. Pins along the top edge of the board

## USB

It is the easiest way to power the Raspberry Pi is via the Micro USB port on the side of the unit .it si an industry standard that establishes specifications for cables and connectors and protocols for connection,communication and power supply between computers, peripherals and othercomputers.

## UART

It is a protocol and UART stands for [Universal Asynchronous Receiver and Transmitter].And is a simple communication protocol that allows the Arduino to communicate with serial devices .

## SDIO

May refer to secure digital input output a type of secure digital input output a type of secure digital card interface. It can be used as a interface for input  or outputdevices.

## Graphics Accelerator

A Chipset attached to a video boards is a computer microelectronics program can offload the which a computer program can offload sending and refreshing of images to the display monitor and the computation of special effects common to 2D and 3Dimages

## H.264 Compression

This is the newest and most efficient video compression codec, and it works by taking small groups of frames and evaluating them together as a series to eliminate duplicate content that appears in each frame withoutchanging.

## MJPEG Compression

It called motion JPEG works by evaluating each frame of the frame of the video, compressing them, and sending them as individual JPEG Images.

## MPEGH Compression

This is an older style of video compression and has largely been replaced by H.264

## SD Card

A Raspberry Pi basically used a MicroSD Card as a hard drive for this reason here we recommend using a class 10 microSD card in your Raspberry Pi and this is connected to SDIO and it stands for secure digital input output a type of secure digital card interface it can be used as an interface for input or outputdevices.

## Ignitions Witch

Ignition Switches were key switches that requires the proper key to be inserted in order for the switch function to be unlocked

## Relay

A Simple Electromechanical device that consists of a coil and few electrical contacts when the coil  is energized it acts as an Electromagnet and closer aswitch

## Monitor

The Raspberry has an HDMI Port which you can connect directly to a monitor or TV with an HDMI cable

### 3.2 Algorithm

**Step1:** Check the alcohol content level of the driver, if the level is low then only system goes for face authentication.

**Step2:** System will check the seat belt pattern of the driver and display the warning.

**Step3:** The system captures the driver face and matches with the data base.

**Step4:** The ignition turns on If both the faces matched or an OTP and the captured image will be sent to the owner.

**Step5:** The owner has to resend the password to the driver, if he/she identify the driver or he/she can send the code to ON/OFF ignition.

**Step6:** The face recognized through the password will be stored in database temporary which can be removed by owner later.

**Step7:** If the vehicle get accident, it will send a message to the nearesthospital.

### 3.2  Testing

Testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not. Testing is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actualrequirements.

## Testing Principle

Before applying methods to design effective test cases, a software engineer must understand the basic principle that guides software testing. All the tests should be traceable to customer rquirements.

## Testing Methods

There are different methods that can be used for software testing. They are,

## Black-Box Testing

The technique of testing without having any knowledge of the interior workings of the application is called black-box testing. The tester is oblivious to the system architecture and does not have access to the source code. Typically, while performing a black-box test, a tester will interact with the system's user interface by providing inputs and examining outputs without knowing how and where the inputs are workedupon.

## White-Box Testing

White-box testing is the detailed investigation of internal logic and structure of the code. White-box testing is also called glass testing or open-box testing. In order to perform white-box testing on an application, a tester needs to know the internal workings of the code. The tester needs to have a look inside the source code and find out which unit/chunk of the code is behavinginappropriately.

## Levels of Testing

There are different levels during the process of testing. Levels of testing include different methodologies that can be used while conducting software testing. The main levels of software testing are:

## Functional Testing

This is a type of black-box testing that is based on the specifications of the software that is to be tested. The application is tested by providing input and then the results are examined that need to conform to the functionality it was intended for. Functional testing of software is conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. There are five steps that are involved while testing an application for functionality.

- The determination of the functionality that the intended application is meant toperform.

- The creation of test data based on the specifications of the application.

- The output based on the test data and the specifications of the application.

- The writing of test scenarios and the execution of testcases.

- The comparison of actual and expected results based on the executed testcases.

### Non-functional Testing

This section is based upon testing an application from its non-functional attributes. Non- functional testing involves testing software from the requirements which are non-functional in nature but important such as performance, security, user interface, etc. Testing can be done in different levels of SDLC. Few of themare

### Unit Testing

Unit testing is a software development process in which the smallest testable parts of an application, called units, are individually and independently scrutinized for proper operation. Unit testing is often automated but it can also be done manually. The goal of unit testing is to isolate each part of the program and show that individual parts are correct in terms of requirements and functionality. Test cases and results are shown in the Tables.

## Integration Testing

Integration testing is a level of software testing where individual units are combined and tested

as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing. Integration testing is defined as the testing of combined parts of an application to determine if they function correctly. It occurs after unit testing and before validation testing. Integration testing can be done in two ways: Bottom-up integration testing and Top-down integration testing.

### Bottom-up Integration

This testing begins with unit testing, followed by tests of progressively higher-level combinations of units called modules or builds.

### Top-down Integration

In this testing, the highest-level modules are tested first and progressively, lower-level modules are tested thereafter. In a comprehensive software development environment, bottom-up testing is usually done first, followed by top- down testing. The process concludes with multiple tests of the complete application, preferably in scenarios designed to mimic actual situations. Table below shows the test cases for integration testing and theirresults.

### Unit Test Cases

| Sl # Test Case : - | UTC-1 |
|---|---|
| Name of Test: - | Camera Test |
| Items being tested: | Capture Image |
| Sample Input: - | Input image |
| Expect ed output : - | Should Capture the image |
| Actual output: - | Image Capture Success full |
| Remarks: - | Pass. |

### System Testing

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black-box testing, and as such, should require no knowledge of the inner design of the code or logic. System testing is important because of the following reasons:

System testing is the first step in the Software Development Life Cycle, where the application is tested as a whole.

The application is tested thoroughly to verify that it meets the functional and technical

| Test Case ID | System Test Case 1 |
|---|---|
| Description | Application Should Work in All Platforms |
| Input | Input from Different people |
| Expected output | Functionality should be according to given criteria |
| Actual Result/Remarks | Working as expected output. |
| Passed (?) | Yes |

### Validation Testing

At the culmination of integration testing, software is completely assembled as a packages; interfacing errors have been covered and corrected, and final series of software tests- validating testing may begin. Validation can be defined in many ways, but a simple definition is that validation succeeds when software functions in a manner that can be reasonably expected by customers. Reasonable expectation is defined in the software requirement specification- a document that describes all users' visible attributes of the software. The specification contains a section title "validation criteria". Information contained in that section forms the basis for validation testing approach.

### IV. Conclusion

In this paper, we have maintained It can be successfully implemented as a Real Time system with certain modifications. Most of the units can be fabricated on a single along with microcontroller thus making the system compact thereby making the existing system more effective.

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# DESIGN A MILLIMETER WAVE WITH AN ARRAY OFMICROSTRIPPATCHANTENNAFOR5GAPPLICATIONS

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## ABSTRACT

*Thefastevolutionindatatransmissionandsystematicallyinconveyingthedatahasbeentrickling greatly due to the network excess to avoidthis, we design a millimetre wave with an array ofmicrostrip patch antenna for 5G applications. Thedesigningworkcoverstwoaspectsofmicrostrippatchantenna.Initiallywedesignasinglerectangularmicrostrippatchantennafor5Gapplication that resonates at 46GHz. The second isto design the arrays of rectangular patch antenna ofseriesandparallelfeedusingcorporatefeedtechnique.WiththesubstrateRogersRTDuroid5880substratewhichresonatesat thefrequency46GHz with the better performance in Bandwidth,Gain,returnlossandVSWRisobtained.Thesimulation process is done through the HFSS (Highfrequencystructuresimulator)tool[1][8].*

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**Keywords:** *Microstrip patch antenna, Micro strip feed line, corporate feed technique*, *Gain, Bandwidth, Return loss, VSWR, HFS Stool.*

## 1. Introduction

With the vastdevelopment of thecellulartransmission, where everyone is utilizing electronicdevices for communication purposes [2]. Everyonedemands for high data charge therefore major issuewhich the internet access provider as problem withthe inefficiency of bandwidth [1]. To figure out thisproblem we will use an millimeter frequency rangemore than 30 GHz, So the major intension of thepaper is to form asingle rectangular patch antennaand its antenna arrays suitable for millimetre wavewith a frequency ranging from 38 GHz to 54 GHzfor the 5Gapplication.this overcomes the problemofbandwidthdatarate.

Microstrip transmission feedline is used to form asinglerectangularpatchantennaandinantennaarrays we use corporate feed network for designingof series and parallel network array,which equallysplits the power at individual junction to perform abandwidthmorethen1GHz.Theoutfitformof the antennaarrayswillbestudiedin the following sections [12].

The proposed antenna works on 46 GHz for singlemicrostrip patch antenna and Arrays of microstrippatch antenna to provide better performance basedon Bandwidth (BW), Return loss, Gain, and VSWR[2][3].

## II. Patchantenna

It includes the radiating material with bottom end ofsubstrate and that is mounted on the substrate planewith low volume and low weight as appear in fig A[2].
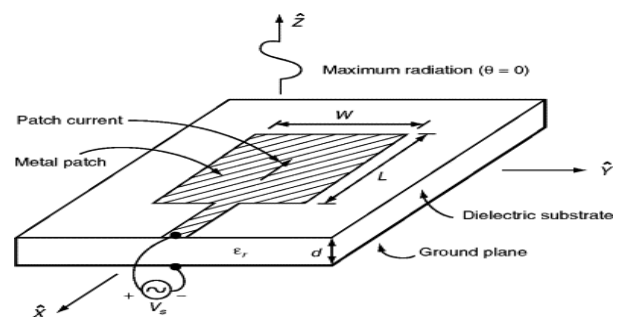


Fig A: Geometric presentation of Microstrippatchantenna

## III. Antenna Arraysand Feed Techniques

Microstrip arrayantennas is employed to examinethe radiation of the signal, to produce high gain,Radiationefficiency,forabetterantennaperformance.Here,Microstrippatchantennasisgiven byMicrostripfeedlinetechnique [2][9].

## A. Microstrip Feed Line

Thefeedline strip is attached at the end of the patchas illustrated in Fig B and correspondingly feed lineis engrave at the top of substrate to give a planarshape [5][7].
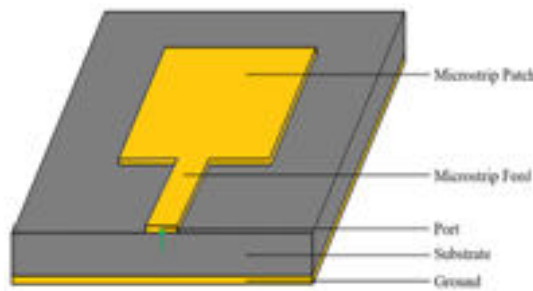
Fig B: Microstrip feed line

### B. Corporate Series Feed Network

The antennafactors are set in series along with thelineFeedfromonefeed systemto theothersystemand then itcombines sequentially to eachantennacomponentsasshowninbelowfigC.



Fig C: Corporate Series feed network Array

The disadvantage in the corporate series network isthe bandwidth limitation and it depends upon thetransmissionline.Toovercomethis,wegoforparallelfeedtechnique[9].

### C. Corporate parallel Feed Network

Theinputpowerissplittedintoparallelarraynetwork tothe entire antenna elements as shown inbelowfigD.itovercomesthelimitationsoftheseriesfeednetwork[12].
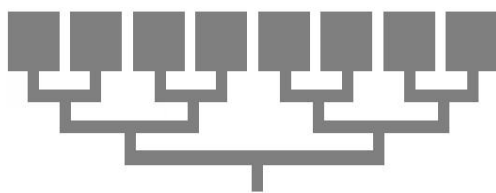


Fig D: Corporateparallel Feed Network

### IV. Antenna Design

The required parameters for the design are: - OperatingFrequency$F_0$=46GHz

Relativepermittivity$\epsilon_r$=2.2

ThicknessofSubstrate$h$=0.787mm

**Step1:**CalculationoftheWidthofpatch($W_p$): substrate and width of patch into six times of heigh to fthesubst rate.

By using above mathematical equations, the resultsaretabulatedforthesingleantennadesignisillustratedintable1.

**Table1: Single Element Patch Antenna Design**

| Parameter | Representation | Values |
|---|---|---|
| $L_S$ | SubstrateLength | 6.3mm |
| $W_S$ | SubstrateWidth | 7.2mm |
| $L_P$ | PatchLength | 1.6mm |
| $W_P$ | PatchWidth | 2.5mm |
| t | Substrateheight | 0.787mm |

### V. Antennaarrays

An antennaarrayisa group of various kind sofinterconnectedantennaswhichoperatessimultaneouslyasasingleelementantennatotransfer and obtain electromagnetic waves, which gives better gain performance [7][2].

**Table 2: Parameter values of proposed Array Antenna**

| Feed Technique | Series feed Technique | Parallel feed Technique |
|---|---|---|
| Arrays | 1x4 | 1x4 |
| LS(mm) | 18 | 7 |
| WS(mm) | 7 | 22 |
| LP (mm) | 1.6 | 1.6 |
| WP(mm) | 2.50 | 2.50 |

### VI. Results and Discussions

Wp=$C$

$2Fo$

$\sqrt{2}$

$\epsilon_r+1$

……(1)

A. Return Loss of antenna:

Step2: Calculating the Actual patch length(Lp):

Lp= Leffective- 2ΔL…… (2) Step3: Effective Length (Leffective) is given by:

It is defined as the system of imitated signal by theantenna, ranges from 0 to 1 in terms of decibels(dB)[1].

Leffective= $C$

$2Fo\sqrt{\epsilon_{reff}}$

Step4: Calculation of Effective

..…..(3)

B. Voltage Standing Wave Ratio (VSWR):

Itisthereflectioncoefficientofthefunctionofthe

$€reff=€r+1+€r−1$[　　**1**　　]…… (4)

loadimpedancebythesourceimpedance,ranges

**2　　　2**

$h$

**1+12**

$Wp$

from$[1−∞)$.[1].

Step 5: Calculation of the length Extension(ΔL):

$(€reff+0.3)(Wp$

Gain:

$ΔL=0.412*h[($

$h+0.264)$

Itgivesthestabilityoftheantenna,thatcan transfer

$Wp$

$)]......(5)$

$(€reff−0.258)(h+0.8)$

Step6: The Length and width of Ground is given bylengthofpatchintosixtimes ofheightofthe

orreceivethesignal[1].

C. Bandwidth:

ItisthedifferencebetweenMaximumresonantfrequencyandminimumresonantfrequency[12].

D. Radiation model:

Itgivesthetotalpowerradiationefficiencyandthea ngle ofbeamprojectionofthesignal[12].

Simulation Results

1) SingleelementrectangularpatchAntenna
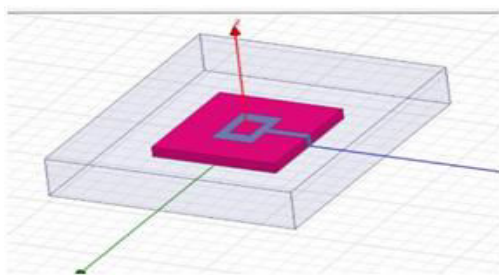


Fig1:Microstripsingleantenna Model
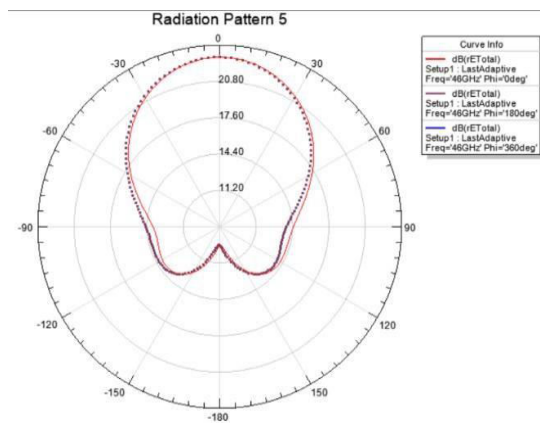


Fig 5: RadiationpatternofSingleMicrostripAntenna

**1) 1x4 Series-Fed Array Antenna Design**
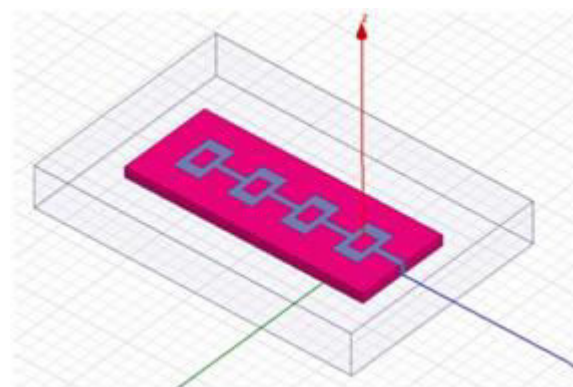


Fig 61x4S:
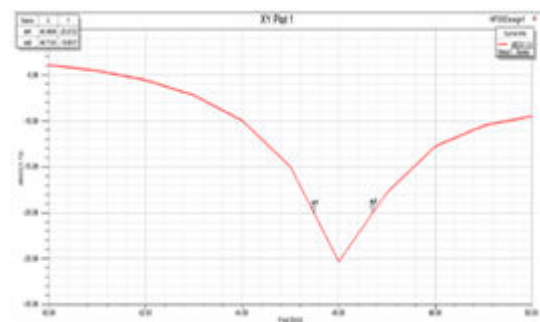


Fig. 1- Feed Array Antenna Design Model
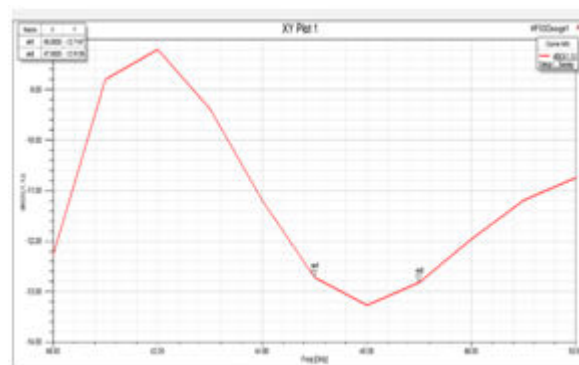


Fig2: Return loss of single patch Antenna
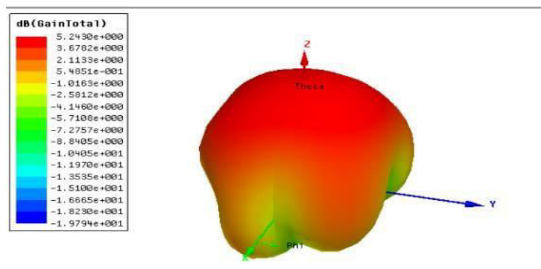
Fig 3: Gain plot of Single Microstrip Patch Antenna
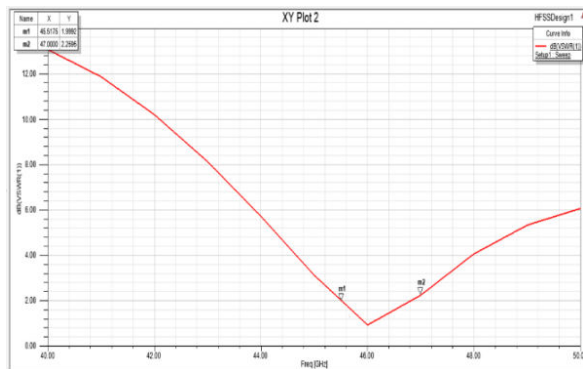


Fig 4: VSWR plot of Single Microstrip Patch Antenna
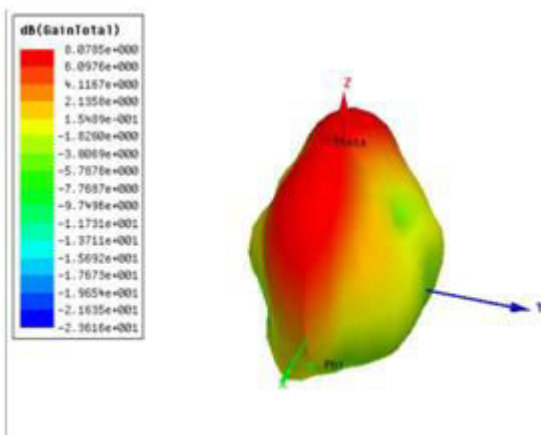


Fig 7: Simulated Return loss of 1x4 Series feednetwork
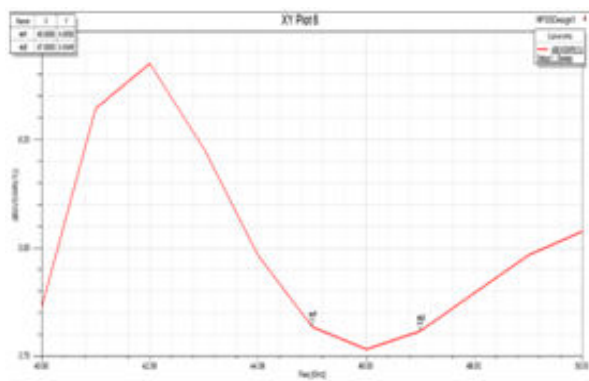
Fig8:Gainplot ofthe 1x4Series-Feednetwork



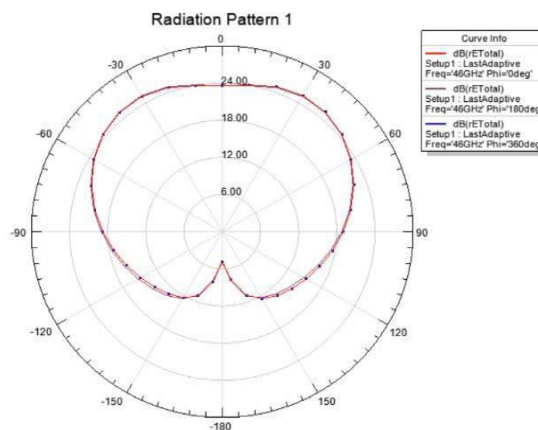Fig9: VSWR plot of the 1x4 Series-Feed network



Fig 10: Radiation pattern of the1x4 Series-Feed Array Antenna
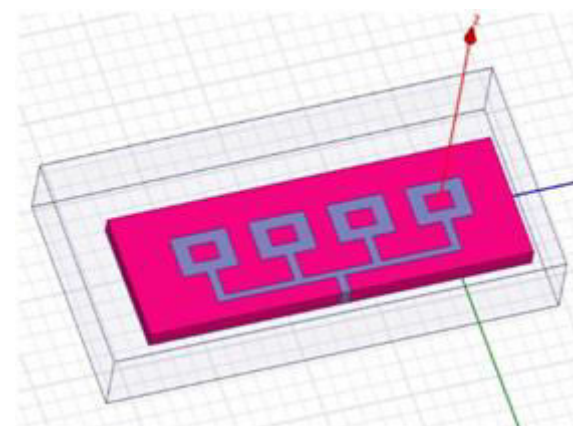
### 1) 1x4 Parallel-Fed Array Antenna Design



Fig11: 1x4 Parallel-Feed Array Antenna Design Model
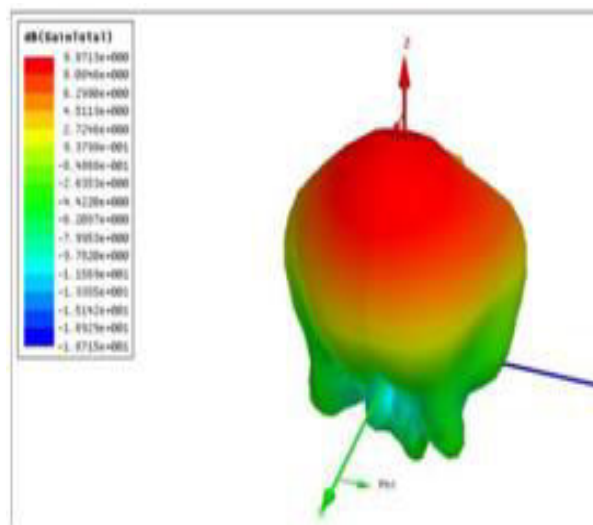
Fig12: Simulatedreturn lossof1x4Parallel-FeedArray



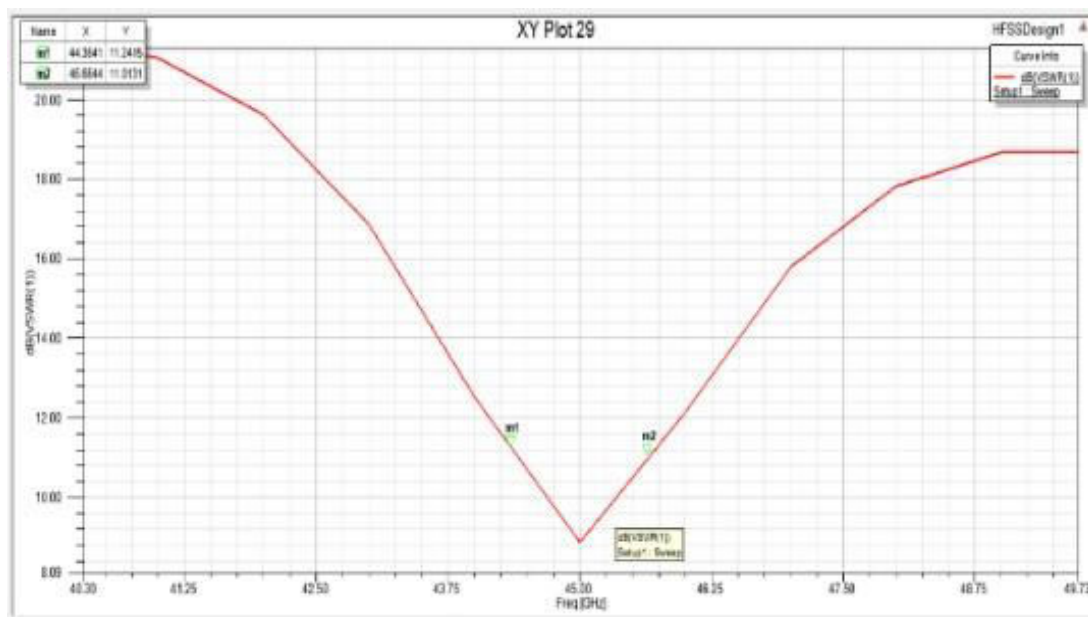Fig 13: Gainplotofthe1x4Parallel-FeedArrayAntenna
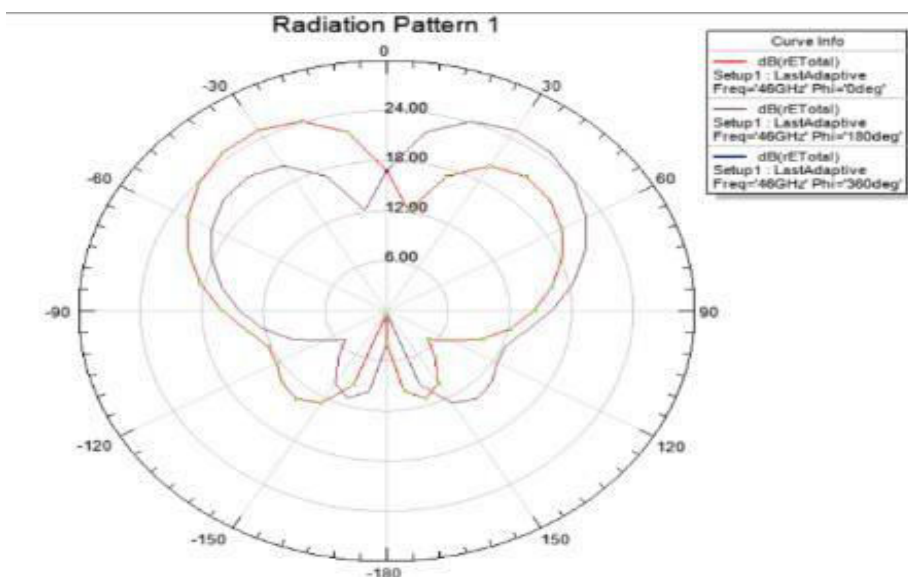
Fig 14: VSWR plot of the1x4 Parallel-Feed Array Antenna
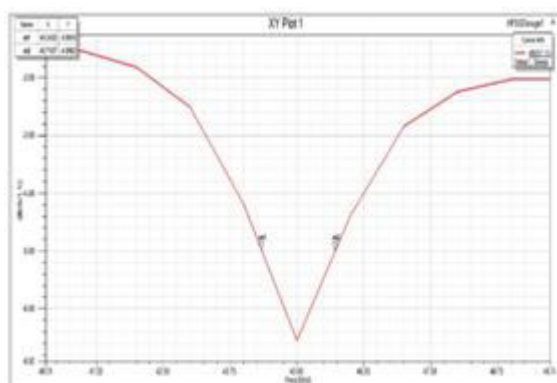


Fig 15: Radiation pattern of the 1x4 Parallel-Feed Array Antenna

**Table3 : Output values of single micro strip patch antenna**

| Single Antenna | FR(GHz) | BW(GHz) | RL(dB) | VSWR | Gain(dB) |
|---|---|---|---|---|---|
| | 46 | 1.2 | 49.15 | 1.007 | 5.24 |



**Table4: Output values of Antenna Arrays**

| Parameters | FR(GHz) | BW(GHz) | RL(dB) | VSWR | Gain(dB) |
|---|---|---|---|---|---|
| 1x4 Seriesfeed array | 46 | 2.00 | 45.24 | 1.01 | 8.07 |
| 1x4 Parallelfee darray | 45 | 1.37 | 40.09 | 1.02 | 9.19 |

**Conclusion**

A single element antenna as well as arrays of 1x4patch elements is utilizedto 5G applications, for thefrequencyof45GHzto46GHzandallthesefrequencybandsareutilizedfor5Gimplementation.

Single microstrip rectangular patchantennaproduces5.24dBofgainand49.15d Bofreturn loss for the resonantfrequency of 46GHz.When a four-element series array is designed whichgives a gain of 8.01dB, alsoa four-element parallelarray is designed which provides a gain of 9.19dBrespectively. Compare toseries the parallel arrayantennahashighGain,Bandwidth,returnloss,VSWR which exhibits that the antenna is essentialandacceptablefor5GApplication.

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12) Ref2_MicrostripPatchAntennafor 5 GHzWi-Fi.pdf

# COMPREHENSIVE STUDY AND DESIGN OF RECTANGULAR AND TRIANGULAR MICROSTRIPPATCHSINGLEAND4*1ARRAYANTENNAS

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## ABSTRACT

*Anantennaarrayhasbeendesignedforwireless application at the frequency of 2.3GHz to 2.6GHz.The comparison study of the rectangular and triangularpatch antenna based on the parameters is presented in thispaper. The antennas are designed on a low cost FR4 glassepoxy with a thickness of 1.6mm. CST software tool is usedfor design and compare the performance of the antennas.The detailed studygives the result that the rectangularpatch antenna has higher gain and vswr that is 1.099, thanthe gain and vswr of triangular patch antenna that is 1.45.Thispapershowscontrastiveanalysisofvariousperformanceparametersbetweentwodifferentshapeantenna arrays in terms of return loss,directivity gain,radiation pattern,VSWR.*

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**Keywords:** *Microstrip patch, Microstrip feed line, Gain,Bandwidth,Return loss,VSWR,CSTtool*

## I. Introductions

The antenna playsa vital role inthe radio communicationsystem. An antenna is a transceiverdevice whichtransmitsand receives the microwave signals, satellite signals, and radiosignals.Themicrostrippatchantennapointer stoaveryinnovativeevolutionintheworldofminiaturization.Itishaving a broad range of application in microwave systems likebiomedical systems, missile system, navigation, mobile andGPS system for remote sensing etc. Microstrip patch antennahas a compact size, light weight, small volume, and can beeasilyfabricatedonaPCB.Thestructureisbased onconductingmaterialmicrostripwhichaseparat esfromtheground plane by adding substrate between them. The finesttechnique to raise the gain is to expand antenna array withoutincreasing the overall size of the communication system, anantenna array with increased gain in a compressed structure isdesigned.

Atwo different antenna arraysare designedwithdifferentshapes forthe radiating elements. FR4 substrate is used topropose the antennas with a frequency of 2.4 GHz to 2.6GHzwhichisusefulfortheWLANapplication.

## II. Micro Strip Antenna Design

Thesubstrateusedfortherectangularandtriangul armicrostrippatchantenna isFR4withεr=4.4 asdielectricconstant for designing the microstrip patch array antenna, thedimensionsarecalculatedasgivenbytheform ula.

$$W = [c \, ((\varepsilon r+1)/2)-1/2] / 2fo \quad \text{...............................(1)}$$
C=velocity of light, εr =dielectric constant of substrate, fo=resonance frequency, w=width.
The length of the patch:
$$L = [c / (2fo \, (\varepsilon reff)-1/2)] -2\Delta L \quad \text{.............................(2)}$$
Where,
$$\varepsilon reff= (\varepsilon r+1) / 2 + ((\varepsilon r-1) / 2) \, [(1+12h)/W]-1/2 \quad \text{.................(3)}$$
h=height of the substrate
and ,
$$\Delta L = 0.412h \, [(\varepsilon reff+0.300)(W/h+0.264)] /[(\varepsilon reff-0.258) (W/h+0.800)] \quad \text{............................(4)}$$
The length and the width of the ground plane
$$Lg=6h+L \quad \text{..............................................(5)}$$
$$Wg=6h+W \quad \text{.............................................(6)}$$

## III. Antenna Design Specification

The substrate used is glass epoxy FR4 with εr =4.4. H= 1.575and tanδ = 0.002. Antenna design is carried out using CSTmicrowave studio with 50ohminsetfeedline.
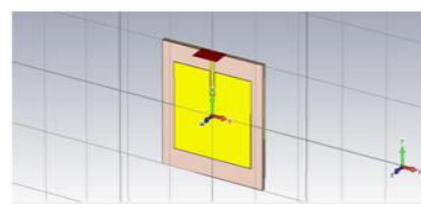


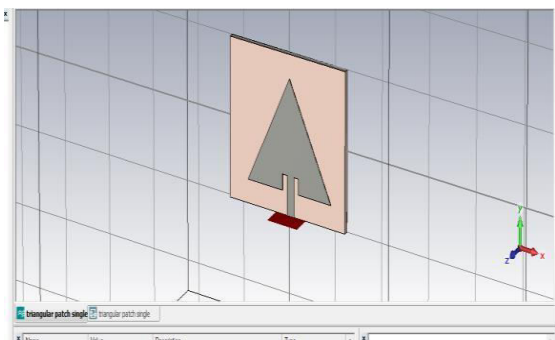Figure1: Structure view of rectangular antenna
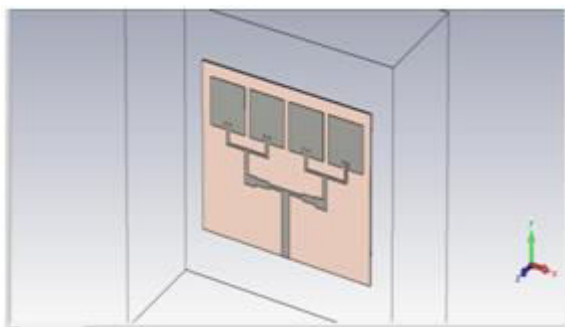
Figure 2: Structure of triangular antenna



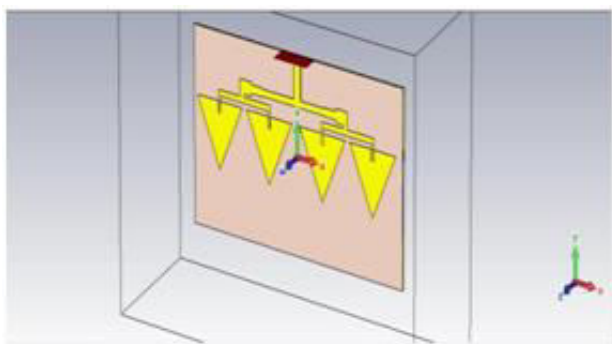Figure3:Structureof1x4rectangularantenna



Figure4:Structureof1x4triangularantenna

## IV. Simulated Results

The simulated result at a resonantfrequency of 2.4GHz to2.6GHz of return loss, radiation pattern and smith chart of the single rectangularandtriangularmicrostripantennaisas shownin Figure 1ato1c and Figure 2 a to 2 crespectively.



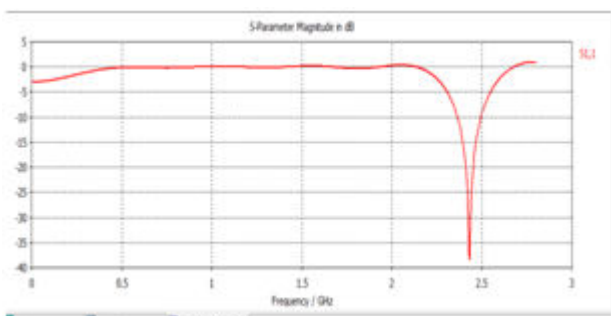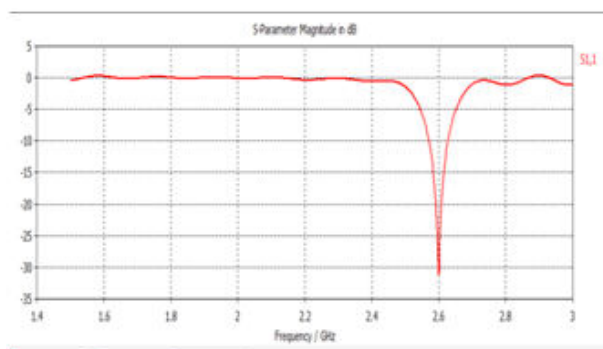Figure: 1a Return loss of rectangular microstrip patch antenna



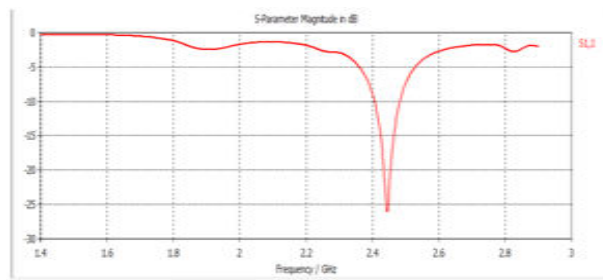Figure: 2a Return loss of triangular microstrip patch antenna



Figure: 3a Return loss of 4*1 rectangular microstrip patch antenna
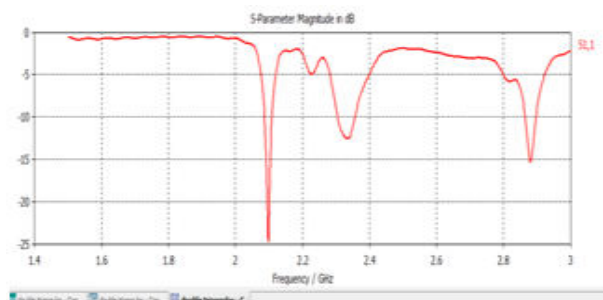


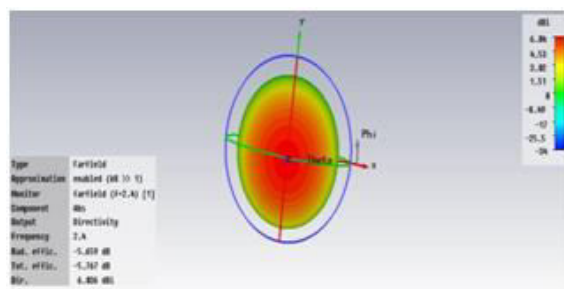Figure: 4a Simulated return loss of the 4*1 triangular microstrip patch antenna



Figure: 1b Radiation pattern of rectangular microstrip patch antenna
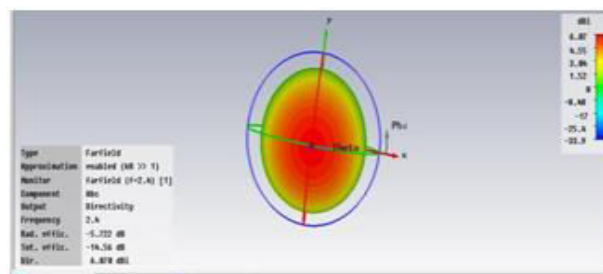


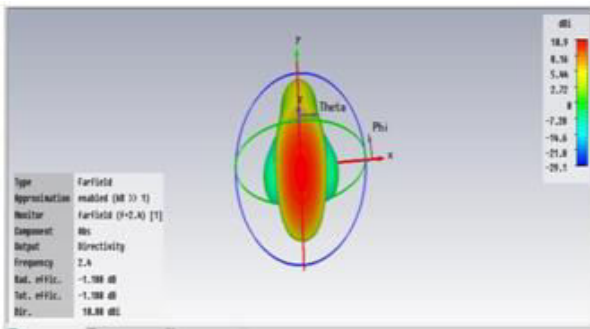Figure: 2b Radiation pattern of triangular microstrip patch antenna

Figure: 3b Radiation pattern of 4*1 rectangular microstrip patch antenna
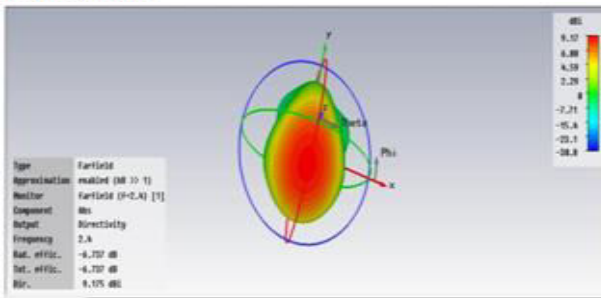


Figure: 4b Radiation pattern of 4*1 triangular microstrip patch antenna
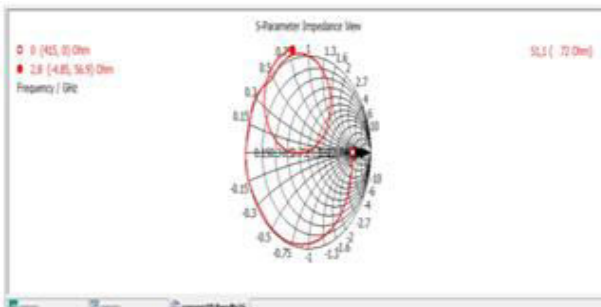


Figure: 1c Smith chart of rectangular microstrip patch antenna
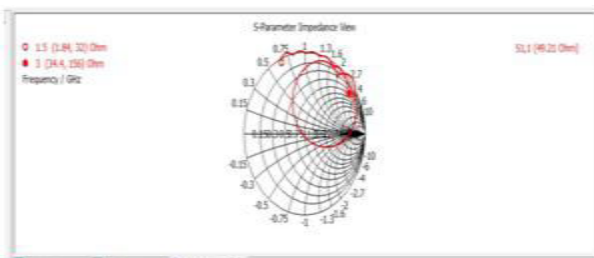


Figure: 2c Smith chart of triangular microstrip patch antenna

The simulated result at a resonantfrequency of 2.4GHz to2.5GHz of return loss, radiation pattern and smith chart of thearray of rectangular and triangular microstrip antenna is asshowninFigure3ato3candFigure4ato4crespectively.
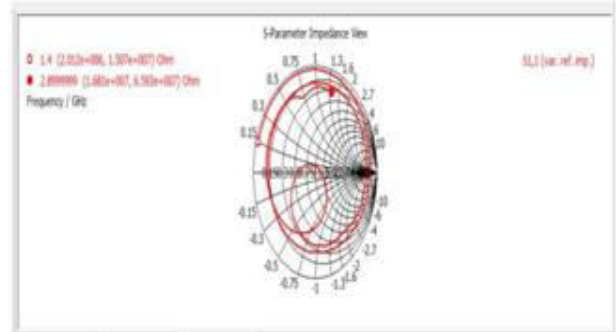


Figure: 3c Smith chart of 4*1 rectangular microstrip patch antenna
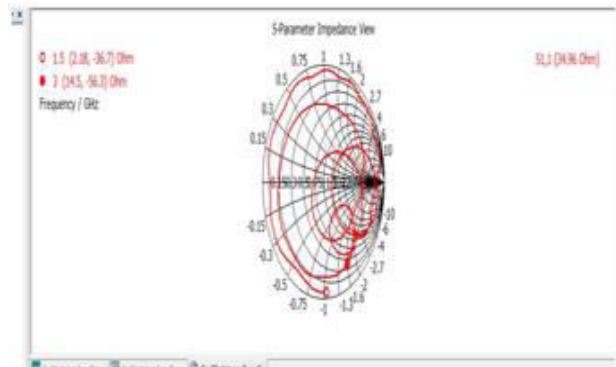


Figure: 4c Smith chart of 4*1 triangular microstrip patch antenna

The simulated result at a resonantfrequency of 2.4GHz to2.5GHz of return loss, radiation pattern and smith chart of thearray of rectangular and triangular microstrip antenna is asshowninFigure3ato3candFigure4ato4crespectively.

**Table:1 Antennacomparison of parameters for the design edmicrostrip**

| Type | | ReturnlossdB | GainindB | Directivity |
|---|---|---|---|---|
| Single | rectangularmicrostrip patch antenna | -39 | 6.04 | 6.03 |
| 4*1 | rectangular microstrip patchantenna | -26 | 10.9 | 10.88 |
| Single | triangular microstrip patchantenna | -34 | 5.3 | 5.3 |
| 4*1 | triangularmicrostrip patch antenna | -24 | 9.17 | 9.1 |

## V. Conclusion

The performance of the rectangular and triangular arrays of Single and 4*1 is compared and the rectangularmicrostriparraysprovideahighgainc omparedtothetriangularmicrostriparrayswhich makesitsuitableforwirelessapplications.Theresu ltsarecomparedintable1.

The antenna in terms of gain is compared with the existingdesigns and there is an

improvement in gain. The gain of therectangularantennais6.04dBand10.9dBandg ainoftriangularantennais5.3dBand9.17dB.

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# IMPLEMENTATION OF KEYLESS DOORLOCK SYSTEM USING RASPERRY PI AND MOBILE APPLICATION

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## ABSTRACT

*MOOCs are the most craving online education platform for the learners around the world. It has given freedom to learn at free (few are paid), independent time selection and still being at home. A learner can select as many courses as he/she wish. World's most successful universities and colleges have come up with innovative course content, extremely comprehensible course delivery patterns and 24x 7 course support system. The growing popularity has been facing complicated challenges where a large number of enrolled participants postpone or leave their leaning at the midway. This study will explore the possible reasons behind the non-continuation of learning by the participants and will recommend provisional way-out to fix the challenges.*

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## 1. Introduction

A smart home is a forthcoming development resolution that uses several microelectronic Internet of Things (IoT) sensors to gather data. Insights got from that data are later used to accomplish assets, resources well; the data is used to recover operations across the home. It comprises data collected from devices, buildings, and assets that are managed and analysed to monitor and manage crime detection [1]. Data is at the heart of the IoT, but to make it responsible adequate for extensive acceptance, the security and privacy of that data must be protected. It is at this focus thing of mandate for novelty and the necessities for satisfactory data safety and confidentiality [2]. The smart home is one of the most projecting applications in the hypothesis of the IoT. While it has additional a level of security and expediency to operators' daily lives, it carries a exclusive security trial of extenuating insider fears posed by genuine users. Such intimidations mainly rise due to the allocation of IoT devices and the presence of intricate social and trust relations between users. Hi-tech home IoT platforms accomplish contact control by installing several multifactor validation devices. However, such tough security measures are insufficient to protect against insider threats, and there is a increasing requirement to integrate user behaviour and ecological situation in order to variety smart authorization conclusions [3]. Some of the

foremost home IoT platforms that have developed over the past few years are Samsung's SmartThings, Apple's HomeKit, and Google's Android Things. These platforms are liveliness well-organized, connect dissimilar devices and protocols, permit distant control and actuation, and provision third-party application development [4]. The reputation of smart home appliances is producing the growing enlargement of the IoT. For example, devices—such as smart TVs, fridges, dishwashers, freezing systems, and warming apparatuses, among others—are linked to the Internet to sort people's lives supplementary relaxed and cooler. Currently, the capability of smart home administration to combine and control devices has enlarged and established expressively. A smart home is like a modified home built on personal favourites and specific stipulations. It can normalize and control the interior/external structures of a house, such as lighting, temperature, gates, and windows. Smart home supervision can be used to set the intensity and temperateness of a room, regulate contextual music, and even agenda TV packages to be recorded and played, all dependent on the proprietor's taste and choices. With the use of a smartphone, it is also likely to check a household's present status distantly. Still, surroundings can be adjusted when away from the house. For example, air conditioners that use temperature sensors and automatic lighting schemes can be controlled, and the

television can be controlled remotely [5–8]. In recent times, microelectronic door lock schemes are one of the utmost prevalent safety schemes that are being mounted for numerous residents and commercial places. The key characteristic overdue such schemes lies on the consistency in which the certified persons can advance the agreement to access the doors throughout a safe scheme that has a collaborative edge. A novel system has been developed which is called Near Field Communication (NFC) door lock system [9]. Such system is constructed on a pattern recognition expertise where the individuals' faces are being investigated in order to recognize their behaviours [10]. Such analysis grosses dissimilar methods such as evaluating facial image or video stream. In addition, the size and location of the face's features are being also measured in the investigation

This article is organized as follows. Section 1 discusses the expertise and investigation developments of smart home safety. Then, Section 2 describes safety deliberations and appropriate study on IoT smart door lock system. Section 3 proposes an interior security outline for smart door lock systems. Section 4 then presents the demonstration of the system. Finally, the conclusion is drawn in Section 6.

## II  Back ground

For the design of keyless doorlock system, there are so many methods which are extracted from different journals in different period. The following survey is mainly focused on design of the keyless doorlock with spoofing techniques.

The proposed the mechanism to resolve the object detection tracking problem on the video security surveillance system[11]. The suggested new mechanism used by Raspberry pi, and PIR Sensor , can make intelligent detection tracking and recording for interesting objects so that make the amount of valid video high and improve video's quality.

A home security system with the face detection method has a detached system with Internet of Things as a network of communication is realised[12]. Raspberry Pi is used as controlling unit coded in Pyhton language.

A remote access controlled door entry system for homes and office buildings [13]. A remote access control system contains of the internet to control the devices and appliances at home or workplace with the individual supervisory from anyplace round the sphere. In proposed system, a Raspberry Pi board is used as the podium for monitoring and controlling the door lock. The door entrance system comprises of a switch for visitor monitoring, camera for guest validation, solenoid actuator for opening of the door and a speaker set for making the system intimate the responses to the visitor. Switch, speakers and camera for interaction with the visitor are mounted at suitable places at the door.

The significance of face anti-spoofing algorithms in biometric validation systems is attractive indispensable [14]. Recently, the accomplishment of Convolution Neural Networks (CNN) in key submission areas of computer vision has invigorated its use in face biometrics for face anti-spoofing and corroboration applications

The proposed design is implemented using Raspberry Pi 3 and Arduino, which are linked by USB cable[15]. The PIR sensor is installed on the Arduino and the webcam is mounted on Raspberry Pi 3. The Raspberry Pi 3 is used to process inputs from received sensors and process images for human detection. The PIR sensor senses the movement about the sensor to activate the webcam to capture a picture.

The face image is the most available biometric modality which is used for extremely precise face gratitude systems, while it is vulnerable to numerous dissimilar types of presentation attacks [16]. Face anti-spoofing is a very dangerous step before nourishing the face image to biometric systems. In this paper, a innovative two-stream CNN-based method for face anti-spoofing, by removing the local features and holistic depth maps from the face images. The local features facilitate CNN to distinguish the spoof covers self-governing of the spatial face areas..

The proposed a formal security proof and verify its security properties using the AVISPA (Automated Validation of Internet Security Protocols) tool is provided [17]. A secure

shared key contract protocol for multiple devices inside the home IoT situation which all diverge security, privacy and scalability anxieties is established. The protocol attains key contract between devices and let's secure data transmission without linking to the cloud.

### III Proposed System

The proposed system adapts the existing system by allowing keyless door lock with integrated Internet of things and image processing technology. It is prepared by automate monitoring of the persons by capturing the images and identifying the captured image with pre-processed images. Figure 1 shows the working of the proposed method. It has two modes of operation as

### 3.1 IN to OUT mode

When a person is already inside, a new person is waiting outside, the camera will capture the image of the person and analyse with the registered images. Then it will check for the spoofing and anti-spoofing as shown in figure2.

### Case I

Once it gets verified with registered images with anti spoofing. Then it will send a mail with the captured image of a person who is waiting outside and also send a message to the person who is already inside. After sending the message immediately the user interface of the application changes automatically according to the results provided by the anti spoofing face recognition and image verification. So the person who is inside can able to unlock the door with the help of mobile Application.
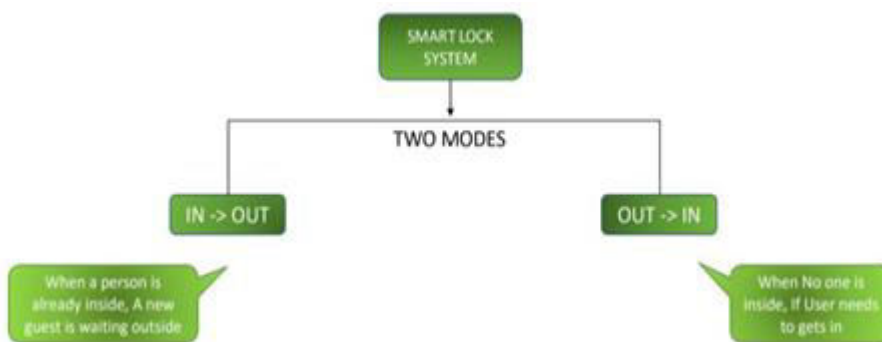


Fig 1. Block Diagram of Proposed System
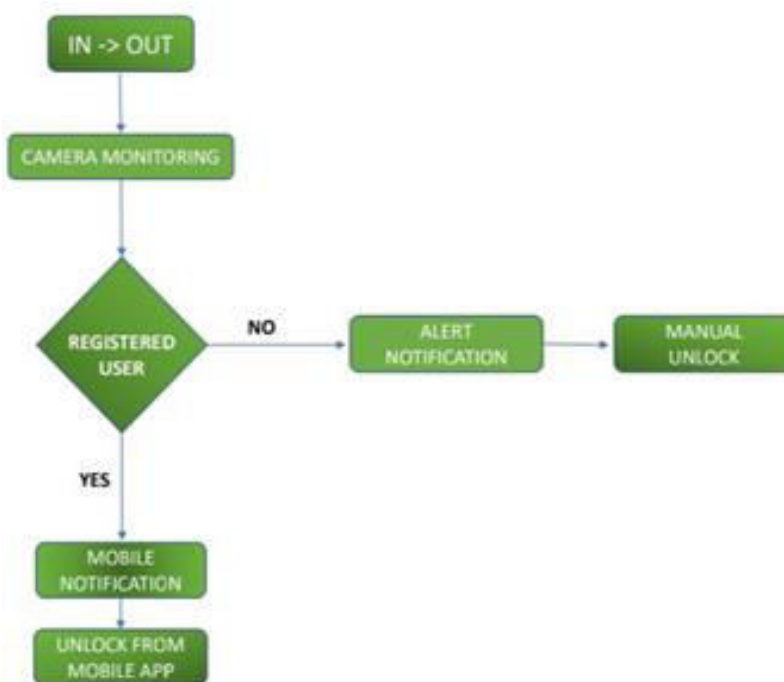


Fig 2.Block diagram of In to out mode

## Case II

In case any of the results gets unsuccessful. Unverified image is spoofed. Accordingly, the user interface of the mobile application changes. Now the user cannot able to unlock the door through mobile application because the verification is not fully successful. Only way to

unlock the door is to check the captures image and unlock the door manually.

### 3.2 OUT to IN mode

This mode works as shown in figure3.
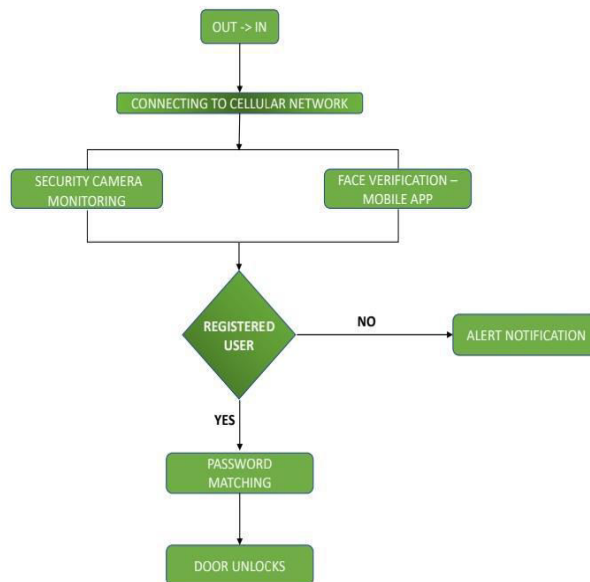


Fig 3. Block diagram of Out in In mode

When there is no one inside the home, all the family members are outside .In order to unlock the door. Any of the family member should open the application and choose the option of unlock in the dashboard of mobile application. Once the user presses the unlock tab. The application needs a pin code must be entered by the user. After enter the pin code. The application checks with the database. Once both the pin get matched. Then the door gets

unlocked and the current status of the door in the application will be changed into Unlocked.

In case the pin code doesn't match, door will not unlock and also a vigilant message will be sent to family members and according the pin altering steps to be followed.

As shown in the flow chart in figure 4, initially when an unknown person waiting outside the home. Firstly, the Camera capture the image and check with the anti-spoofing.
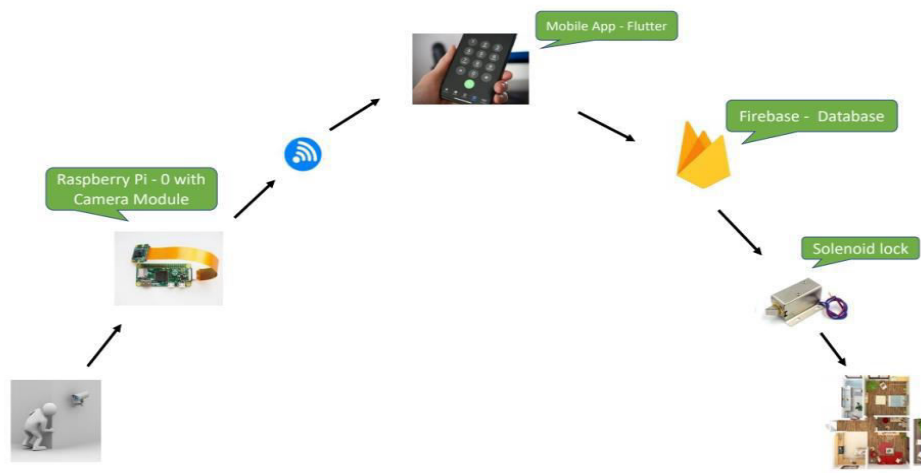


Fig4. Flow chart of proposed method

Face recognition and image verification. Once both get verification gets successful. According to the results the user interface of the mobile application.so the user can unlock the main door of the home.

## 4. Simulation Result

Figure 5 shows the screen of mobile application
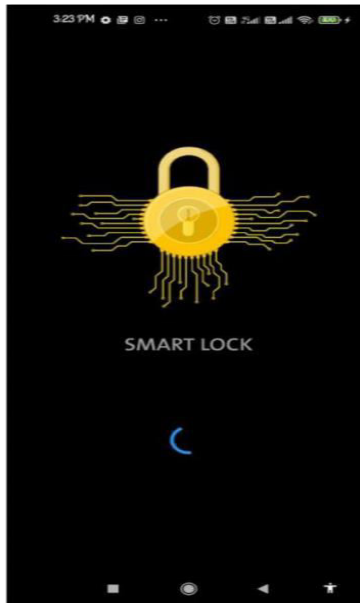


Fig 5. Splash Screen of our mobile application

Figure 6 shows the home account creation. Home account is created by giving the following details.
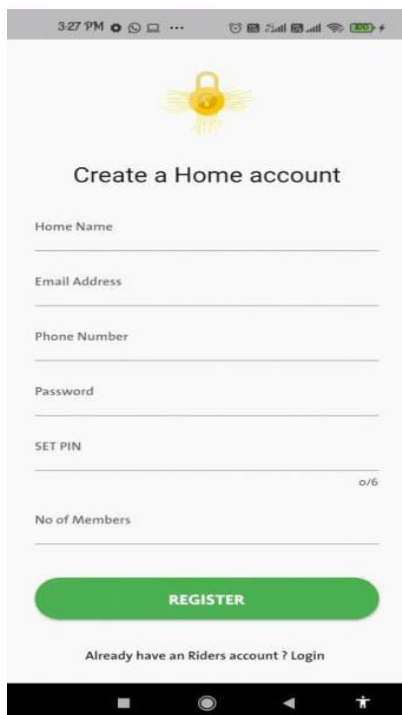


Fig 6. Registration Page of mobile application

Figure 7 shows the login page. Enter registered email id and password to unlock the door.
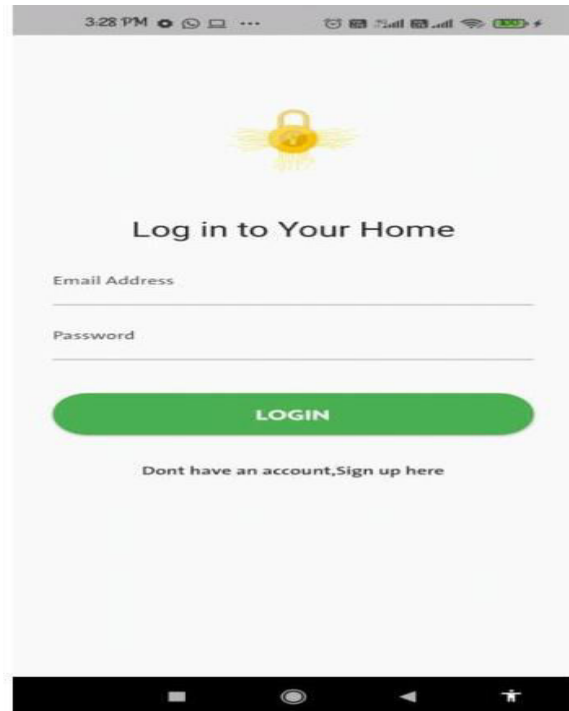


Fig 7. Login Screen of our Mobile Application
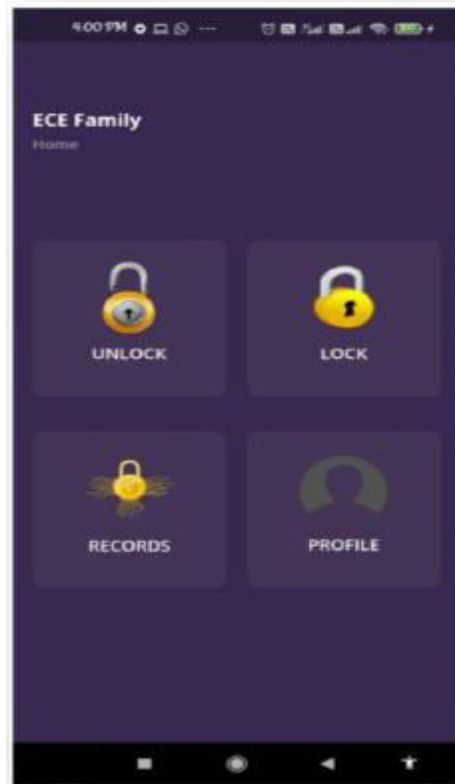


Fig 8 Main dashboard

Figure 8 shows main dashboard which contains all the functionalities. This is the fully developed mobile application dashboard which contains all the functionalities such as unlock, lock, store family members profile, recorded are activities as shown in figure 9.
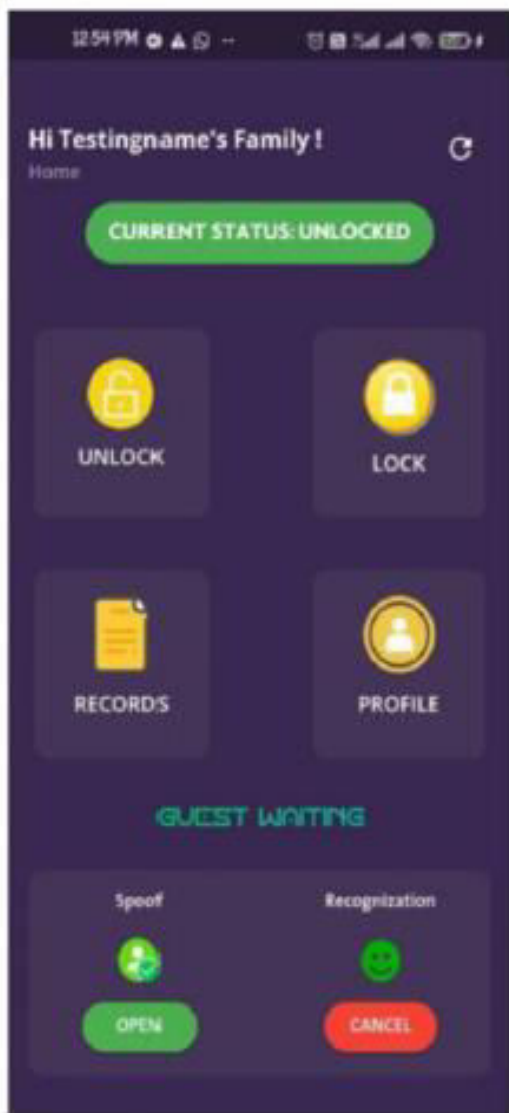


Fig 9. Status of locking systems

This is notifications and alerts are sending through SMS and G mail. In Gmail the alert send with the captured image of a person who is waiting outside. In SMS notifications is send to the mobile.

**Proposed Method 2**
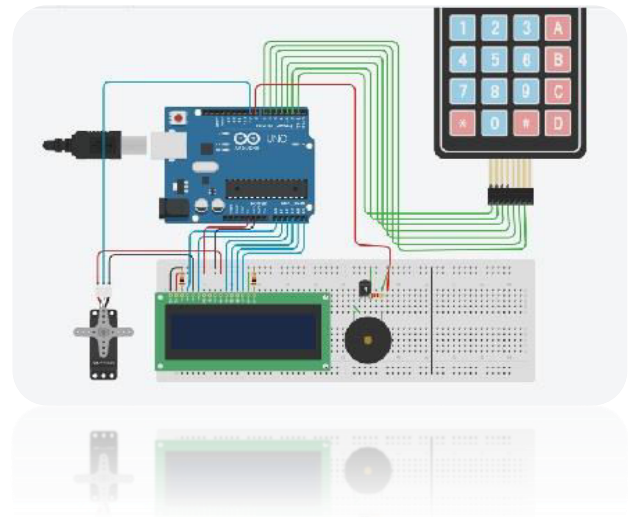


Fig 10 Arduino Keypad Door Lock system

Figure 10 shows the Arduino Keypad Door Lock system. There are so many types of security systems present today but behind the scene, for authentication they all relay on fingerprint, retina scanner, iris scanner, face id, tongue scanner, RFID reader, password, pin, patterns, etc. Off all the solutions the low-cost one is to use a password or pin-based system. The Arduino Keypad Door Lock which can be mounted to any of your existing doors to secure them with a digital password. The password is entered using keypad by user is send to arduino which checks password with existing password which is stored. If password matches means the solenoid value opens which in turn open the lock otherwise solenoid valve remains closed. But it is a low cost and simple lock system. High cost with additional features is available in the proposed method1.

**Conclusion**

The conclusion of the discussion of our Keyless Lock system has no more direct contact between the user and the lock. It will completed be with Anti spoof face recognition method to increase the security and the Mobile Application will be fully completed with better user experience. Finally we will resolves the problem of the existing lock system.

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# FACE DETECTION AND RECOGNITION FOR AUTOMATIC ATTENDANCE SYSTEM USING ARTIFICIAL INTELLIGENCE FOR REAL TIME APPLICATIONS

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## ABSTRACT

*Face is the key part of the human body that especially identifies a person. Face recognition system can be implemented by using face characteristics as biometrics. The attendance marking is the most demanding task in any organization. In traditional attendance system, the students are called out by the teachers and their presence or absence is marked accordingly. However, these traditional techniques are time consuming and tedious. In this project, the Open CV basedface recognition approach has been proposed. This model integrates a camera that captures an input image, an algorithm for detecting face from an input image, encoding and identifying the face, marking the attendance in a spreadsheetandconvertingitintoPDFfile.The training database is created by training the system with the faces of the authorized students.Thecroppedimagesarethenstoredas a database with respective labels. The features are extracted using LBPHalgorithm.*

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*Keywords: Face, Recognition, Open CV, Biometrics, Integrates, Capture, Image encoding, LBPH*

## I  Introduction

To check the performance of students, attendance process is essential in all learning foundation. In most learning centres, student attendances are physically taken by the exertion of attendance sheets provide by the organization heads as a component of directive. The enormous development within the field of pattern recognition and its applications in numerous areas like biometric authentication, face recognition so on arises the importance of this technology in numerous areas in giant organizations. For a company to be effective it desires correct and quick means that of recording the performance of the individuals within the organization.

Authentication is firstly found in the field of computer communication. Face recognition use includes similar to system security and door system. The proposed work describes the way to take student's act swindle face recognition. The face recognition is implemented with the help of camera and open CV formula. The system will acknowledgethefaceofspecificstudentandsaves the response in information automatically. The system additionally includes the features of retrieving the list of students who are absent during a explicit day. With the assistance of a camera which is connected as a part of front of classroom is able to be continuously taking footage of students to record various information , detect the faces in image and it distinguishes appearances alongside the information and mark the attendance. This work initially examine the connected works in the field of participation administration concertedly the face acknowledgement.

At the time, it nears our framework structure and plan. Eventually the experiments area unit implemented and it shows the advance of the performance of the attendance system. Raspberry pi is used and employed to find the face with the assistance of Open CV in this work. Identifying the naming of an individual using their faces refers to face recognition. It can be able to identify people in photos, videos or inreal-time.

## II  Related Works

Chaitanya Reddy [1] proposed a paper "Face RecognitionUsingArtificialIntelligence"ona lecture attendance system with a new method called continuous monitoring, with the student's attendance marked automatically by the camera which captures the photo of a

student in the class. The system has simple architecture with only using two cameras installed on the wall of the class. The first camera is a capturing camera used to capture the student image in the class and the second camera is sensor camera used to get the seat of a student inside the class and the capturing camera will snap the student image. The system then compares the picture taking from the capturing camera and images in the database. This process is done repeatedly to complete the attendance marking process hence introduces real-time computer vision algorithm in automatic attendance management system. The system uses non- intrusive camera that can captureimages in the classroom and compares the extracted face from the captured image with database inside the system. This system also uses machine learning algorithm which is usually used in computer vision. In addition, Haar classifier is used to train the images from the camera. The face captured by the camera then converted to grayscale and the image is put to subtraction process. The image then stored on the server tobe processedlater.

Pradeepa M. [2] proposed a paper "Face Detection and Recognition for Automatic Attendance System using Artificial Intelligence Concept" the system consists of a camera that captures the images of the classroom and sends it to the image enhancement module. Algorithm is trained for the images of faces and then applied on the class room image for detection of multiple faces in the image. The detected faces are croppedfromtheimageandcomparedwiththe face database using an OPEN CV algorithm. The face database consists of templates of face images of individual students that was collected and stored by an enrolment process. In this way the faces of students are verified one by one and the attendance is marked on the server. A time table module is attached to the system to obtain the subject, class, date and time. Teachers come in the class and just pressa button to start the attendanceprocess.

Anushka Waingankar [3] proposed a paper "Face Recognition based AttendanceManagement System using Machine Learning" were many approaches used for dealing with disparity in images subject to

illumination changes and these approaches were implemented in object recognition systems and also by systems that were specific to faces. A method for dealing with such variations was using gray-level information to extract a face or an object from shading approach. The main reason why gray scale representations are used for extracting descriptorsinsteadofoperatingoncolorimages directly is that gray scale simplifies the algorithm and reduces computational requirements. Here in their case, color is of limited benefit and introducing unnecessary information could increase the amount of training data required to achieve good performance. Being an ill-posed problem,these proposed solutions assumed either the object shape and reflectance properties or the illumination conditions. These assumptions made are too strict for general object recognition and therefore it didn't prove to be sufficient for face recognition. The second approach is the edge map of the image which is a useful object representation feature that is insensitive to illumination changes to certain event.

Nandhini R [4] proposed a paper "Face Recognition Based Attendance System" Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detects the student face when he/she enters the class and the system is capable to marks the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detect human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the students.

Sudhir Bussa [5] proposed a paper "Smart Attendance System using OPEN CV based on Facial Recognition" technique that used the principal component analysis. This system uses two libraries which are OPEN CV, a computer vision library, and FLTK (light tool kit). Both libraries help the development of the system, for example OPEN CV supports algorithm and FLTK is used to design the

interface. In this system, there are two processes, namely request matching and adding new face to database. In request matching, the first step is opening the camera and capturing the photo, then the face is extracted from the image. The next step is recognizing the face with the training data and, then learning the face projecting the extracted face onto the principal component analysis. The final step is displaying the face that closely matched the acquired image. The next step is storing the image into the database, and followed with application of principal component analysis algorithm. The final step is storing the information inside the face XML file. The system is focused on the algorithm to improve the face detection from acquired images or videos. The system can extract the object in the face such as nose or mouth by using MATLAB with principal component analysis(PCA).

Naveen reddy [6] "AI Based Attendance monitoring System" the system consists of a camera that captures the images of the classroom and sends it to the image enhancement module. Algorithm is trained for theimagesoffacesandthenappliedontheclass

room image for detection of multiple faces in theimage. The detected faces are croppedfrom theimage and compared with the face database using an OPENCV algorithm. The face database consists of templates of face images of individual students that was collected and

storedbyanenrolmentprocess. Inthiswaythe faces of students are verified one by one and the attendance is marked on the server. The system has been enforced in 3 basic steps. The primary step is face detection and extraction. The second step is to seek out and train face footage. The third step is face recognition part andidentification.

## III Proposed System

The system sketch is part of an in-house built learning management. It is constructed in **many** modules.

Rotating camera positioned centrally in the front of the classroom is required infrastructure. The  effective to capture frontal images from students by using the below setup. In the entrance of the classroom a camera is used that would individually detect the faces of each and everyone who are entering in the classroom.In this way the face detector would have much less work to do, but there would be only one chance to capture a quality frame. A frontal camera **can**take as many pictures as necessary in the middle of the classroom. Physically the system is integrated on the existing South East European  Universities  infrastructure.  To function, the system requires each classroom to have at least one internet connected computer. To transfer the captured images the computer communicates with LMS server.
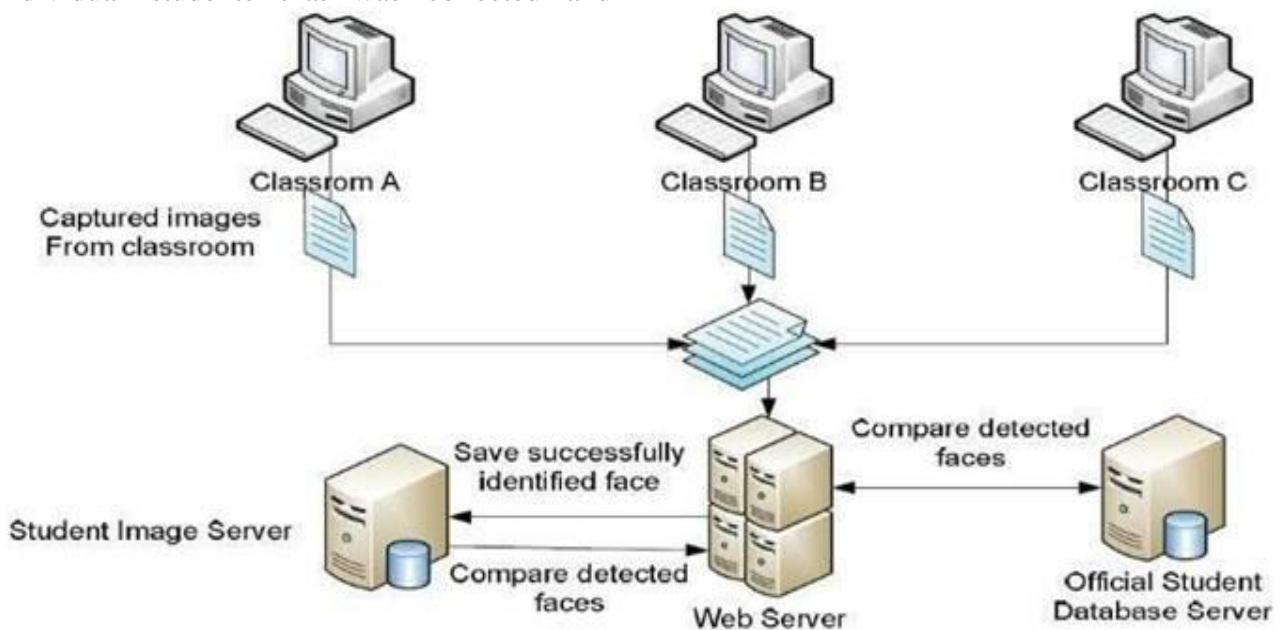


Figure 1: The physical Architecture of the System.

## Image Capturing

Here Once the image capturing is done the web service is used to transfer the image on server for processing. Jointly with the image, the web service accepts the coursecode.Usingthiscoursecode,theLMS isawareofwhichstudentsareenrolledinthat class and do face matching only for those students. The camera continuously takes pictures on a given interval by default each five minutes, until all faces detected are successfully identified or until the system is told tostop.

## Face Detection

Because of processor intensive job of the face detection algorithm, this tool is server based. Detecting a face is in essence an object detection task, where the object of interest in this case is the face. However, many factors can impede with the face detection algorithms, factors such as face pose, scale, position, rotation, light, image colors etc. The same problems appear when one wants to identify a face, with addition to some other barrier which is discussed shortly. The process of detecting faces from still pictures containing multiple faces can be separated in few steps. There are plenty face detection algorithms which can effectively detect a face or any other specific object in a picture. In the system presented here, most students face the camera frontally hence we chose to use the HAAR classifier for face detection. Intel's Open CV library is implemented in this classifier and it works by training a model using positive face images and negative face images. An image that contains the desired object to be detected is positive image, in our case this object is a face. An image that does not contain the desired object is negative image. The image is able to identify face features, which is later, stored on a XML file after the model is trained.

A problem faced during this process was the large number of false-positives: objects mistakenly detected as faces. This was not suchabigissueforus,sinceafalse-positive does not result in a positive identification during the recognition phase. Because of this, we lowered the detection threshold,so all faces could be detected. After a face has been detected, the rectangle enclosing this face is cropped and processed later by the face recognition module. This rectangle represents a single face, and after being cropped as an image is transferred on server. Each transferred is renamed to have a uniqueID.

## Face Recognition

Recognizing a face means to identify that particular face from a list of faces on a database. Our university, upon enrollment takes pictures from every student, and those images are stored in a database. Same as in face detection, there are many existing algorithmsusedtoidentifya face. Oursystem implements a server based module, programmedinPythonwhichtakesbenefitof Eigen faces to identify a face. This algorithm has many drawbacks: it depends on scale, pose and the color of the compared images. However, the algorithm is very fast, and can compare only to images, thus we do not need to have multiple images of a person to train our system. Since our system is setup to capture only frontal images the pose of the face in not anissue.

When a face is captured during the face detection phase, it is converted into gray scale. The same conversion is applied to faces on our student image database. Background subtraction on our images were done so that other objects would not interfere during the process. Another issue is that faces are subject of change during time (facial hair, eyeglasses etc.). The face is successfully identified and a copy of that face is stored in the database of faces for that student. The image is stored individually with time and date when that image was taken. This way even if a student gradually changes his appearance(e.g.,growsabeard)thesystemis still capable to identify him, since it has multiple images of the same person. On each consequent scan for a student, therecognition module starts comparing images from this database, sorted by date in descendingorder.

This approach was chosen since the latest image of a student on our database is most likely to be more similar to the current captured image. Of course, a drastic change on a student's look causes the system to not identify that particular student. To solve this issue a

module was included, which lists all unidentified faces and the teacher is able to manually connect a captured face with a studentfromthelist.Thisimageisalsostored on our database, as an updated picture of this particularstudent.

Thismanualrecognitionprocessisperformed only once. In a subsequent scan, this student is identified automatically by our system. To speedupthefacerecognitionprocessweonly compare images captured in a classroom, with the database of students enrolled forthat course only. This ensures that only a small subset of images available on their central database wasprocessed.
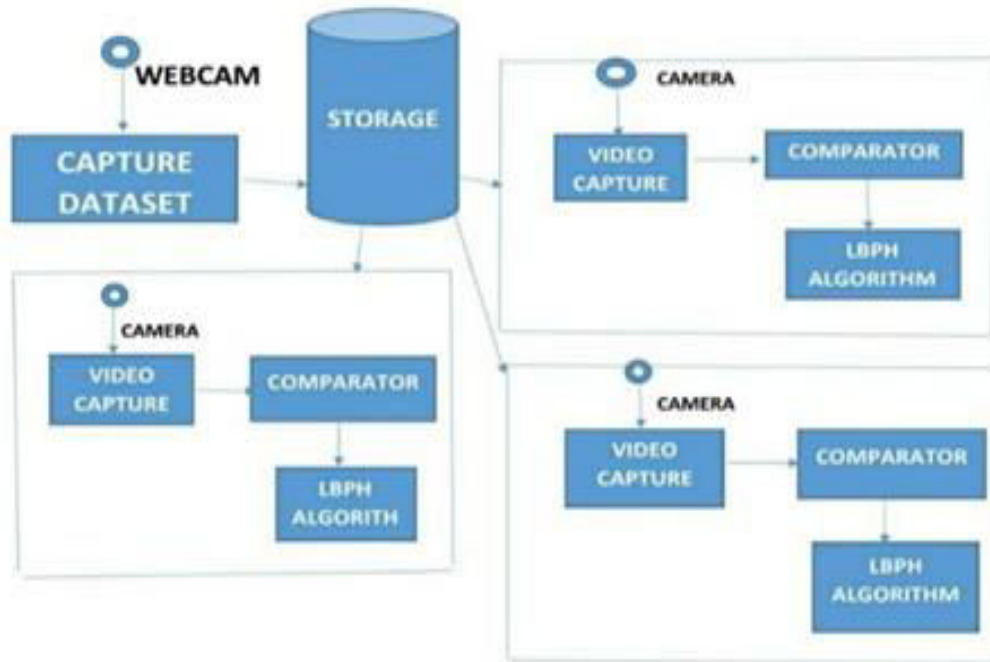


Figure 2: Block diagram face detection and recognition for automatic attendance system,

The task of the proposed system is to capture the student face and data's are stored in the database for their attendance. The face of thestudent needs to be captured in such a manner that all the feature of the students face needs to be detected, even the seating and the posture of the student need to be recognized. There is no need of taking attendance manually because the system only records a video and further processing steps the face is recognized after that attendance is updated. Artificial Intelligence is a method used in project and Machine Learning isimplemented.

### Explanation About the Block Diagram

Block diagram is divided into mainly two parts:

1. Registrationpart.

2. Recognitionpart.

First block is the Registrationpartconsist of WEBCAM, Capture Dataset and the Storage. A video camera connected to a computer,

allowing its image to be seen by internet user or system user refers as WEBCAM. When any person stands in front of camera the image of that person is captured in thedataset.

In storage block the data are stored in binary form .We can store the data in flash drive, hard disk, data cloud etc.

And the second block is recognition part .Weget the data from the storage block and that will be implemented to the LBPH Algorithm (Local Binary Pattern Histogram) .It is a simple solution on face recognition problem which can recognize front, side, right and left facing .

The stored data is compared with LBPH algorithm. If compared image is greater than 60%thentheattendanceismarkedaspresent. If compared image is less than 60% then the attendance is marked as Absent. The Binary pattern will be compared and go to the excel sheet consist of the students or faculty name, id with respect to the compared image attendance

will be marked with timing and date specified     in it.
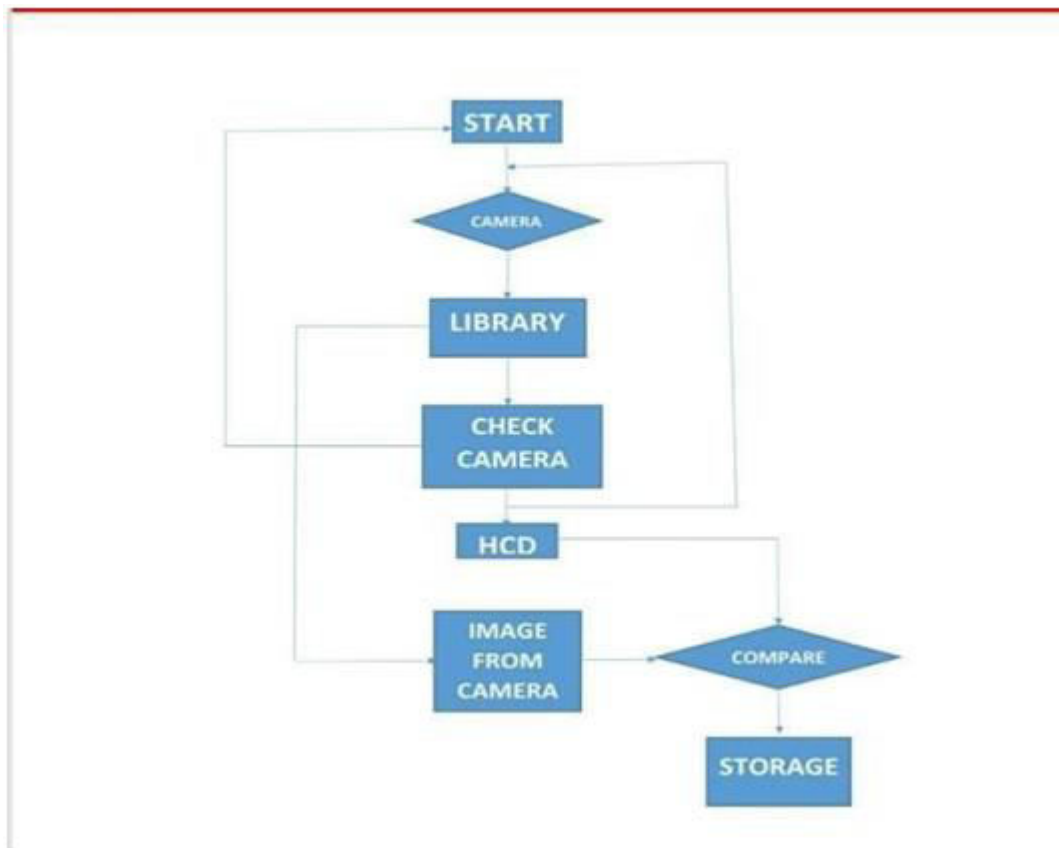


Figure 3: Flow chart of Registrationpart
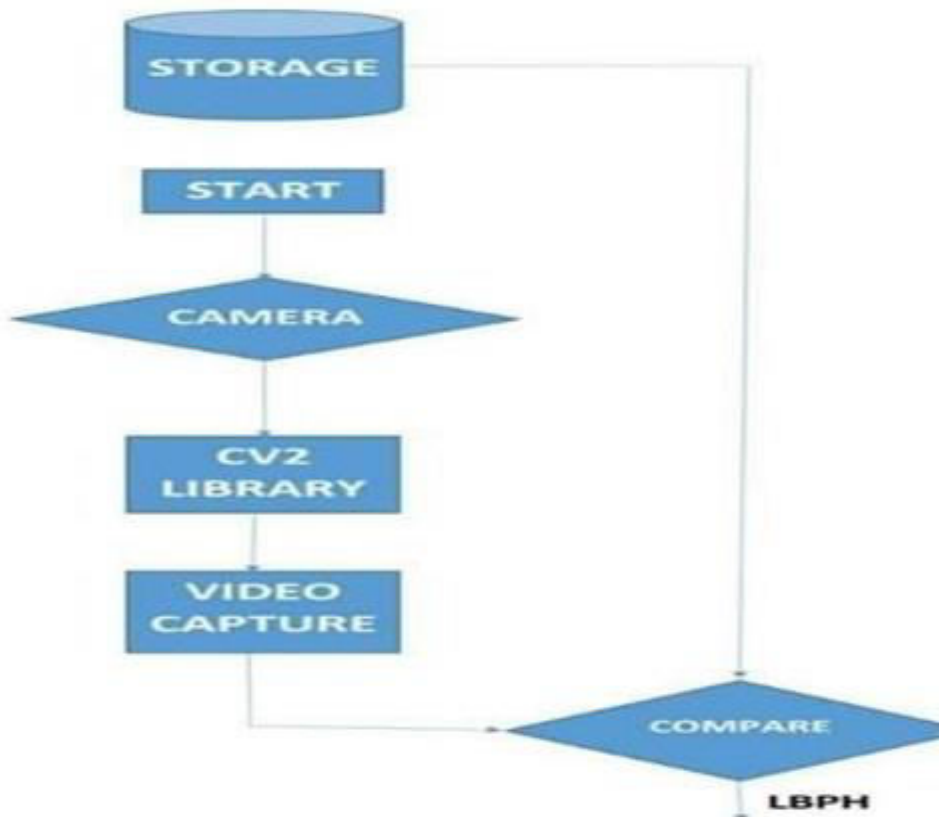


Figure 4: Flow chart of recognitionpart

## IV Implementation

- RFID interfaced with RASPBERRYPI3

- FACERECOGNITION

- ARDUINOATMEGA

### Raspberry pi Pin connection

| RC522 Pin | Raspberry PiPin | Wire Colour |
|---|---|---|
| 3.3V | Pin 1 | Red |
| RST | Pin 22 | Orange |
| GND | Pin 6 | Black |
| MISO | Pin 21 | White |
| MOSI | Pin 19 | Grey |
| SCK | Pin 23 | Green |

### Face Recognition

**OPENCV** is a considerable open-source library for our computer vision, machine learning and image processing. OPENCV-Python is basically a library of Python wrapping which is created to solve computer vision related issues. It hold up a programming languages, they are C++, Java, python etc. In this project we will be working with python as our source programming language this library is typically used for processing various image and videos. Its accuracy ranges from recognizing objects in the videos to the signature of a human being. It can also work with various librariesinvolvingnumericaloperationslikenump y and dlib. These libraries have great usage in image processing and dataanalytics.

General live streaming is done by a camera, in this project we are using a raspberry pi camera. OPENCv is the library we use to interface with the webcamortheraspberrypicamera.Basically,inthe above code of camera check we are recording a videoclipfromthecamandconvertingtheimageto grayscale and then the output is displayed. The Image is converted to grayscale using thecommand "gray=cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)". The Video Capture objectisbeingcreatedhavinganargumentof0,1,- 1 based on whether the internal or external camera is used. Here 0 is passed as we are using an internalcamera. After the processing is done, the videois The problem is divided into three sub problems: identifying employee, saving history and calculating working hours, display of history. First sub problem can be addressed with RFID reader and some tags. Second sub problem is saving history, it can be resolved with some kind of external memory module, like SD card. Third one is composed from communication and GUI. These can be resolved with simple Web Server and the attendance is passed through the excelsheets.

### Pin description of Arduino at mega 2560

| S.NO | PIN NUMBER | FUNCTION PIN DESCRIPTION |
|---|---|---|
| 1 | D0-D53 | 54 Digital I/O Pins |
| 2 | A0-A15 | 16 Analog I/O Pins |
| 3 | D2-D13 | 12 Pulse width modulation (PWM) Pins |
| 4 | Pin #0 (RX), Pin #1 (TX) Pin #19 (RX1), Pin #18(TX1) Pin #17 (RX2), Pin #16 (TX2) Pin #15 (RX3), Pin #14 (TX3) | 4 Serial communication port (8 Pins). |
| 5 | Pin #50 (MISO) Pin #51 (MOST) Pin #57 (SCK) Pin #53 (SS) | SPI Communication Pins |
| 6 | Pin #20 (SDA), Pin #21(SCL) | I2C Communication Pins |
| 7 | Pin #13 | Bult-In LED for Testing |

## Steps for Face Recognition

STEP 1: starts capturing frames from the camera object.

STEP 2: To tranform color image to grey scale.
STEP 3: Detect and extract faces from the images.

STEP 4: Face detection using Haar cascade classifier.

STEP 5: Face is matched with trained ones.

STEP 6: Uses the recognizer to recognize the Id of the user.

STEP 7: Face recognition is done using local binary pattern histogram.

STEP 8: And then the face will be check.

STEP9:Ifthefacematchesthentheattendancewill be marked as "PRESENT" in the datasheet.

STEP 10: If the face doesn't matches then the attendance will be marked as "ABSENT" in the datasheet.

STEP 11: Generate the report. STEP 12: Update the attendance.

STEP 13: Continues the step 6 for further images.

STEP 14: Stops the process and saves the time and effects of the attendance system.

## V   Result and Discussion

The face recognition can be used in various schools and colleges as today's attendance takes up at least 10minutes and the task can be very tiresome for teachers. With this technology we implemented in this project, one can just stand in front of the camera and their face gets recognized along with their name and their registration number. Along with that the RFID tag is also interfaced where the tag can be swiped and verified with the data base that is obtained from the face recognition. In addition to this one can even add the time and date which makes it easier while retrieving data. The teacher can get access to the attendance at any point of time with just typing the roll number. There will be a less chance of a forgery as the data is obtained by a machine based approach and there is no way to give a proxy.

## VI Future Scope

This automated attendance system can be further extended in work environment and can be added alongwithbiometricsystemsformoreaccuracyand ease of data. This makes the employees data more reliable and can be accessed at any point of time. The addition and removal of new candidates can also be done when compared to the manual way of adding members. Based on this attendance, the payment can be made on the number of days the candidate has appeared and the number of hours each candidate has worked. This face recognition hasalsohelpedimprovethesecurityandcomplexity of the system. It helps to identify the criminals in case of any forgery or mismatch. These images will beputintheblacklistfileswhichcanbeusedincase
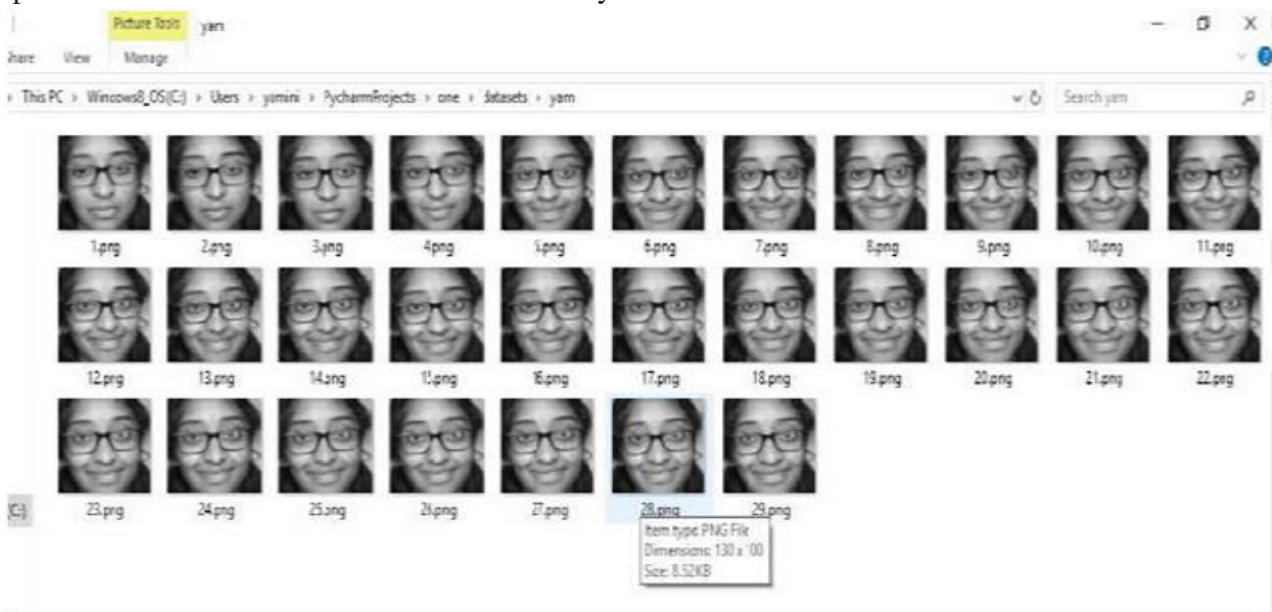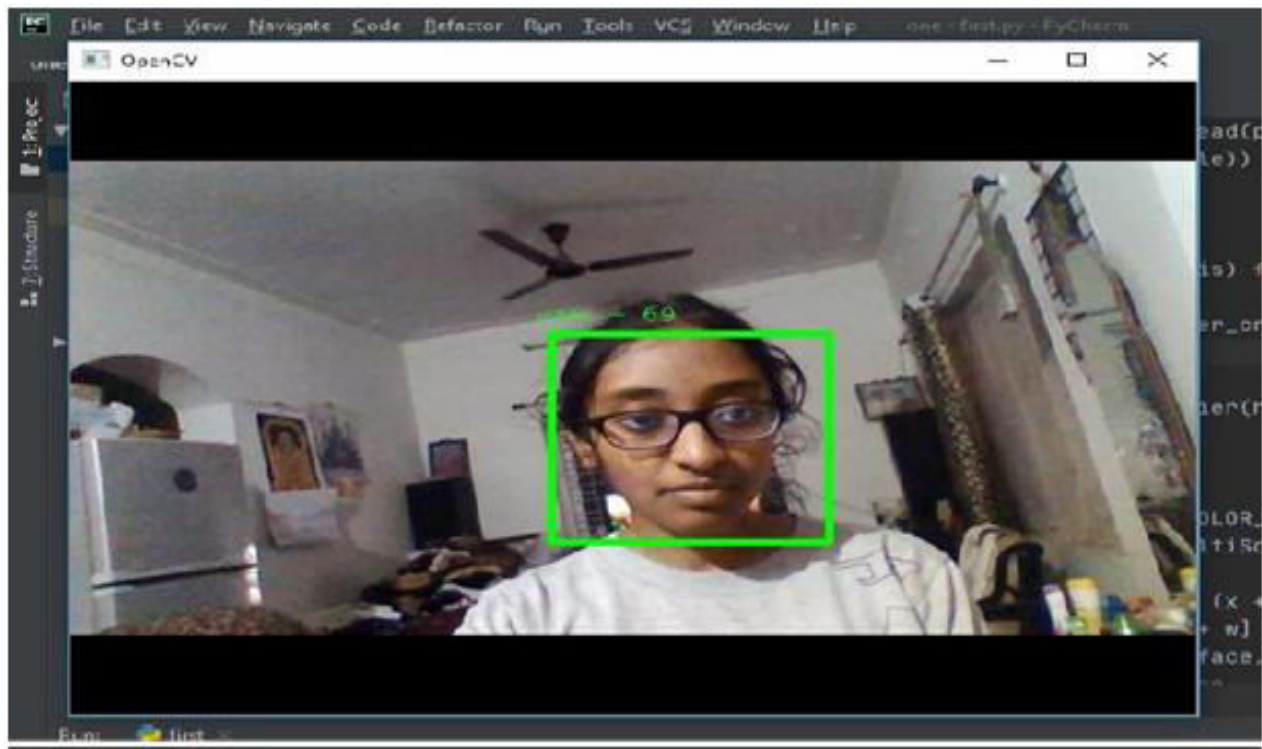
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# SMART AUTOMATED PILL DISPENSER FOR CHRONIC PATIENTS

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## ABSTRACT

*In this era of modern medicine where humans are largely dependent on the use of pills/tablets. We know at least 1 or more who have to take their medication for a long term in order to live and stay healthy. In this project, we focus on a Smart Automated Machine which will help a person to take his/her pills on time according to their desired scheduling and it mainly focuses on making sure that our loved ones who are either old aged or having memory loss or have difficulty in remembering the medicines schedule, take their pills on proper time from the touch of your phone around the world. Our project is especially designed in order to solve the problem of taking in time and adequate dosage of medicine (specifically tablets) for chronic patients. This device is user friendly with alert buzzers in it which acts as remainders for tablets intake, timers for keeping a log on the daily basis time schedule and a LCD screen for viewing and to explore other features. The device is also WIFI, Bluetooth enabled for better connectivity with devices and its smartness increases when it is linked with IOT. The preliminary design is to be done by SOLIDWORKS or AUTOCAD.*

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*Keywords: Modern Science, Smart Automated Pill Machine, Chronic patients, WIFI, IOT.*

## 1. Introduction

What is chronic disease? Chronic disease is a category of diseases which lasts over a long period of time in a human body, hence requiring an ongoing medication. For example, Diabetes, cancer, cardiovascular diseases, arthritis, Alzheimer's, chronic obstructive pulmonary disease etc. are considered as chronic diseases. Globally, the percentage of chronic diseases affecting individuals is rising gradually every day. There is a high tendency that common Homo-Sapiens don't take it seriously.

The rise in chronic diseases has also increased negligence in medical adherence. The impact of this negligence isdrastic with the risk of resulting a critical health condition or even death. Hence, the one infected with chronic disease needs to take extra care andthorough medication according to a prescribed schedule by a doctor.

As the people are getting busier these days with their daily livelihood, they tend to forget the required medication according to the prescribed schedule, also resulting in a high probability by a caretaker to miss a medication in the schedule.

Over the years it has been very evident in hospitals that 64.55% nurses have a tendency to make errors in giving a patient their medication. The most common errors that were reported are wrong dosage and infusion rate. The most important causes of these medical errors are fatigue due to work load and lack in pharmacological knowledge.

Therefore, to overcome all the above stated scenarios a need for a smart solution is much required. The smart solution which is required must be a modern day technological device which can be accessible by all individuals. Keeping in mind all of the above constraints, we are introducing a "**Smart Automated Pill Dispenser**" that would dispense prescribed dosage of pills/tablets to a patient according to the user defined schedule. Hence eliminating all the negligence caused due to any uncertainties.

Inspired by a device from the US based pharmaceutical **"Hero Health, Inc."** which primarily performs an effortless pill dispensing act according to the user defined schedule, similar to our "**Smart Automated Pill Dispenser**". As much as this device works seamlessly it is limited only to the US market and it is also priced on the extortionate side. Due to its lack of availability and high pricing it makes it slightly laborious for a common man to afford it.

Citing the above drawbacks our main moto is to design and prototype a device which performs all the required functions of an expected smart pill dispenser, which must be feasible in all aspects considered.

## 2. Related Work

As we all know how important a medication in the form of tablets is for a person suffering with a disease. In the 21st century humans have been dependent on machines and especially smart machines. Also, the pandemic created by the COVID-19 has clearly taught us the need for social distancingand the requirement of fully automated machines that totally function independently without any human interaction. The first idea of a pill dispenser was cited in the year of 1964 by the author David.P.Wanger in [1]. The author has presented a patent model of a pill organizer making it easier for a patient to sort their medication. The author's work in this patented model has been a base for the idea of a pill dispenser back in the day when the technology is not as advanced as it is today. The author Nidhi Solanki in [2], came up with an idea of a "Smart Pill Box Health Care System". The author came up with a medical alert system which helps the user take their medication with a reminder. The author's work cited consists a LCD display which displays the current time, medication alert. The author has given a dedicated and allocated a slot for GSM sim, which according to the given schedule sends an SMS to the user's registered mobile numberreminding them that it's time for their medication. The author Diaa Salama Abdul Minaam in [3], created a pill dispensing machine. The basic requirement of a pill dispensing machine is to dispense a pill according to a schedule, which was done by the author in her work. The mechanism used to dispense the pill is similar to the ones in vending machines found in the market which dispense soft drinks or snacks. The author also had a dedicated smartphone app which had basic features like pill intake schedule and countdown timer for the next dose. The author Mohammed Asad Fasahate in [4], in his work designed a system which can overcome the negligence in medical adherence. The author's system also helps the doctor's to monitor and track records a large number of patients with

ease. The author Ekbal Rosli in [5], worked on making a device to help the nurses in the hospitals to deliver the perfect dosage and medicine to a patient. The author's work also concentrates on introvert patients who do not like or are shy to interact with a nurse for their medication. The author has a developed a smart robot which navigates itself by using RFID and line following concepts. The author has also developed a software application through which a nurse can login and operate the device by giving the necessary inputs. The author Abdullah Kassem in [6], has worked on developing a smart medicine dispenser. The author's work includes a functional prototype which contains 4 wheel like structures with each of 7 pill capacity. To attain a successful mechanism the author has used the Arduino R3 has the main board which is coded to perform the required tasks. The author has selected servo motors as the main motor which will initiate and perform the rotating mechanism. Also a smart user interface was developed by the author which could be installed on the user's smartphone. The user interface has many features like tracking the dosage, alerting by SMS and refill warnings. The authorAna Rita Sousa in [7], innovated a smart modular dispenser for medical administration. One of the best feature of this device is that it is portable. The device consists of compartments called modules. As stated by the author each module can store a single type of drug. The device consists of a single microcontroller module which connects to all the other modules, a countdown timer, LED indicators for multiple information and a dropping mechanism to dispense the pills.

The above referred papers were excellent respective to the content in them, but the biggest issue with all the papers was that either the device was not made available in the market or they had financial constraints. Our project aims to eradicate all the above stated limitations and also to build additional features which will enhance a user experience to the maximum

## 3. Planned Features of the Device

The following section will briefly explain the features and its role played in the device.

i. The Smart Automated Pill Dispenser comes with a user friendly interface between the virtual understanding of the machine and the human level.

ii. The inputs are given with buttons provided on the machine or the smart app. The output can be viewed on a 7inch touch display or the user's smart phone for any given input.

iii. It comes with a dedicated water dispenser and an air tight container to store water and dispense it simultaneously with dispense of a tablet, as water is an important criteria in consuming tablets/pills for many humans.

iv. The device comes with WIFI and Bluetooth 5.0 connectivity for the sole purpose of communication with smartphones/androids/IOS devices by assigning a dedicated mobile application to it.

v. WIFI not only helps in communicating with the user's smartphone enabling another unique and most common feature found in advanced devices i.e. IOT.

vi. We have alert buzzers present in the system which act like an alarm or a remainder in three different stages:

Stage 1: Before dispensing the tablet.

Stage 2: After dispensing the tablet.

Stage 3: Until the tablet is taken from the provided section.

vii. This three stage alert buzzers comes with a voice that recites specific messages during each phase

Stage 1: ""Name", it's time for your "xyz" medicine intake"

Stage 2: "Your medicines are dispensed and are ready for intake"

Stage 3: "Your medicines are taken and the next dosage is in ----hrs."

viii. We have also planned for an exception case where the patient ignores/forgets to intake the medicines after two stage alerts have been called out. In such cases a special sound/tune will be continuously triggered until the medicines are taken

from the area of dispensing along with a constant notification on the dedicated smart app.

ix. The device also holds a feature of intimating the consumer/caretakerwhen the dosage of a particular or group of medicine is closing to its completion in stock.

## 4. Operational Methodology
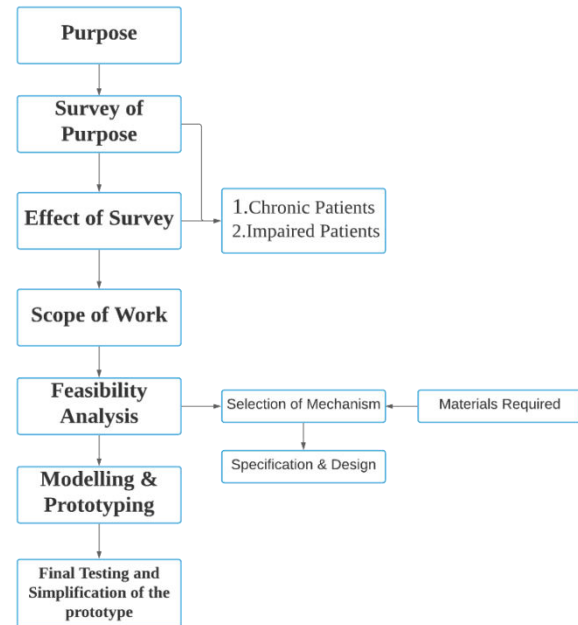


Fig 4.1 Operational Methodology

### 1. Purpose

The main purpose of this project is to tackle the problem of medical negligence in tablet criteria's, to avoid over dosage of tablets and to maintain the prescribed and proper schedule of dosage, according to user desire.

### 2. Survey of the Purpose

The need for survey is to come to a clear idea how the people are suffering from this negligence and ignorance of just not taking pills on time and on regular intervals.

On study it is statically proven that non-communicable diseases (NCD) especially cardiovascular diseases and diabetes mellitus were found to be the leading cause of mortality worldwide. Morbidity, mortality, and disability attributable to major NCDs account for almost 60% of all deaths and 47% of the global burden of disease.

The majority of deaths occur among low and middle income countries like India and

China.**NCDs account for 53% of all deaths in India**. One of the major strengths of study was the use of validated scale to measure medicine adherence. However, we could not get the exact pill count missed as the tool used to measure adherence has questions related to forgetfulness or carelessness and attitude of the patients toward drug intake. Higher response rate (93.8%) and exploring barriers to nonadherence for multiple NCDs also add to the strength of the study.

### 3. Effect of the Survey

The effect of the survey was divided by two segments namely:

- Chronic patients

- Impaired Ability

The main aim of this project is that it will be a great use to the chronic patients whose lives are led by having their day to day pill and according to the survey study, Of the estimated 10.3 million deaths that occurred in India in 2004, 1.1 million (11%) were due to injuries and 5.2 million (50%) were due to chronic diseases.

Mortality rates for people with age-specific chronic diseases are estimated to be higher in India than in high-income countries. In 2004, the overall age standardized mortality rates for chronic diseases were 769 per 100 000 men (56% higher than in high-income countries in 2004) and 602 per 100 000 women (100% higher than in high-income countries in 2004).

### 4. Scope of Work

Our scope of work is mainly to stream with the problem definition which includes our objectives as follows:

❑ To select appropriate materials used to design the SAPD.

❑ To select appropriate mechanism and program for actuating the device.

❑ To develop a working prototype.

❑ To design and Fabricate Automated Pill Dispenser.

❑ To improve medical adherence in our livelihood.

### 5. Concept Selection

The concept selection process was first initiated by the group members deciding the title of the project, objectives and how to tackle with the current situation. When the board approved our concept, it was on the members of the team to implement this concept with the guidance of our guide (lecturer) and we went on to decide the specifications and design of the SAPD and we inferred a basic flowchart on how the achievement of the project should be approached.

### 6. Feasibility Analysis

We are trying to make this project as feasible as possible with no compromise in quality. As of now since the project is still in the development stage we are constantly learning and analyzing the feasibility of the final outcome. Thedesign for the outer body/housing of the product has been designed using SOLIDWORKS. The dimensions for the housing has not yet been finalized as it will be totally dependent on the size of the internal mechanism which is still under development. The final assembly of the product is shown in the figures in the further slides.

### 4.1 Functional Block Diagram

As per the given operational methodology for selecting a suitable actuating mechanism we first need to analyze the required functioning of the device. Therefore a proposed work flow process or a proposed functional block diagram has been researched and following figure represents the functional block diagram.



Fig 4.1.1 Functional Block Diagram

For this system we have selected **Arduino Uno R3** microchip as the main programming board for the device based on the following aspects:

i. For the cost convenient and its vast applications.

ii. The board has easy programming base and it already has more standard library functions declared.

iii. It has 14 digital input/output pins. Hence more components like sensors, drivers, displays and other like type devices can be programmed together.

iv. It is an open source software and hardware device accessible for every individual, which is very essential for creating a working prototype.

On the left hand side of the Arduino Uno R3 board are the input devices given to it, which comprises the following:

i. **12V AC-DC Motor Power Supply**: It provides the required power or energy to the NEMA-17 Stepper motor.

ii. **5V Power Supply**: This power supply drives the main Arduino Uno R3 microchip board.

iii. **I.R sensor**: It emits infrared rays for detection of any object in its sensing range.

On the right hand side of the Arduino Uno R3 board are the output devices connected to it, which comprises the following:

i. **A4988 Driver**: The A4988 is a micro stepping driver with a translator equipped in it. The driver can operate at maximum output capacity of 35 V and ± 2 A. It can step the bipolar stepper motors in full, half, quarter, eighth and sixteenth-step modes.

ii. **NEMA-17 Stepper Motor**: It is hybrid category of stepper motor which can step 1.8° per step and has a holding torque of 3.2kg-cm.

iii. **Display**: It is used to view the input content and also to guide the functions of the device.

iv. **Buzzers & Speakers**: Buzzers are used to alert the consumer at the time of dispensing and speakers are used to recite some messages to the consumers.

## Theory and Formulations

This section will include how to do the assembly of the above shown functional block diagram.

So on studying and interpreting some references we have found that two primary motions can be used to dispense the tablets and they are

i. Rotary Motion Mechanism.

ii. Circular – Straight line motion mechanism.

For the rotary motion mechanism we would use a NEMA-17 Stepper motor and for the second type of motion we are studying on drag link or a Crank and slotted lever motion mechanism.

Other option can also be the tool changing mechanism of a CNC machine which will be added to consideration for study and finalized mechanism will be the best of the feasible conditions.

At this juncture an electronic circuit design is done and with the help of some simulation software's the final circuit design is as shown in the figure.
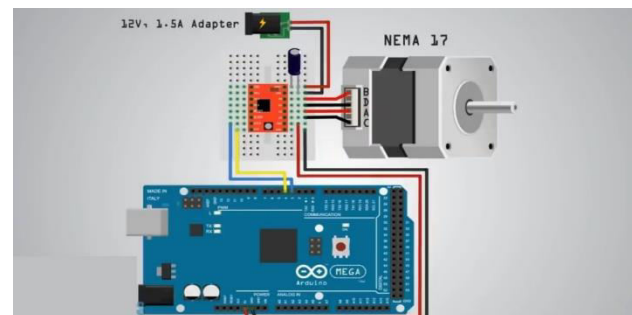


Fig 4.1.2 Circuit diagram

## Procedure to Connect the Circuit

i. Place the A4988 driver in the center divider in between the terminal slots and insert it firmly.

ii. Identify the same coils of the motor and connect it accordingly to pins 1A, 1B, 2A, 2B.

iii. Short the pins Reset and sleep with a connecting wire.

iv. The Pin- Step is connected to the 3rd digital output pin in the ARDINO-UNO and Pin-Dir is connected to the 4th digital output in the same microcontroller.

v. Pin VMOT & GND is connected in parallel with a 47micro Farad capacitor and from the same terminal the positive end of the capacitor is given to positive of the power supply and the same follows with the negative one.

vi. Pin VDD is connected to +5v of the ARDINO-UNO and VDD is connected to the VDD of the same microcontroller.

Note: Before testing out the circuit we need to set the reference voltage in the A4988 by a simple formulation which implies,

**Vref of an A4988 =8 * rated current of the stepper motor* resistance of the driver**

From our data Vref= 8 * 1.7 * 0.1

= 1.36 V and the value we have set in the driver is in the tolerance of ±0.05V.

### A special mention on A4988 Driver
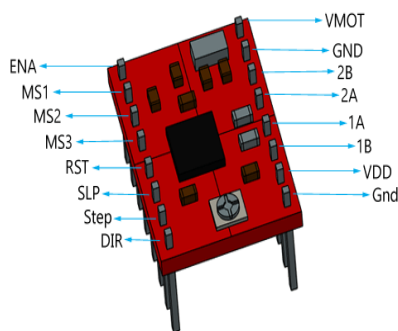


Fig 4.1.3 A4988 Driver

As shown in the above diagram, this driver consists of 16pins and each pin as a specific function when connected to a microcontroller. Let's see each pin function:

i. Pin-1 (ENA) - ENA stands for ENABLED, which enables the driver.

ii. Pin- 5 (RST) - RST stands for RESET, which resets the driver.

iii. Pin- 6 (SLP) – SLP stands for SLEEP, which puts the driver to sleep mode or it gives the delay when needed.

iv. Pin- 7 (Step) – This pin enables the motor connected to the driver to actuate in steps.

v. Pin- 8 (DIR) – DIR stands for direction, which determines the motor to move in required direction.

vi. Pin- 9(VMOT) and Pin -10 (GND) – These pins are used to power the motorand provides grounding also.

vii. Pin- 15(VDD) and Pin- 16(GND) – These pins are connected to 5V and GND of the Micro-Controller.

viii. Pins MS1 MS2 MS3 –These pins are the micro-step selection pins which determines the motor to move in steps, this is followed by a truth table which actuates the motor in quarter, half, eighth and sixteenth step as follows :



ix. Pins 1A, 1B, 2A, 2B –These pins are connected to the 4coils of the motor respectively.

### 4.2 Conceptual Design

**Front View**



Fig. 4.2.1 Front View of SAPD

**Top View**
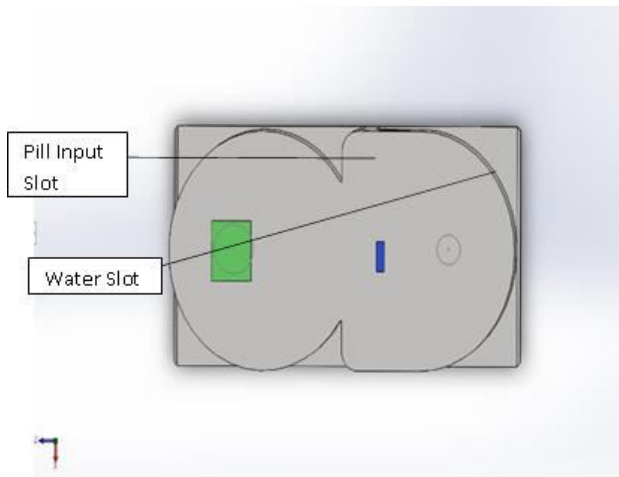


Fig. 4.2.2 Top view of SAPD

**Side View**
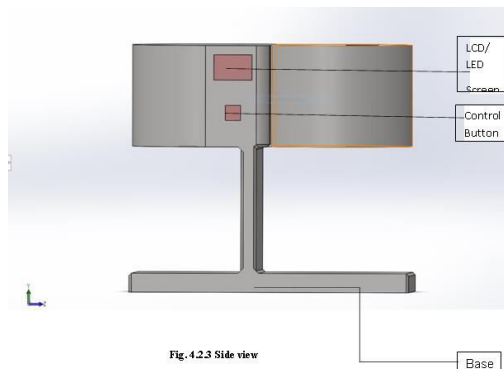


Fig. 4.2.3 Side view

**Isometric View**
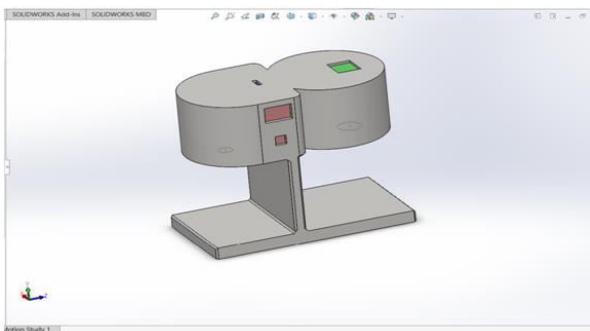


FIG 4.2.4 Isometric view

The design of SAPD was designed using Solid Works 2016. Design of SAPD consists of a dedicated shape and size that is irrespective of standards as it is a Phase-I design, the final component will be as per standarddimensions. The SAPD has a distinct slot for each tablet and water storage (capacity unknown) which is shown in thetop view and in the side view. The device has a dedicated storage area which contain cartridges for the storage of pills/tablets. The storage capacity of the device can accumulate enough tablets for 2 patients with 6 different tablets each. Every cartridge has a storage capacity which can last for 25-30 days depending on the size and intake of a specific tablet. The SAPD has a LCD touch screen display for visual presentation of data as well as manually entering a schedule. The device is also incorporated with specified control buttons which can help navigate through the various options provided and displayed on the screen by the user. The base stand supports the device to hold its position fixed at a desiredplace. Other than the above specified feature, we have added another feature which will enhance the user's experience. Hence, we have also included a water dispenser which will dispense 150-250ml of water when a pill has dispensed as water is much required to intake a pill.

As of now the conceptual design has been completed because of which we have an idea on how the final product will appear. A further detailed design and feasibility analyses of the design will be discovered in the further stages of the product development.

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# DEPRESSION DETECTION FROM SOCIAL NETWORK DATA USING MACHINE LEARNING TECHNIQUES

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## ABSTRACT

Proposed Social networks have been developed as a great point for its users to communicate with their interested friends and share their opinions, photos, and videos reflecting the moods, feelings and sentiments. This creates an opportunity to analyze the user's emotions and social networking data to investigate their mood and attitudes when they communicate via these online tools In this work, The aim is to perform depression analysis on Twitter data collected from an online public source. To investigate the impact of depression detection, machine learning technology has been proposed as an efficient and scalable method. The result is an assessment of the efficiency of the proposed method using a range of different psycholinguistic features. It shows that the proposed method can greatly improve the accuracy and classification error rate.In addition, the result shows that in different experiments support vector machine gives the highest accuracy than other Machine learning approaches to find the saddness . Machine learning techniques as known the high quality solutions of mental health problems among twitter users.

**Keywords**: *Natural  language processing ,Machine learning ,Social network, Depression .*

## 1. INTRODUCTION

This project describes a set of experiments performed on public tweets, to identify users who suffer from depression or are at- risk of depression, using text mining techniques. We also try to identify the tweets that are stuck in the Twitter stream. According to a recent report by the World Health Organization (WHO), mental health is an integral part of health and well-being (WHO, 2004). Mental disorders can affect anyone, rich or poor, male or female, of any age or social group. The experience of mental illness is often described as difficult, especially when associated with demeaning prejudices and lack of understanding. Mental illness is very difficult to diagnose in these days . There is no such reliable laboratory test for most forms of the mental illness, and diagnosis is usually based on the patient's self-reported experiences, relatives- reported behaviors, and mental status messages.Unfortunately, the problems of mental disorders are also increasing worldwide due to the aging population. In this  context of mental illness, depression is very common. In Canada, 5.3% of the population experienced a depressive episode in the past 12 months, while in France it was 7.8% . The goal of our project is to exploit big data from social media and apply social media mining and sentiment analysis methods to discover people at risk. The aim of this thesis is to apply natural language processing and machine learning techniques to build a system that gives a set of tweets from a user that can identify the compromised tweets and thus the vulnerable users. For this task, we need to select useful text or community features.

This system needs to take into account the knowledge of social media posts, such as 1) tweets are short and may convey less emotion; 2) Users tweet about a variety of topics; 3) The language does not match the grammatical structure and may contain misspellings/shortcuts that fit 140 characters. This leads to a secondary objective of the thesis, which is to identify relevant tweets for analysis from the large amount of Twitter data.

## II  DETAILS OF LITERATURE SURVEY

K. Lee, A. Agrawal and A. Choudhary proposed "Mining social media streams to improve public health allergy surveillance" Year: 2015,To distinguish the tweets of their interest, Lee et al. [1] have used Bag- of- words supervised learning approach. . While removing stop words, adjective noun were also removed in bigrams e.g. natural allergy and all other allergies were identified from noun POS tags.

Carchiolo, A. Longheu and M. Malgeri proposed "Using twitter data and sentiment analysis to study diseases dynamics" Year: 2015 ,V. Carchiolo et al They have used SNOMED-CT which is a systematically organized computer process able collections to correctly detect medical terms.

S. Liu, X. Cheng, F. Li and F. Li, proposed "Adaptive Sentiment Classification on

Dynamic Tweets" Year: 2015 ,Liu et al. [3] have used topic-adaptive sentiment classification model, which work as a classifier that utilizes common text features and mixed labelled data extracted from different fields. To extract text feature data, Point-wise mutual information and information retrieval was used.

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M. Chen, W. Chen and L. Ku proposed "Application of Sentiment Analysis to Language Learning" Year 2016, Chen et al. [4] have used resolve technique, Ranking Emotional Synonyms for language Learners Vocabulary Expansion, a context-aware emotion synonym suggestion system. . .

M. T. Khan and Khalid proposed "Sentiment Analysis using supervised and unsupervised techniques of Machine Learning were compared to analyze review documents related to health care which can help new patients identify their concerns and learn from others experience [5]. For subjective text analysis Khan et al. have used naive bayes by computing cumulative aspect probabilities in association to class labels. The class with which the document gets the highest probability gets assigned to it. Variations of k-NN were used to avoid the bias towards majority classes and improve its efficiency. Aspect based Sentiment Analysis was done to avoid ambiguity in sentiment polarity.

## III  METHODOLOGY

There a growing number of methodologies to detect depression from the posts. In our study, we incorporate a technical description of approaches applied for depression identification using the NLP and text classifying tech

Our project consists of 2 components. First, to predict distress at the tweet level, and second, to predict depression at the user level. the main reason is to train two classifiers. The first classifier predicts the Tweet Class, while the second classifier predicts the User Class.

### Tweet-level Classification:

In this goal of training a tweet-level classifier that make predictions whether agiven tweet indicates distress or not.

### User-level Classification

The goal of training a user-level classifier is to predict whether a given user may suffer from or is at-risk of suffering from depression.

**Table1**:Words frequently used in depression-indicative posts and standard posts

| Depressive indicative post |
|---|
| alone, break, blame, depressed, deserve better, deserve unhappy, die, escape, distraction, nobody, feel alone, feel depressed, felt pain, fuck don't, hate, hurt, loneliness, mine, myself, reject love, safe, shit, sucks, no job, painful, pressure, too worried, unsuccessful, ugly, uncomfortable, winter, worry, worth, wrong life |
| Standard posts |
| close, advice, cooking, cousins, don't care, encourage, family, logical person, got married, I do, better, mom, peace, parents, spend time, new friends, right, funny, need, thankfully, uncles, soul-friends, work, weekend, |

The framework in Figure.1 consists of data-pre-processing, feature extraction followed by the machine learning

classifiers, features analysis and experimental results.
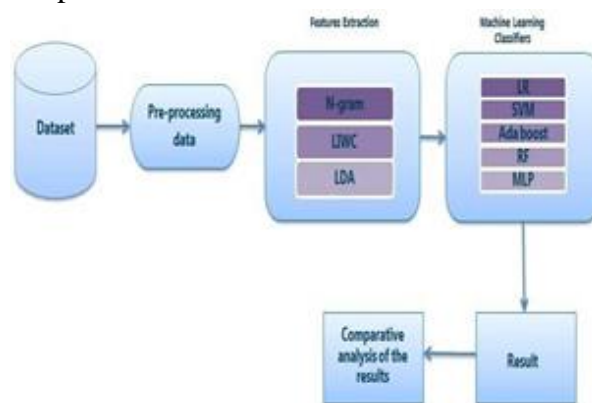


*Fig.1:Block Diagram Of Methodology*

## 1 DATA PRE-PROCESSING

We use the NLP tools to pre-process the dataset before it is proceeded to the feature selection and training stage. First, we use tokenization to divide the posts into individual tokens. Next, we remove all the URLs, punctuations and stop words which could lead into erratic results if stay ignored. Then we are apply stemming in the order to reduce the words to their root form and group same words.

## 2 FEATURES EXTRACTION

After data pre-processing, we feed our models with the fea- tures that reflect users' language habits in Reddit forums. To explore the users' linguistic usage in the posts, we employ the LIWC dictionary, LDA topics, and N-gram features. These text encoding methods are applied to encode the words to be proceeded by different classifiers.

N-gram modeling is used to examine features from posts. It is widely used in text mining and NLP as a feature for depression detection to calculate the

probability of cooccurrence of each input sentence as a unigram and pegram. For n-gram modelling we use the Term frequency-inverse document frequency (TF-IDF) as a numeric statistic where the importance of a word with respect to each document in corpora is highlighted. The main goal of its usage is to scale down the impact of empirically less informative tokens, which occur frequently to give a space for the more informative words occurring in a small fraction. The word is ranked with greater TF-IDF value if it is present in a particular post and absent in other post. In our study, we use TF-IDF vectorizer from the scikit-learn Python library to extract 194,613 unigrams and bigrams. We remove all stopwords from the dataset and limit the based term matrix to 3000 of the most common larges and bigrams. In addition, we used Pointwise mutual information (PMI) to filter infrequent bigrams.

LIWC, or Dictionary of Linguistic Query and Word Count, is widely used in the computation of linguistics as a source for psycholinguistics and psycholinguistics.. It works as a baseline measure with a set of words and a behavioral link. It is often featured in various mental health projects. To accomplish our experiment, we extract 68 among 95 different features in view of psycholinguistic measures and change every depressive and nondepressive post with numeried values. This way we obtain the scores for three higher- level categories considering standard linguistic dimensions, psychological processes and personal concerns.

The standard linguistic processes are one of the most largest parts in the LIWC psycholinguistic vocabulary package. It

was intended to quantify the words' usage in mentally significant classifications as well as for recognizing the connection between individuals in social co-operation. In our study, we first choose 9 linguistic features (articles, auxiliary verbs, adverbs, conjunctions, impersonal and personal pronouns, negations, prepositions and verbs) to characterize the user text. Then we divide the Psychological processes into subcategories from which we used effective processes (anxiety, sadness, positive or negative emotion), biological processes (sexual, body, ingestion and health), social processes (family, friend, male, female), cognitive processes (cause, always, never, because), personal concerns (job, cook, cash, bury, kill), and time orientations (present, past, season). To examine the users' linguistic usage, we implement LIWC2015 dictionary [44] as the pre-defined category to measure all the textual content submitted by the users to extract Lexically featured. We evaluate the correlation using the Pearson correlation coefficient r and also Benjamini-Hochberg selection method used in.

Topic modelling is an effective tool in computational linguistics to reduce the input of textual data feature space to a fixed number of topics. Through the unsupervised text mining approach, hidden topics such as topics connected with anxiety and depression can be extracted from the selected documents. In comparison to LIWC, it is not created by a fixed set of pre-established words. However, that automatically generates the group of the nonlabelled words. The choice of words is based on a probability. As a result, each generated document deals with different topics

among each other. In our study, we examine the content of each post semantically connected with depression discussion session. To derive the topic distributions for each post in the dataset, we used Latent Dirichlet Allocation (LDA) module. It is a probabilistic generative model for discretion of data collections helpful in discovering its underlying topic structures.

Based on our results, LDA model works best on the validation set when it is limited to 70 topics. For the topic selection we consider only the words that appear at least in more than 10 posts. We include every post as a single document that must be further tokenized and stemmed. This way allows us to compute the topics over the collection of documents to annotate them according to detected topics Before we start the subject modeling process, all stop words are removed.LDA implementation is provided by the Mallet toolkit.

## 3 TEXT CLASSIFICATION

To estimate the presence of depression, we employ classify- ing approaches to estimate the likelihood of depression within the users. The proposed framework is developed by using Logistic Regression, Support Vector Machine, Random For- est, Adaptive Boosting and Multilayer Perceptron classifier. Logistic Regression (LR) is a linear classification approach used to estimate the probability occurrence of binary response based on one or more predictors and features. Support Vector Machine (SVM) model is a representation of the examples as points in a highly dimensional space utilized for classification, where the points of the separate categories are widely separated.

The new examples are then mapped into the same space and predicted to belong to a category based on which side of the gap they fall into. Random Forest (RF) is an ensemble of decision tree classifiers trained with the bagging method where a combination of learning models increases the overall result. Adaptive Boosting (AdaBoost) is an ensemble technique that can combine many weak classifiers into one strong classifier. It is widely used for binary class classification problems. Multilayer Perceptron (MLP) is a special case of the arti- ficial neural network often used for modelling complex rela- tionships between the input and output layers. Due to its multiple layers and non-linear activation it can distinguish the data that is not only non-linearly separableIn our study, we applied the MLP method and two hidden layers with 4 and 16 perceptuals to fix all features to ensure the consistency of the separation.

## RESULTS AND COMPARISON

For both tasks, tweet-level classification and user-level classification, we choose precision, recall & F-measure as performance measures. Precision and recall are selected instead of accuracy due to the data being imbalanced. Baseline experiments for tweet-level classification return an accuracy of 96.19% by classifying all samples as majority class, which is not a true reflection of classifier performance.

Precision is sensitive to data distribution, while loopback is not. The F scale combines accuracy and recall as a measure of rating effectiveness in terms of weighted importance over recall or accuracy. To measure performance, we

believe recall is somewhat more important to the task, and therefore we aim to achieve high recall. This can be justified by considering the problem we are trying to solve. In the context of depression detection, false positive (FP) is defined as a user who is expected to be depressed but who is not actually depressed.. A false negative (FN) is defined as a user who is almost actually in depression but is predicted to not have depression. A classifier detecting more false positives would result in lower precision, the cost in which that the state would need to invest more money to help users who are not actually depressed. On the other hand, a classifier detecting more false negatives would result lower recall, cost of which is that users suffering from depression will not get the help they need on time, which could lead to serious consequences, like suicide.

At the same time, we are trying to find the balance of precision and recall. A perfect recall of 1, with a very low precision (e.g., 0.2) may not be an acceptable outcomeIn such cases, we look at the F scale that combines accuracy and recall.In particular, we look at the precision, recall, and F-scale of the positive class, obtained on the test to set. The most straightforward classifier evaluation score is an accuracy defined as follows:

$$(1) \ Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

$$(2) \ Precision = \frac{TP}{TP + FP}$$

$$(3) \ Recall = \frac{TP}{TP + FN}$$

$$(4) \ F1 = \frac{2 \ x \ precision \ x \ recall}{Precision + recall}$$

**DATA VISUALIZATION:**

As per the experiment words in the tweet are classified as all words, positive words and depressive words. The following figures shows the classification of words in the tweets.

**ALL words:**

*Figure.5.1.all words*



**POSITIVE Words:**

*Figure.5.2 .positive words*

**Depressive Words:**



*Figure.5.3 .Depressive words*

### CONCULSION

In this research, we collected public Twitter data for BellLetsTalk campaign. From this dataset, we have identified 95 users who self-disclosed depression. From these 95 users, we have collected their tweets for the year 2020. Similarly we collected 2020 tweets for users who did not self-disclose depression, these are called control users. From both self- disclosed users and control users, we selected 30 users each who had between 100-300 tweets. Tweets from these 60 users where then hand-labeled by the 2 annotators for distress level (0-3). In addition the to tweets,e users themselves were also annotated as depressed" or not- depressed".

We performed experiments that create 2 classifiers: a tweet-level classifier that predicts whether a given tweet shows distress or not, and a user-level classifier which predicts whether a user suffers from disorder of sadness.The experiments used a variety of features and algorithms in order find combination that performs well for our tasks. The best tweet-level classifier obtained provides a recall of 0.80

with a precision of 0.12. This classifier was trained using SVM algorithm on data balanced using under sampling. It has 7 features including polarity word counts, depression word counts, and pronoun word counts. The best user-level classifier obtained provides a recall of (0.8750) with a precision of ( 0.7778). This classifier was trained using SVM algorithm on user data balanced using the SMOTE algorithm. It uses 10 features including polarity word counts, depression word counts, pronoun counts, depressed tweet count, total tweet count, and percentage of depressed tweets. It also relies on a rule to remove users who self-disclose depression but had less than 10% distress tweets in the order to improve performance.

The user-level classifier was further then tested on 100 users to provide aset of recall of 0.8182 and with the precision of 0.5714. Many of the misclassifications for this test set can be justified by looking at Annotator disagreements. In terms of contribution, we conclude that our user- level classifier can be used to find at-risk users from Twitter with a fairly high recall. Our tweet level classifier on the other hand is not very accurate. Its not suggested for labeling tweets, but can be used to under sample user tweets to discard a large chunk of irrelevant . Experiment also shows that using 116 features instead of 10 features did not have a significant effect on performance. .

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# I0T BASED HOME AUTOMATION CONTROLLED USING SENSORSAND MOBILE APPLICATION

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## ABSTRACT

*Abstract— The key idea of Internet of Things (IoT) requires the absolute connectivity of millions of different devices. In today's era, implementation of IoT based smart home has drawn a huge attraction and become a prominent area of research. Smart home is a house that uses different devices connected to the internet in order to enable the remote monitoring and management of the home appliances. Smart home technology, that is, Home Automation or domotics ("domus" means home in Latin), provides security to homeowners, comfort, convenience and energy efficiency by controlling them by using a mobile application or other networked device. We have built this Home Automation project with Arduino UNO controls the FAN, LED and lights connected to the Arduino through relays. The Arduino board is interfaced with a HC05 Bluetooth module to pair with a smart phone. Along with Fan and light control we used sensors like temperature (LM35), UV sensor, PIR sensors for other applications and we display the humidity, temperature and the distance using LCD Display.*

**Keywords:** *Proteous 8 professional, Arduino IDE, MIT app inventor, Arduino UNO, Sensors, LEDs*

## I INTRODUCTION

A home automation system is designed which can be controlled by a smartphone. The automation system connects with smart phone using Bluetooth. An user can control home appliances using mobile app via voice commands (built using MIT app inventor platform) using Bluetooth connection.

This project is built with Arduino UNO and it is used to control FAN, LED and lights connected to the Arduino through relays. The Arduino board is interfaced to an HC05 Bluetooth module to pair with the smart phone. Along with Fan and light control we used sensors like temperature (LM35), UV sensor, PIR sensors for other applications. The Proteus professional 8 is used to build this circuit and stimulated. An app called "Bluetooth terminal " is used in the mobile phone which will send text string to the device which is paired.

Another app named "Home automation" built to control the home appliances Fan and light through voice commands like turn on lights, turn off fan. The PIR sensor connected to Arduino UNO helps in detection of objects. Hence PIR sensor mostly used in security alarms and automatic lighting applications. The temperature sensor continuously monitors the room temperature that will be displays on the LCD. Hence it can be used to control the AC by using the concept that whenever the temperature crosses the certain limit the AC will turn on automatically otherwise it will be turned off. UV sensor used in automatic garage door opening, video doorbells etc.

## II SOFTWARES USED

### 1. Arduino IDE

Arduino IDE (Integrated Development Environment) is the open-source Integrated Development Environment which is used for uploading programs easily to a variety of Arduino boards, clones, and compatibles. An official software invented by Arduino.cc, which is used to write the code, compile it and can upload the code in the Arduino board. All Arduino modules are fusible with this software that is an open source and is readily made to install and

compile the code on the go.

### Key features of Arduino IDE

**Board Selection Option**- The users can choose which board they want to use for their applications. By simply clicking on the board manager, we can download the required board.

**Direct Sketching-** Arduino IDE allows user to use the built-in examples on various topics and also it provides examples from custom libraries as well. The process simple and straight forward.

**Project Documentation**- The sketch book option keeps the track of all the projects that are previously compiled.

Also allows modifying the code that are previously saved.

**Sketch Sharing**- Arduino IDE has this feature which allows us to share the sketch to our team mates/ other programmers. There will be a unique link for each sketch to share.

**External Hardware Support**- Arduino has the external hardware support in which third-party hardware can be connected.

**Integrated Libraries**- There are hundreds of libraries available in Arduino. We can download them anytime in the IDE.

### 2.Proteus 8 Professional

Proteus 8 Professional is a open source software which is used to simulate microprocessors, schematics and PCB designs. Proteus 8 also includes components such as FLOW PCB layout, ISIS schematic capture and VSM (Visual System Modelling). This software, usually used by Electronics Engineering Students and Electronics work, because this software has a more complete component database than other Electronics software. This software is used to draw schematics, code, layout of PCB and can also simulate the schematic. We can simulate our schematics and be more efficient in completing our task at hand.

Breadboarding, which is done with physical electronic components can also be done but when the circuit is big and complex, we might get confused. Creating a PCB and testing it consumes a lot of time and it even needs a lot of effort so instead of this we can use Proteus 8 Professional. In Proteus 8 Professional software one can draw schematics, PCB layout and also simulate the schematic/ PCB.

### Key features of proteus

**Schematic drawing-** To draw the schematic we can clock on 'pick devices' button and can select the component that we need to add. Drawing schematics is easy task to do in the Proteus software.

**Simulation-** There are two simulation options one is 'Run Simulator' using which we can run the simulation in normal speed this can be used only if the circuit is not heavy. Other one is 'Advance frame bt frame' option in which it advances to next frame and waits till you click the button again.

**Designing PCB-** Using proteus one can easily design any PCBs, we can make our own designs or even the proteus can do it for us. This is easy task, in designing we just have to drop/place the components in the schematic and just draw the traces on them.

**3D visualization-** In 3D visualization feature, it virtually creates a 3D model of the PCB.

**Bill of Materials:** This is Proteus professional's feature "Bill of materials". Here we have to specify the cost of the components that we used, then the software automatically generates list of the components used with their respective cost and the total cost of the schematic.

## III SYSTEM MODULES

**LED-** LED means Light emitting diodes, it is a semiconductor device. A diode is an electrical component which allows the current to flow only one way. Light emitting diodes glow when current flows through them. The Holes from p-type semiconductors recombine with electrons from n-type semiconductors to produce light.

**FAN-** Here a DC Motor is used for the fan. It is a electric device that converts electric

energy to mechanical energy. The speed and the torque depend upon the design of the dc motor.

**Arduino Uno-** The Arduino UNO contains the ATmega328P microcontroller chip to execute and perform the programmed instructions and the memory to store the data. The Arduino Board is powered with a USB Connection or a DC input power of 5V or 3.3V and the GND pin is to connect other devices.

### SENSORS

**Temperature Sensor-** The sensor that we have used here for measurement of the temperature is LM35DZ that has an operating range of about 0°C to 100°C and it outputs a 10mV for each degree rise in the temperature. The maximum output voltage is 1V. In this project, we have made it to measure the temperature and then display in the LCD display.

**Ultrasonic Sensor-** The ultrasonic sensor (HC-SR04), it calculated the distance by transmitting an ultrasonic sound wave and them it measures the time taken to receive the echo of the sound from the target. The frequency of this wave is about 40kHz, that is greater than the frequency range limit of the human hearing i.e, 20kHz. The distance (in cm) between the sensor and the target point is equal to half of its echo time (micro seconds) and multiplied by 0.0343 (speed of the sound ia assumed as 343m/s). The measurable range of the sensor is 2cm to 4cm.

**Infrared Sensor-** This sensor is used to emit and detect the infrared radiation. They can be used in obstacle detection such as robots like line follower robot. Another type is PIR Sensor, which only detects the infrared radiation and it does not emit the infrared radiation from the LED (which is in the sensor that emits the IR radiation in active type IR sensor) for example it can be used as motion detection like we used in this project. Human eye cannot see the Infrared light, the wavelength of IR is about 700 nm to 1000nm which is longer than the wavelength of visible light i.e., 400 nm to 700nm.

**Humidity Sensor-** The humidity sensor that we have used is DHT11, it measured between 20% to 90% of measurements of humidity which takes every second and with accuracy of ±5%. It also measures the Temperature of range between 0°C and 50°C with accuracy of ±2°C. The air is completely dry at 0% humidity and at 100% humidity, condensation occurs.

**Bluetooth communication-** The Bluetooth is a type of wireless communication technology in which the sender and receiver can send messages without the physical connection but through electromagnetic waves. Here, we have used Bluetooth communication between the mobile application and the Arduino UNO. The Bluetooth module used here is HC-05 module. This module meets all the application requirements. The range of this Bluetooth module is 10 meters, which is enough range to control the home appliances using the mobile phone application at home. The mobile phone should have the Bluetooth connectivity so that it can be paired with the Bluetooth module of the project.

The microcontroller ATmega328P is the core of the application, where all the information is centralized. This microcontroller is included in the Arduino UNO Board. Here, the code that is written in the Arduino IDE is executed continuously and it collects all the function modes, receiving the data through the mobile application, information/data from the sensors and governing all the actuators connected after processing all the data acquired.
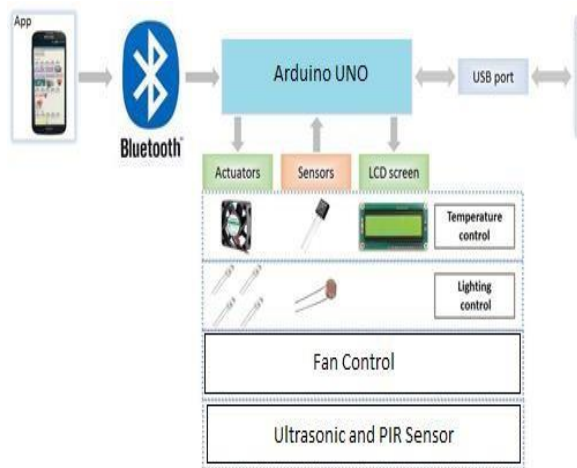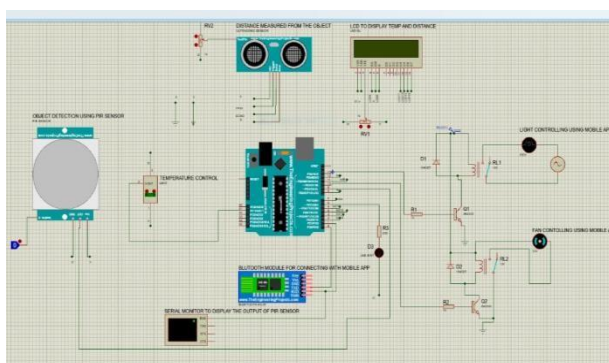
Figure 1: Block diagram of Home Automation



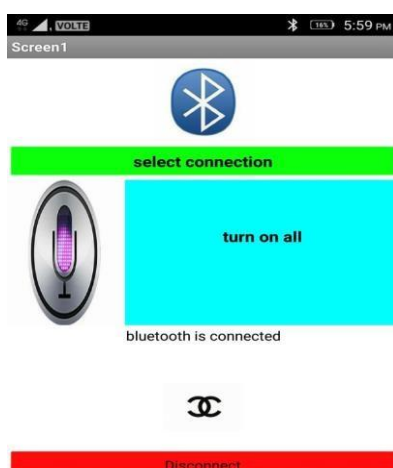Figure 2: Circuit diagram of Home automation inProteus 8



Figure 3: Mobile Application

The outcome of this project is that we can able to controlFan and Lights via mobile app

[1]   Neil Cameron, Arduino Applied mprehensive Projects for Everyday Electronics, Edinburgh UK, 2019

Along with PIR sensor is connected to Arduino to sense movement of people or their pets hence this sensor can be used in burglar alarms, automatically activated light system by sensing the motion of humans,public toilets and in many areas.

## EXPERIMENTAL RESULT

built using MIT app inventor (it has option to connect with the nearest devices). light system by sensing the motion of humans, public toilets and in many areas. The temperature sensor maintains room conditions and monitors temperature of the particular area.the ultrasonic sensor (HC05) measures distance from its position to an object. Hence used in radars,in making blind sticks, liquid level indication, automatic garage door opening and in security alarms. We also used LCD display the humidity, temperature and the distance measured.

## V CONCLUSION AND FUTURE WORK

Projected the basics of home automation using the arduino platform. We built wireless home automation project based on arduino using technologies such as Wi-Fi and Bluetooth.

Then we connect home automation project to the internet, this idea of connecting every object in your home to the internet is called IoT. We built temperature, humidity and PIR sensor and then we displayed the temperature and humidity values on the LCD Display, automated light and fan based on arduino and Bluetooth simulated using Proteus8 professional to understand the virtual functioning.in order to extend this work hardware implementation can de done for better analysis. Wireless coneection between mobile and laptop can be made using Wi-Fi, firebase and node MCU instead of Bluetooth.

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# DEFECTIVE COFFEE BEAN INSPECTION WITH GA BASED GANOPTIMIZER USING TENSOR FLOW

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## ABSTRACT

*Abstract— Coffee bean quality can be determined by several factors which includes texture, size and color. This evaluation is done by human inspector, but the decision-making capabilities of humans are subjected to external influence such as fatigue, environment, light, emotions, etc. In the process of production of green beans to packaging coffee bean, the defective bean removal stage is one of most labor-consuming stage to automate this task, in order to minimize human effort. We proposed a defective bean inspection using deep-learning with CNN classifier, together with an automated labeled data GAN-structured augmentation method to enhance the proposed scheme, so that the automation degree of defective bean detection is improved for coffee industries. We have also used SVM, KNN and Random Forest Classifiers to detect the defective beans. The experiment obtained the highest accuracy of 100% in training, Validation and Test results using CNN. Where the number of training images are 2670, the number of testing images are 334 and the number of validation images are 334. The Train, Test and Validation sets are divided into two classes: Good and Bad Coffee Beans. Each of the training data set was trained with 350 epochs. We have also obtained an accuracy of 97.6% using Support Vector Machine, an accuracy of 94.6% using K nearest Neighbors classification and an accuracy of 94.9% using Random Forest Classification.*

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*Keywords: Automatic defect inspection, machine learning, data augmentation, applied artificial intelligence, CNN, SVM, Random Forest Classification, GAN optimizer.*

## I INTRODUCTION

Coffee is world's popular and most extensively consumed beverage. Above two billion of coffee is used worldwide every day, this makes coffee as one of the most prevalent beverage products marketed in world-wide. Thus, coffee consumption and the urge for superior -standard coffee beans have been increasing over the years. The coffee bean undergoes a diligent procedure in order to reach a best quality. There are many parameters that affects the quality of coffee which includes harvesting and grown conditions of coffee beans and processes carried-out in the field. Diseases caused in coffee bean are mainly due to deficiencies in nutrients and protection provided is inadequate that in turn lowers the quality of coffee bean. Ripeness of coffee cherry is another factor that greatly affects the taste of coffee bean; hence the fully ripened coffee bean has to be hand-picked. The task of segregation of unripe or overripe fruits considerably affects the quality of coffee. Main

features in the selection process is done by taking account of physical appearance which include color, morphology (external appearance), shape and size of beans. Therefore, estimating the quality of coffee beans has become an salient issue for retail price, shelf-life and consumer demands.

Traditional data labeling was carried out in three listed ways namely:

"One-by-One labeling", in which the user takes snaps for an discrete bean and labels these pictures. User has to picture of bean individual and labels the picture individually. The coffee bean has to be picture in blank background with a specific position this may lead to imperfections in the practice. The second practice followed is named as "All-in-One" labelling in which the user takes the large amount of coffee bean and container and labels them one by one using the screen of monitor. The second method is less time consuming as compared to the previous one. The third way of labelling coffee bean is "batch labelling" in which the user considers

a least amount of coffee beans in a container and label them this process is done in creative manner in order to obtain the sufficient amount of coffee bean.

The one most common thing which can be noted in all three processes is that a large amount of time is required for labelling this might be a difficult process when it is done at industrial level, this problem led to the solution of developing a deep learning method.

The proposed deep-learning-based defective bean inspection with CNN/SVM/KNN/Random Forest classifier, in addition to this GANs are used to generate augmented data labelled images which reduces the cost of labour. Labelling the coffee beans is a labour consuming process. Sometimes labeling coffee bean becomes a difficult task as the shape and size of coffee bean is small this being when done with greater number may be a time-consuming process.

## II RELATED WORKS

Yung-Chien Chou, Ding-Chau wang et al. [1] proposed a "Deep-Learning-Based Defective Bean Inspection withGAN-Structured Au

tomated Labeled Data Augmentation in Coffee Industry" this method is used for enhancing the detection of defect coffee bean. The proposed scheme aims at providing a productive model to a deep-learning-based for object detection module to accurately identifying defects among dense beans. The proposed GAN-structured automated labeled data augmentation method is used to greatly reduce labour costs, since the labelling the data is the most labour consuming work.

Alberto Mario Ceballos-Arroyo et al. [2] proposed "Towards the recognition of non-defective coffee beans by means of digital image processing" These techniques are processed automatically. To build a prototype and images captured in controlled light conditions, the captured images is there estimated using HSI and YCbCr are colour space in order to separate the beans from the

background correctly. Threshold is applied on Cr channel of YCbCr space to classify the coffee beans into good and image aur beans an accuracies obtained about 83%.

I G A Gunadi, I P M K Artha et al. [3] proposed "Detection of coffee bean damage in the roasting process based on shape features analysis" in roasting coffee beans can be damaged and changes to the coffee beans. Some types of damage to coffee beans include, blackened seeds, partially blackened seeds, browned seeds, broken seeds, horned skin seeds, too young seeds,spotted seeds, and dirty seeds. The results of this study have the following accuracy values, at good coffee with a classification of good accuracy of 93.4%, while those at coffee with a bad classification of accuracy are 78.5%.

Edwin R.Arboleda et al.[4] proposed "An image processing technique for black bean identification" The coffee beans are classified based on the species they belong to, this is done automatically using imaging technique the main features which is taken into consideration are allergy such as perimeter equal and perimeter area of the beings percentage of roundness where tracked. In this paper we have considered about 60 testing images 195 training images. They have employed K-Nearest Neighbour algorithm in addition to capsule neural network automatically classify the coffee bean

Bhakthi Shetty, Disha Yeshwant et al. [5] proposed "Coffee bean detection and segregation" in this method the standard of coffee bean can be estimated by several factors including size, colour and texture. Here normal beans are found through the extraction of RGB color components of training image. The RGB values were integrated in an image processing technique. One of these is called the black beans which are result from harvesting immature cherries that falls gradually from the tree.

Ruifang Ye, Chai-Sheng pan, Ming Chang et al. [6] proposed "Intelligent defect classification system based on deep learning" In this paper and automatic optical inspection (AIO) is used in order to obtain the defective

bean images. The model is string using deep learning approach based on convolution neural network. Detailed features of coffee beans extracted such as quantity size settlement develop system.In this paper and automatic optical inspection (AIO) is used in order to obtain the defective bean images. The model is string using deep learning approach based on convolution neural network. Detailed features of coffee beans extracted such as quantity size settlement develop system.

Kuo-Yi Huang and Ya-Ting Tu [7] proposed "Development of novel auto classifying system based on machine vision" In this paper they developed novel machine-vision-based auto classifying system for pea berry (PB) and flat beans (FB) of coffee. In this paper system is developed to which has inlet outlet mechanism, software and machine hardware under control system for classifying coffee beans. Experimental results yield classification accuracy levels of 96.97% for PB and 95.22% for FB. In this study, 1486 PB and 1413 FB training samples were used to train the BPNN (back propagation neural network) classifier. The shape features of the coffee beans were obtained to establish a BPNN classifier.

Rayner H. Montes Condori et al. [8] proposed "Automatic classification of physical defects in green coffee beans using CGLCM and SVM" This physical ork is focused on the evaluation of physical coffee beans through a model of automatic classification of defects. The model uses a segmentation step that discriminates the background from the coffee bean image with a follow contours algorithm, then a CGLCM is introduced as features extractor and a Support Vector Machine for the classification task, a database of Images has been collected with a total of 3367 images, the classification process used twelve variety of defects, the results of an accuracy of 86% for classification.

### Generative Adversarial Network (GAN)

GANs have two neural networks which are generator and a discriminator. The first neural network is the generator, responsible of generating the output bean, while its adversary, the discriminator differentiates between real images and fake images. A discriminator model axe like a classifier. It learns how to classify the real and fake images hence it is known as classifier. Discriminator model takes X. Discriminative models take a set of features X, from these features determine a category they try to model the probability of class Y given a set of features X. Generator model learns how to make images that look realistic to some classes. Generator takes random input as a noise. The main target of generator is to generate images which has a set of X features that are similar to realistic image

### Genetic Algorithm (GA)

Genetic algorithm is a classical evolutionary algorithm, this generates random new ones by applying random changes on the current solutions. The process done to select the fittest chromosomes are Crossover, Mutation, Fitness function, Selection method. A fitness function is used in order to select the best individual. The quality of solution is the result of fitness function which represents a fitness value. Higher quality solution can be achieved when the fitness value is greater.

### III PROPOSED METHOD

We have done the classification using K-Nearest Neighbour, Support Vector Machine, Random Forest classification and Convolutional Neural Network

A **Support Vector Machine** (**SVM**) is machine learning model which uses supervised learning in order to classify the two groups of classification problem

**K-Nearest Neighbors (KNN)** is one of the uncomplicated algorithms used in machine learning for classification and regression problems. KNN algorithms use points in data

and classify new points of data based on measure of similarity (e.g., distance function). Classification is done by a majority vote to its neighbors.

**Random Forest** Classification is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in Machine Learning

A **Convolutional Neural Network (CNN)** uses artificial neural network used to process and recognise the pixel data.



Figure 1: Flow chart of the project

### Database

Database has a collection of coffee bean images about 3500 images of pixel 32*32. This dataset has variety of coffee bean of species Arabica and Robusta and contains both good and bad coffee beans.



Figure 2: Bad Beans



Figure 3: Good Beans

**Splitting the dataset**

When there is large amount of data and complexity in the module, this requires a large amount of time to train the model. This problem can be overcome by simply separating with training, testing and validation data. Split       train data into training and validation when using Image Data Generator. Keras comes bundled with many essential utility functions and classes to achieve all varieties of common tasks in your machine learning projects. One usually used class is the Image Data Generator: Image Data Generator generates the real-time data augmentation these images are in the batches of tensor data image. The data is split into testing dataset and training dataset to verify our model performance, the data is divided into train data and test data, where the train data is analyzed through different procedures and then finally estimated with the test data.

 **Data Augmentation Using GAN (Generator Adversarial Network)**

GANs are made up of two artificial neural network that works adversial to each other. The two neural network are generator and discriminator generator create the new data instance where discriminator estimates the authenticity of generated date.

**Evaluation Metrics**

**Accuracy:** Accuracy predict the percentage of true predicted value amongst the available

value. Accuracy is suitable only if the data set is symmetric in nature. Precision: precision is the ratio of positive value to all positive value.

**Recall:** Recall is the ratio of true positive to that of true positive together with false negative.

**F1 score:** F1 score is the harmonic mean between the accuracy and recall.

**Confusion matrix:** Confusion matrix determine the overall performance of the model. Confusion Matrix determines where the model has confused to make the prediction it also tells what type of error has the model incurred.

**Loss function:** Loss function is a mathematical measurement of the performance of the model. Loss function describes how good the model performance is.

**Binary Classification-** Binary classification loss function is used when solving a problem has only two classes. For example, prediction fraud in transaction of credit card, to detect whether transaction is either fraudulent or not.

**Binary Cross Entropy-** The Binary Cross entropy will estimate the cross-entropy loss function between the true class and the predicted classes. By default, the sum_over_batch_size reduction is used. This means that the loss will return the average of the per-sample losses in the batch.

**i) SGD Optimizer** - Stochastic Gradient Descent(SGD) updates the parameters performing optimisation algorithm on the each training examples. Stochastic gradient reduces the bigger dataset,by recomputing the same examples for each parameter is updated. The objective function in stochastic gradient fluctuates heavily because the frequency updates are done with high variance.

**ii) Adam Optimiser:** The full form of Adam optimizer is adaptive moment estimation this calculate the current gradient by using the past gradient for deep mathematics. Adam optimizer adds the past fraction gradient to the present gradient, hence we can conclude that it uses the concept of momentum

## Convolution Neural Network (CNN)

Convolution neural network has three layers input layer output layer and hidden layers, using these layers it converts complex object into patterns. The given input image is subsampled by using convolution and pooling processes, and then they are subjected for activation function this activation function partially connects the hidden layers, the last layer which is fully connected known as output layer. The input image dimension is retained in output image.
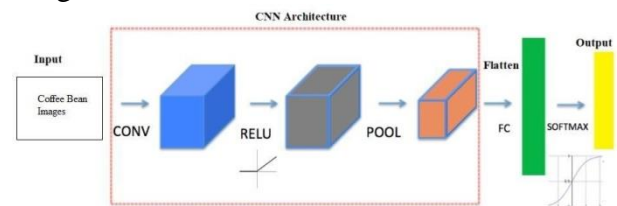


Figure 4: CNN Architecture

### Convolution

Convolution is a combination of 2 functions this shows how one function adjusts the other function. The three major processes done are input image, feature detector and feature map. Image being detected at the input is an input image 3x3 or 7x7 matrix is formed this is a feature detector feature detector is also known as filter or a kernel

### Apply the ReLu (Rectified Linear Unit)

The next step is rectified linear function which is done to increase the non-linearity in CNN network. This makes images to be nonlinear to each other. If this function is not applied then the images would be treated as on nonlinear one though it is of linear one.

### Pooling

Pooling is applied to detect the spatial features of an image which uses spatial invariance concept, this does not affect the neural network in order to detect the object in an image.

Majorly there are two types of cooling max-pooling and mini-pooling. Maximum pooling places the 2x2 matrix on the featured box that picks the largest value in the box, then the 2x2 matrix is moved from the left to right direction throughout the

feature map this leads to picking of the largest value in each of its pass**.**

### Batch normalization

It is used to maintain the activation standard close 1 and mean activation close to 0. The previous layers are activated in batch normalisation. Batch normalisation fights the internal covariate shift problem by normalising the input of each layer. The three steps followed during the training stages are:

- Mean and variance of input layer is calculated
- Previously calculated batch statistics is used to normalise the input layers.
- Scaling and shifting is done in order to obtain the output layer.

### Flattening

The other step after pooled feature map is flattening. Single column is obtained by converting the entire pool feature map and this is processed by feeding them into a neural network.

### Soft-Max Layer

Soft-max is applied to the last layer for activation purpose, that acts like a classifier. The classification process takes place by classifying them into distinct classes in each layer.

### Prediction of output

Keras provides registered callback to train the deep learning model. One of the common callbacks to train the deep learning model is history callback. This history callback records the training matrix for each epoch. The recordings will have accuracy and loss, accuracy for validation of data set etc. The matrix obtained is stored in form dictionary data structure which returns the history member when called.

### IV EXPERIMENTAL RESULTS

Detecting the Bad coffee beans accurately is important as one Bad bean can affect taste of 50 other beans. Using CNN model substantial improvement in accuracy of Coffee bean detection is found & it can classify the Good and Bad images accurately. The experiment was conducted on images of test data, training data and validation data using a different number of images and for 350 epochs in the training process.

The experiment obtained the highest accuracy of 100% Training, Validation and Test results. Where the section of training, test and validation set, where the number of training images are 2670, the number of testing images are 334 and the number of validation images are 334. The Train, Test and Validation sets are divided into two classes: Good and Bad Coffee Beans. Each of the training data set was trained with 350 epochs.

We have also obtained an accuracy of 97.6% using Support Vector Machine, an accuracy of 94.6% using K nearest Neighbors classification and an accuracy of 94.9% using Random Forest Classification.
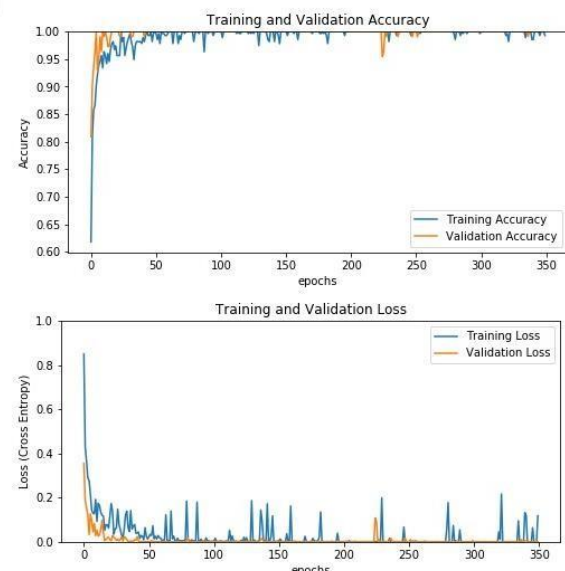


Figure 5: Plots for training and validation (Accuracy and Loss)

### V CONCLUSION

In this paper we have proposed a defective bean inspection using deep-learning with CNN classifier, together with an automated labeled data GAN-structured augmentation method for enhancing the proposed scheme This method will meet the industrial standards as the degree of automation to detect the defective bean is improved.

Our proposed scheme requires only a limited time from human for labelling the bean, this

can be a solution for industrial requirements. This project will consider the two main aspects, first is the proposed scheme meets the industrial standards as it reduces labour for labelling the coffee bean and second is it meets the SCAA standards at the same time. List of two advantages led to the achievement of automation engineering.

In our experiment we have collected images for test data, training data and validation data using a different number of images and for 350 epochs in the training process. The accuracy result was about 100% in training, Validation and Test results. We have also obtained an accuracy of 97.6% using Support Vector Machine, an accuracy of 94.6% using K-Nearest Neighbors classification and an accuracy of 94.9% using Random Forest Classification.

Current experimental results are mainly based on the loss function and accuracy. More statistical tests will provide thorough evidences to support the superior performance of the proposed scheme.

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# AN EFFICIENT IOT BASED COVID-19 MONITORING SYSTEM USING CNN CLASSIFIER

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## ABSTRACT

*As we are aware of the current pandemic situation that is Covid-19 which is spreadingall over the world.Corona virus spreads mainly by droplets produced as a result of coughing orsneezing of Covid-19 infected person, itcan also spread from contact withinfected surfacesor objects. Any person who comes into close contact with someone with Covid-19, is athighrisk ofbecoming infected themselves. As it is spreading widely it is difficult to get the report on required time, hence todetect Covid-19 "Positive or Negative" within 30minutes of time we are using anefficientIoT based Covid-19 Monitoring System Using CNN Classifier. In this process we are usingsensors such as heart rate sensor, temperature sensor, and respiratory sensor to collect datafrom a person and it is transmitted wirelessly with the help of Bluetooth module and to the Arduino uno. These data are being processed using MATLAB and CNNClassifier is used to predict the result whether it is "Positive or negative" based on this result, best accuracy and efficiency is achieved.*

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## I INTRODUCTION

Coronaviruses are the viruses that cause illness such as respiratory diseases or gastro-intestinal disease. COVID-19 spread has impacted the world in a captious way in the present situation. To reduce the effects of these, the feasible solution is to reduce the spread and isolate the infected person. To control and restrict the disease, the fine way is to monitor the Patients or people. The possible way is by using the latest technologies like Internet of things (IoT) as this technology helps in collecting, monitoring analyzing and managing the disease symptoms in remotely. It is seen that the wearable automations can monitor and predict the occurrence of COVID-19 using sensor devices such as heart rate sensor, temperature sensor, oxygen saturation, pulseoximeters and other sensors. In the world of modern healthcare technology, wearable automations play a vital role in diagnosis of covid-19 pandemic. Hence, it is necessary to take precautions to minimize both the risk of being sick and the transmission of the disease.

## II DETAILS OF LITERATURE SURVEY

Chanchal Raj, Chaman Jain and Wasim Arif presented [1], "Health monitoring and nous: An IoT based e-health care system for remote telemedicine," In this paper, they have designed A low-cost health sensor platform for rural health monitoring with convincing and secure interface between medical and remote centers for sharing of important medical parameters. In this implemented model they have developed separate interface for medical specialists and remote centers.

This proposed system methodology is based on a remote health telemedicine system consisting of a portable sensing unit containing of Pulse Oximeter, ECG, EMG, GSR, Body temperature and blood pressure that is allocated with the work of explains various medical data'slaterally with images of eye, tongue and area of influence of the patient's body.

In this paper the system can work in both online and offline mode. The data's are collected using an embedded architecture and stored in cloud infrastructure for rural areas

with incomplete or zero internet connectivity. The stored data can be used at any time later.

This system is tested under the supervision of medical man/woman for some patients and the results are fulfilled with 8 medical parameters along with live streaming also available. Data examination of some of the signals is also made.

[2] Kovuru Chandu Chowdary, K. Lokesh Krishna, K. Thejesh and K. Laluprasad proposed a paper with title "An Efficient Wireless Health Monitoring System" In this paper they have calculated and implemented with a low cost, transportable effective patient monitoring system that can transmit the dynamic signs of a patient in alternative situation continuously through a wireless communication network system.

In this system various sensors such as pulse sensors, temperature sensors, blood pressure and fingerprint are connected with the microcontroller for measuring the physical parameters of a patient. These are interfaced to a sensor node through GSM module for wireless transmission. Raspberry-pi is used as sensor node since it has better structuresassociated to the other microcontrollers. The developed system includes hardwares such as Raspberry-pi 3 model A, blood pressure sensor, temperature sensor, pulse-oximeters and GSM module.

This proposed health monitoring system guides and signals in real time about the oscillations of important parameters about the critical patients and the changes in surrounding parameters. In this system the patient's physiological signals are acquired by the various sensors attached on the patient body and are then transmitted to the base station and PC/ Laptop/Smartphone storing and analyzing. The created equipment model was tried effectively on four patient's and the readings have been observed on the presentation. The fundamental benefit of the framework is the decrease of the mediation season of the patient in any crisis likewise it is of minimal expense and saves lives in basic consideration and crisis circumstances.

Subsequently, this framework makes the human's day by day life loose and more agreeable.

[3] Dr.Abraham Chandy "A Review on IoT based medical imaging technology for healthcare applications" The primary point of this paper is to expound the audit of consolidating web of things with the clinical imaging hardware's for simple sharing of the pictures over the web bring about more precise determination and the treatment progressively. The principle point of this paper is to expand the survey of fusing web of things with the clinical imaging gear's for simple sharing of the pictures over the web bring about more precise determination and the treatment progressively.

The paper presents the IoT in clinical imaging would upgrade the nature of administration and lessen the expense for the assistance alongside the abatement in the vexation and the time utilization for the conclusion of an illness. The legitimate plan with the ideal administration, pressure and the encryption calculations would make the IoT empowered clinical field proficient and fruitful.

[4] Fan Wu and Mehmet Rasit Yuce "Design and Implementation of a Wearable Sensor Network System for IoT- Connected Safety and Health Applications" This paper presents a wearable sensor network framework for web of things associated for wellbeing and wellbeing applications. This proposed network framework joins various wearable sensors to screen natural and physiological boundaries. The wearable sensor on various subjects can speak with one another and send the information to a passage network which shapes a heterogeneous iot stage with Bluetooth-based clinical sign detecting organization.

In this paper it is anticipated that there will be 26 to 50 billion internet associated gadgets by 2020 and 100 billion by 2030. IoT can upgrade execution of remote sensor organizations (WSN's) particularly in ecological observing and medical care applications. Wearable body region

boundaries (WBAN) is a unique reason WSN that is for the most part utilized in medical care conditions to screen physiological sign that can work on the nature of the life. The work screens temperature, dampness, ultraviolent for security applications.

The framework can screen both physiological ecological information shaping an organization from wearable sensors appended to the specialists body and give priceless data to the framework administrator and laborers for security and wellbeing checking.

[5] Neel Kamal and Parasul Ghosal "Three Tier Architecture for IoT Driven Health Monitoring System Using Raspberry Pi" this paper utilizes a three-level design that can be for the most part applied to WSN based medical services framework. This model screens the patient internal heat level, heartbeat, and body position developments continually. The system furthermore gives emergency cautioning to a trained professional and sense the data on a web worker.

This carried out framework model uses raspberry pi that is driven by web of things associated through various sensors DS18B20, ADX1345, ADC1015, and heartbeat sensor. The structure uses DS18B20, heartbeat sensor and accelerometer.

The framework is planned gotten by giving a system to confirm the client to gain admittance to patient information. This paper gives the subtleties of a proposed framework productive to ceaselessly screen the patient. It gives ongoing checking of the patient. The created framework is strong and conservative. In this paper the framework gives help that remembers mechanization for orderly checking of patients, transmission of clinical information at constant, additionally these information are put away in information base and utilized for sometime later.

This framework works in two modes for example the mode relies on number of tests gathered that is 50 examples (quick mode)

and 200 examples (high exactness mode). This framework comprises of three level structures. The level one comprises of wired senor network that have low force utilization to gather different examples of patient. Level two comprises of handling unit that incorporates preparing model, probabilistic model and choice model. Level three comprises of website page for far off access for patient condition.

This framework is effective to produce various examples in various modes for example quick mode (50 examples) and accuracy mode (200 examples). The framework gives consistent checking and makes successful moves through regulators. The created framework is hearty, and it is feasible to create for an unbelievably minimal price. Likewise, this framework gives financially savvy and continuous checking of an individual.

[6] D. Shiva Rama Krishnan, Subhash Chand Gupta and Thanu Priya Choudhury "An IoT Based Patient Health Monitoring System" this proposed paper is for uncommonly checking the advanced age patients and illuminating specialists. They have proposed an inventive task to evade abrupt demise rates by utilizing patient wellbeing checking that uses sensor technology and uses internet to communicate.

This framework utilizes temperature sensor and heartbeat sensor for following patient's wellbeing. Both the sensors are associated with the Arduino-uno. To follow the patient wellbeing miniature regulator is interfaced to a LCD show and wi-fi association with send the information to webserver (remote detecting hub). This framework shows patients temperature and heartbeat followed live information with timestamps over the internetwork.

In this paper an Arduino Uno with Atmega regulator is related with the sensors, the sensors which are related are temperature sensor, Bpm sensor, heart beat sensor. These sensors are put on human body which screens the prosperity condition without upsetting the

step by step schedule of the patient and prosperity noticing system involves sensors, microcontroller.
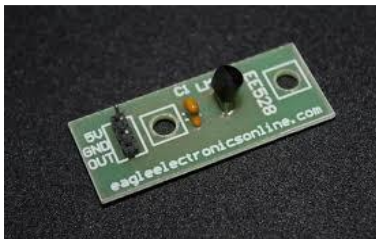
In this paper the use for miniature regulator will be in each field. Those miniature regulator AT89S51 (8051) is used for development of a heartbeat checking system. A headed and photo opposition, individual camwood recognizes heart-beats, these basic energies would be more changed by an employable enhancer LM3518, it needs two developed Operational Amplifiers.

The wellbeing observing framework takes not exactly a moment to register. Time cost confusion is decreased, memory put away increments. The wellbeing related information and data of the patients will be handily gotten to on specialist's cell phone. In this way, patient wellbeing checking framework dependent on IoT utilizes web to viably screen patient wellbeing.

## III METHODOLOGY

Infection with the virus causing COVID-19 (SAR-COV-2) is confirmed by the presence of viral RNA detected by molecular testing, usually RT-PCR. Factors that control transmission risk include whether a virus is still replication-competent, whether the patient has symptoms such as a cough, which can spread infectious droplets, and the behavior and environmental factors associated with the infected individual. Usually, it takes 3-5 days to get the tested report. Hence, we are using COVID-19 monitoring system, to detect whether the person is infected with COVID-19 "Positive or Negative" using a CNN Classifier.

### 1. Proposed system workflow
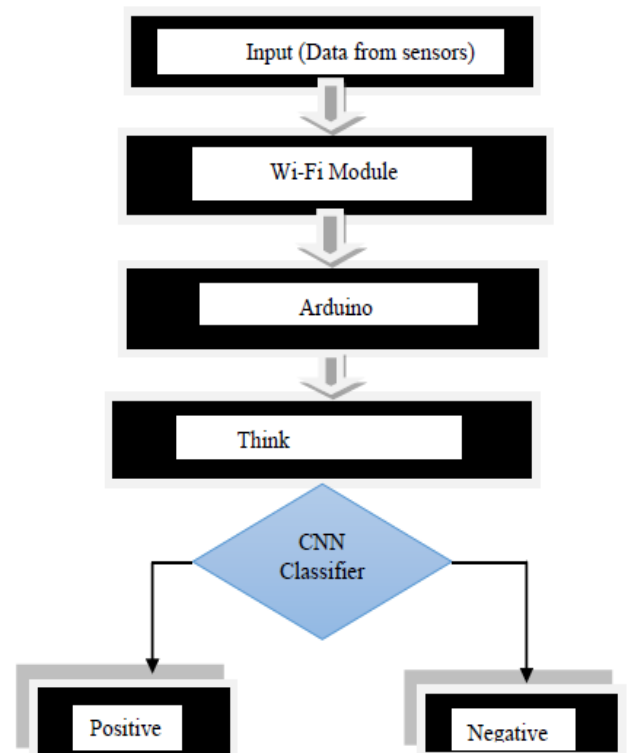


*Fig: Workflow diagram*

## 2. System block diagram
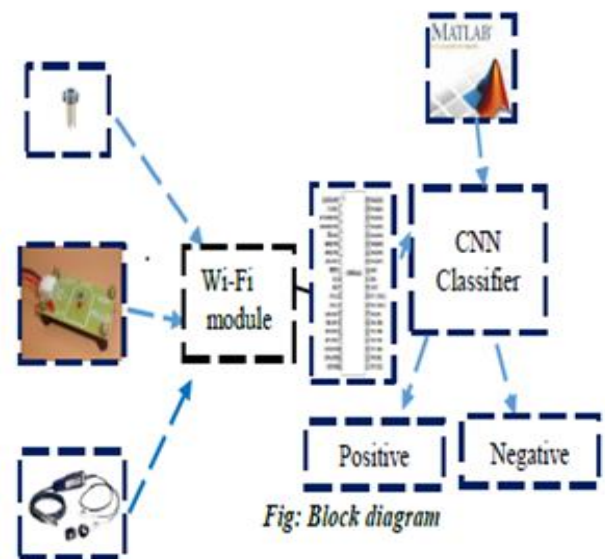


*Fig: Block diagram*

### 1. Temperature sensor:

*Fig Temperature sensor*

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. Temperature sensors are used in automobiles, medical devices,

computers, cooking appliances, and other types of machinery.

### 2. Heart rate sensor

Heart rate is a window into your muscles and lungs as it reveals how hard they are working. Heart rate can be measured in different ways. Two of the most common techniques are electrical and optical methods, the latter is more cost effective and convenient.

### 3. Matlab

MATLAB is a superior language for specialized figuring. It coordinates calculation, representation, and programming in a simple to-utilize climate where issues and arrangement are communicated in recognizable numerical documentation. A matlab open source think talk can be utilized.

### 4. CNN Classifier

A convolutional Neural Network (CNN) is a multi-layered neural network with a special architecture to detect complex features in data. CNNs have been used in image recognition, powering vision in robots, and for self-driving vehicles.

### IV IMPLEMENTION

Circuit diagram of covid-19 monitoring system: This is the simple block diagram that explains covid-19 monitoring system using wi-fi module and Arduino.
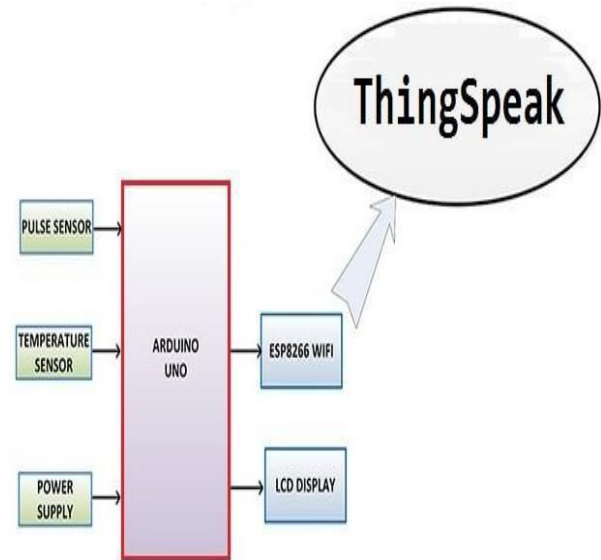


*Fig: Basic block diagram*

### Circuit diagram

The circuit diagram of covid-19 monitoring system as shown in above figure consist of sensors like temperature, heart rate and respiratory sensor, Arduino board, wi-fi module (ESP8266). ESP8266 wi-fi module connects the wi-fi and sends the data to IoT server. The IoT server used here is Think speak, the data can be monitored from any part of the world by login into the Think speak channel.

### RESULT

The Hardware circuit of the system with the required output is shown in the figure.
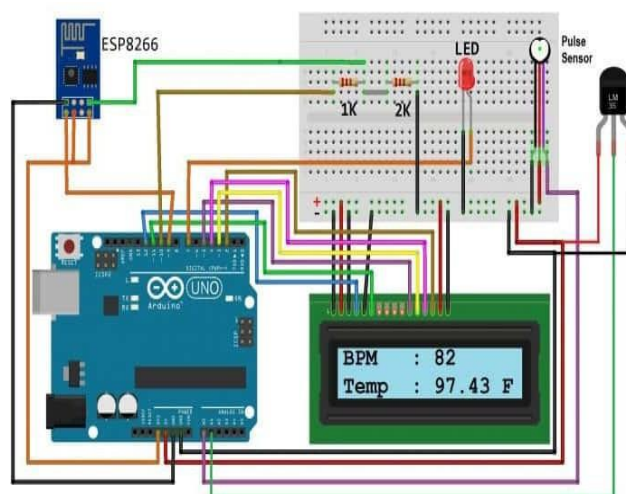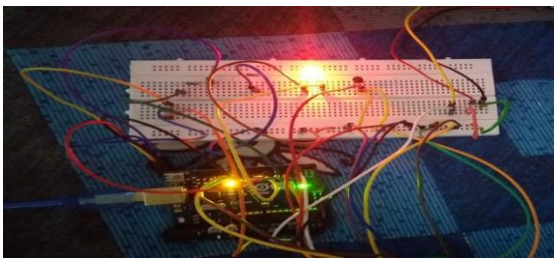
*Fig: Hardware circuit of the system*

## Characteristics of the patient in the COVID-19 non-COVID-19 groups.

|  | Non-COVID | COVID | p-value |
|---|---|---|---|
| Gender | 13(female) | 15(female) | 0.873 |
| Age(years) | 59.9±19.8 | 59.5±14.4 | 0.919 |
| Body temperature | 37±1 | 39±9 | 0.328 |
| Oxygen saturation (%) | 86±8 | 87±10 | 0.426 |
| Shortness of breath | 9(no) | 9(no) | 0.804 |
| Cough severity | 2(low) 4(high) | 7(low) 16(high) | <0.001 |
| Chronic respiratory disease | 18(n0) | 27(no) | 0.079 |

The output graph of the body temperature and the heartrate sensor in the Matlab is shown.



*Fig Graph of heartrate*



*Fig: Graph of Temperature*

## Conclusion

The aim of this system to collect real-time symptom data through a set of wearable sensors on the user's body. The most relevant COVID-19 symptoms were identified, based on a real COVID-19 patient dataset. These identified symptoms were: Fever, Fatigue and other symptoms like Cough, Sore Throat and Shortness of Breath.

There are several biosensors available to detect these symptoms. For instance, temperature-based sensors can be used for the detection of Fever.In future work Cough and its classifications for different ages can be detected using audio-based sensors with acoustic and aerodynamic models. Motion based sensors can be used to detect Fatigue, Sore throat can be detected using image-based classification.

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# A DEEP LEARNING TECHNIQUE FOR IMAGE BASED PLANT DISEASE DETECTION

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## ABSTRACT

*Plant infections are a significant danger to food security, however their quick identification is difficult in many parts of the world because of the absence of the important framework. Easily spreadable infections can contrarily affect plant yields and even annihilate entire harvests. That is the reason early disease diagnosis and anticipation are of extremely high significance. Conventional strategies depend on lab examination and human expertise which are typically costly and inaccessible in a large part of the undeveloped world. In this paper, we have created a deep neural network (DNN) model based on state-of-the-art modelling and solution techniques. Initially a public dataset of images of diseased and healthy plant leaves were gathered under controlled conditions and then trained using deep convolutional neural network to distinguish crop species and diseases. The trained model achieves an accuracy of 99.35% on a held-out test set, showing the attainability of this methodology.*

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**Keywords:** *Plant Disease, Convolutional Neural Network, Deep Learning, Detection.*

## Introduction

Present day innovations have enabled human society to deliver sufficient food to fulfil the need of more than 7 billion people. In any case, food security stays endangered by various factors like diseases in plants, decrease in the pollinators and others. Plant diseases are not just a danger to food security at the worldwide scale, but it also affects the farmers whose occupations reply upon healthy crop yield. 80 percent of the agricultural production is from smallholder farmers out of which 50% are diseased due to pests. Besides, the biggest part of hungry people (50%) lives in smallholder cultivating families, many of the crop will be pathogen-derived causes disruptions in food supply. Number of efforts are being applied to stop crop loss due to disease.

To reduce the crop loss Integrated pest management (IPM) has supplemented the application of pesticides in the past decade. Independent of the approach, identifying a disease correctly at the initial stage is a very important task, many agricultural extension organizations or other institutions, such as local plant clinics has also extended support in this regard.

Due to the rapid usage of technology with Internet and mobile phones online diagnosis of disease is supported. Many recent advances have been based on approaches such as Computer vision, and object recognition. With the development of Large-Scale Visual Recognition Challenge (ILSVRC) based on the Image Net dataset (Deng et al., 2009) in **recent** years has become benchmarks for numerous visualization-related problems in computer vision, including object classification.

In 2012, a large, deep convolutional neural network was designed to classify images of 1000 categories with an error of 16.4%. In the subsequent 3 years, many advancements in deep convolutional neural networks reduced the error rate to 3.57%. Training a huge neural network is a tedious work, but these trained models very quickly classify the images and made available on smart phones for consumers in order to diagnosis the disease.

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DNN finds its application in many varied domains and thus forms end to end learning. The neural networks provide a bridge between an input that is image of a diseased plant to an output that is crop disease detection in this paper. In between the input layer and output layer there are intermediate layers that performs processing of numerical inputs taken by nodes. The DNN maps the input layer to the output layer with a series of stacked layers of nodes. DNN must be designed in such a way that nodes and the weights assigned to it must correctly map the input to the output. This mapping process must improve during the training process.

We utilize Deep learning Technique where Deep neural networks fit to the class of representation learning models that can find the underlying representation of data without handcrafted input of features. Deep neural networks have various stacked non-linear layers which alter the raw input data into higher and more abstract representation at each stacked layer. Accordingly, as the network grows deeper more unpredictable highlights are separated which add to the higher precision of results.

### Work Accompanying to this

### Haralick, Robert M, Karthikeyan Shanmugam, and Its' HakDinstein

Proposed a combination of sensory analysis and image processing, for establishing features of visual data. Later it describes, in a generic approach of visual inspection, how characterize aesthetic anomalies with a new approach of texture-based features. An anomaly is defined as a deviation that should not exist. Note a defect is a non-compliant anomaly. And the authors used a region approach of image processing, which consists of two classes of aesthetic anomalies.

### Cortes, Corinna, and Vladimir Vapnik

Proposed the network based on Support vector machine. The support-vector network is another machine learning algorithm used for classification problems. Furthermore, the machine theoretically carries out the accompanying thought: input vectors are non - linearly mapped to a very high dimension feature space in which decision surface is constructed. The key idea behind the Support vector machine was applied for limited situation where the training data is separated without errors, this can further be applied to non-separable training data.

### Duan, Kai-Bo, and S. Sathiya Keerthi

Proposed an experimental proof to show that these techniques are inferior compared to another versus one strategy: one that utilizes Platt's posterior probabilities along with the pairwise coupling thought of Hastie and Tibshirani. The proof is especially solid when the preparation dataset is insufficient.

### Deng, Jia

introduced new data set called "ImageNet", an enormous scope philosophy of pictures based upon the foundation of the WordNet structure. ImageNet expects to populate most of the 80,000 synsets of WordNet with a normal of 500-1000 spotless and full resolution images. This will bring about huge number of clarified pictures coordinated by the semantic hierarchy of WordNet, 12 subtrees with 5247 synsets and 3.2 million images in total are proposed in ImageNet. Deng, Jia introduced that ImageNet is a lot bigger in scale and variety and considerably more precise than the current Image datasets, developing such huge data is a difficult task. The authors also portray the scheme in which data is collected with Amazon Mechanical Turk and also demonstrated the utility of ImageNet via three applications in object recognition, image classification and automatic object clustering.

### Szegedy, Christian

projected new idea on deep convolutional neural network architecture for classification and detection in the Image Net i, e in Large Scale Visual Recognition Challenge 2014 (ILSVRC14). The main agenda of this architecture is to get improved utilization of the computing resources inside the network.

In order to improve the quality, depth and width of the network by keeping the computational spending consistent. Further upgrading can be based on the Hebbian guideline and the instinct of multi-scale handling. One specific manifestation utilized in our accommodation for ILSVRC14 is called Google Net, a 22 layers deep network, the nature of which is evaluated with regards to classification and detection.

## Methodological Approach

System design thought as the application of theory of the systems for the development of the project. System design defines the architecture, data flow, use case, class, sequence and activity diagrams of the project development.

## A. SYSTEM ARCHITECTURE OF DL DISEASE IDENTIFICATION METHOD (CNN)

This architecture diagram illustrates how the system is built and is the basic construction of the software method. Creations of such structures and documentation of these structures is the main responsible of software architecture.
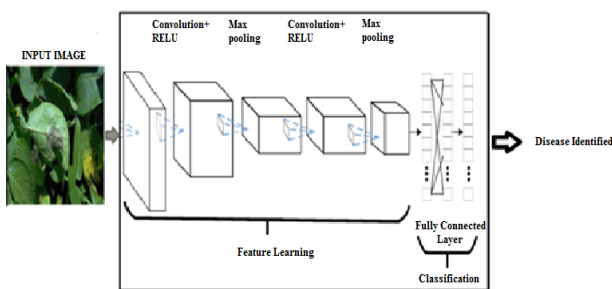


**Figure 1: Architecture Diagram of Proposed Plant Disease Detection DL System**
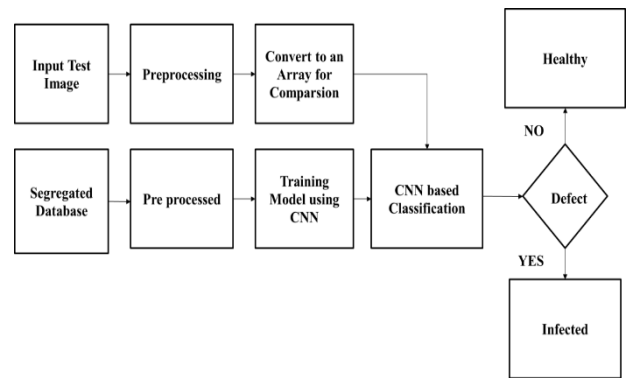


**Figure 2: Data Flow Diagram**

Main Steps to build an architecture in proposed system are:

The first layer in the proposed system is the Convolution layer.

Convolution layer: The Convolution layer is responsible for extracting the feature from the input image and learns the relation between each of the features using kernel or filters with input images.

Relu Layer: RELU is Rectified Linear Unit for a non-linear operation. The output of Relu layer is $f(x) = max (0, x)$. We utilize this on the grounds that to acquaint the non-linearity with CNN.

Pooling Layer: it is utilized to lessen the number of parameters needed for down sampling and hold only the important data needed for further processing. There are different types of Pooling layer like:

- Maximum Pool

- Minimum Pool

- Average Pool

- Adaptive Pool

We have chosen Maximum and Average Pooling. The final stage of the proposed system is Flattening and fully-connected layers.

Flattening: It is the process of converting our whole matrix into 1-dimensional array like a vertical one and is passed to the input layer.

Fully Connected Layer: The flatten vector is passed to input layer, all these features are combined to create a model. At last, there will be an activation function such as soft max or sigmoid to classify the outputs.

## B. SEQUENCE DIAGRAM

A sequence diagram it is a type of communicative diagram which demonstrates how the techniques or processes work with each other and also gives the information about in which order they are working. Sequence diagram, it develops communication arrangement graph. These figures some time named occasion situations, What's more scheduling figures.
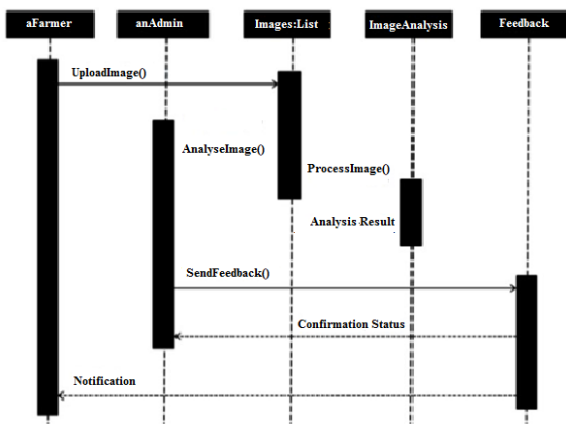


**Figure 3: Sequence diagram of proposed deep learning system**

## C. DATA FLOW DIAGRAM

Data flow diagram also referred as bubble graph. This diagram is useful for representing the system for all degree of constructions. The figure is differentiated into parts which show maximizing data path &practical aspect.

## D. FLOWCHART

A flow chart represents the picture of step by step of the proposed system.
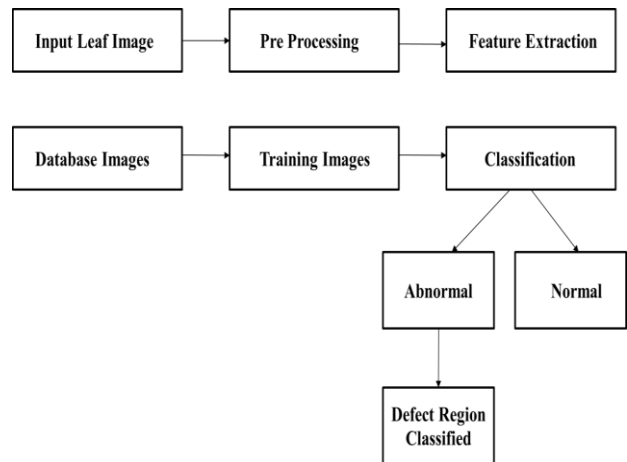


**Figure 4: Flow chart of our proposed system**

The input leaf image is taken from the database and it is pre - processed. In pre – processing the image is resized and unwanted noise is removed by filtering. After pre – processing feature extraction is done from the plant leaf image. The segregated data images are trained using Convolution neural network and further performs classification indicating whether there is plant disease or not. If the plant is defected, those regions will be classified as abnormal. If the plant is not affected then it is considered to be normal.

### Working

Implementation is the process of carrying out any process, or practice of an arrangement, a strategy, or any plan, thought, model, determination, standard or strategy for accomplishing something.

Steps involved in implementation are Image is acquired from the database and is split into train and test data and is pre-processed such as Image reshaping, resizing and conversion to get an array form. The same procedure of image pre-processing is also applied on test image. A data set comprising of various plant species is obtained, out of which any image can be utilized as a test image for the software.

The training dataset trains the CNN model which helps in identifying whether the test image is infected with disease or not. CNN has various layers that are the Dense, Dropout, Activation of Rectified Linear (Relu), Flatten, Convolution2D, MaxPooling2D. After the creation of trained model, which will be able to identify the disease if the plant species is contained in the dataset. Finally, comparison of the test image and trained image is performed to predict about the disease.

**Image Acquisition:** Image Acquisition is performed on both training and testing steps. In order to perform training Image is taken from database and for testing a real time image is taken from camera, here the images are been collected from the mobile, that image will be brought by android application and sent through java web services for example tomcat server to server-side framework on which pre-preparing is performed and next on test model on specific image.



**Figure 5: Sample images of leaves from dataset**

**Image Pre-Processing:** Image pre-processing is performed before performing testing the image. Thus, the paper proposes the image is scaled or resized into 150 x 150 dimensions. The colour image is utilised so there is no need of any colour conversion techniques and thus the pre-processed image is passed to model for training and testing.

**Convolution Layer:** Convolution is the primary layer in the proposed system which extract features from an input real time image. The Convolution Layer saves the connection between pixels by learning image features

utilizing little squares of input data. It is a numerical activity that takes two data sources, for example image matrix and a filter or kernel.
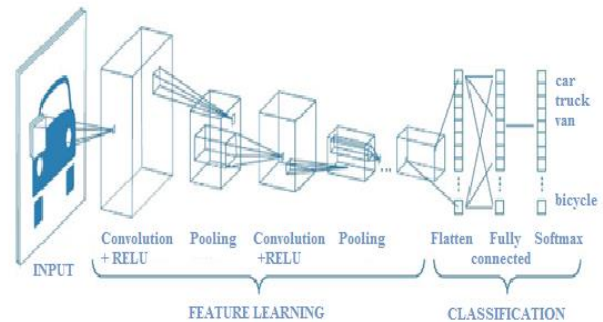


**Figure 6: Neural network with many convolutional layers**

i. An image matrix(volume) of measurement $(h * w * d)$

ii. A filter $(f_h * f_w * d)$

iii. Yields a volume measurement $(h - f_h + 1) * (w - f_w + 1) * 1$
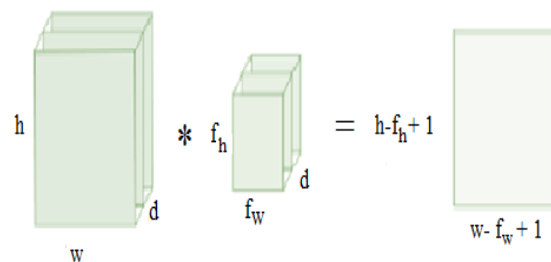


**Figure7 : Image matrix multiplies kernel or filter matrix**

**Strides:** Strides indicates the quantity of pixels shifts over the input matrix. At the point when the stride is 1 then we move the filters to 1 pixel at a time. At the point when the stride is 2 then we move the filters to 2 pixels all at once, etc. The figure below shows the convolution work with a stride of 2.
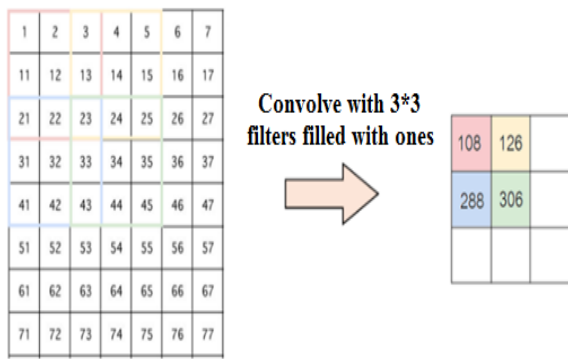
**Figure 8: Stride of 2 pixels**

**Padding:** Padding: The input image is not fit perfectly with some filters thus we have two choices to perform this task.

i. Pad the image with zeros (zero-cushioning) so it fits

ii. Eliminate the part of the image where the filter did not fit. This is called legitimate padding which keeps just substantial piece of the image

**Pooling layer** Pooling layers segment would lessen the quantity of parameters when the images are excessively huge. Spatial pooling additionally called sub sampling or down sampling which decreases the dimensionality of each guide yet holds significant data.

**Fully Connected Layer**: The Fully Connected Layer is a feed forward neural network. It is also called as FC layer, here we smoothed our matrix into vector and then feed it into a fully connected layer like a neural network.
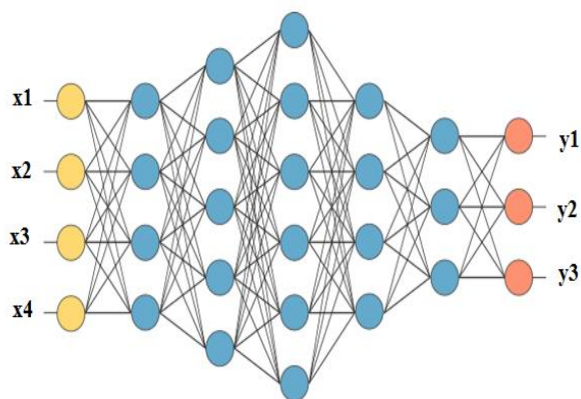


**Figure 9: Flattened FC layer**

In the above diagram of Flattened FC layer, the feature map matrix will be converted as vector

of x1, x2, x3 etc. These features are combined with the fully connected layers in order to create a model. At last, the activation function like soft max or sigmoid is utilised to classify the outputs as cat, dog, car, truck etc.
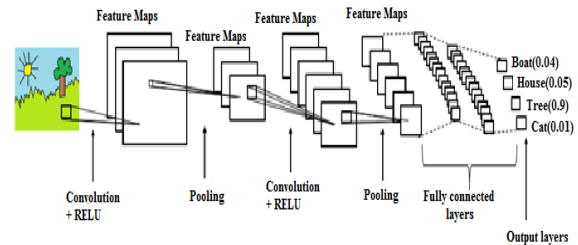


**Figure 10: Complete CNN Design**

### EXPERIMENTATION

Software testing helps in execution of a software component or systems component which in turn assess at least one properties of interest. As a rule, these properties show the degree to which the component or system under test:

i. Meets the necessities that directed its plan and improvement,

ii. Responds accurately to a wide range of data inputs,

iii. Performs its capacities inside a satisfactory time,

iv. Executes its functions and is adequately usable,

v. It can be introduced and run in its planned surroundings, and

vi. Achieves the overall outcome its stakeholder's desire.

The testing steps are:

i. Unit Testing.
ii. Integration Testing.
iii. Validation Testing.
iv. Output Testing

**Unit Testing:** Unit testing is a software development process, where the developer writes a small piece of logical code for each unit to meet its design and behaves as intended.

The process involves the synchronized application of wide range of defect prevention and detection techniques to reduce software development risks, time, and costs.

**Integration Testing:** Integration Testing is one of the phases in software testing which attempts to find defects in the interfaces and interaction between integrated components. Logically larger groups of tested software components relating to components of the architectural design are integrated and tested until the software works as a system.

**Validation Testing:** Validation testing works to choose file option and views messages. It is user convenience to access the images stored and submit is given. Different folders where images are stored can be uploaded and details of disease are displayed.

## RESULTS AND DISCUSSION
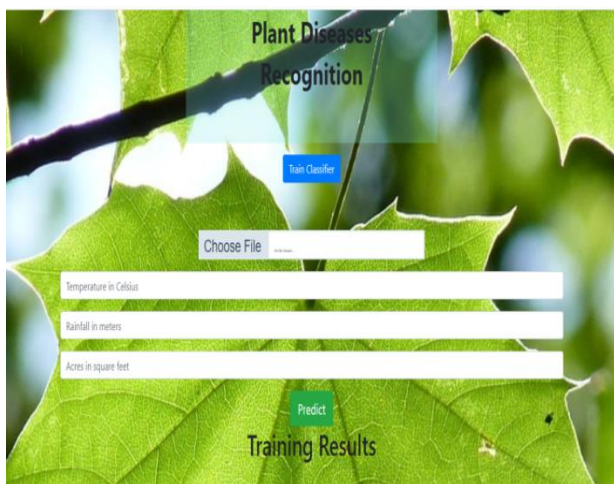


**Figure 11: Home page of proposed system**

The main page of front end frame work of proposed system. We have Train Classifier button to raining the model with new datasets. Also we have provided choosing the images for testing. Once we choose the image by clicking predict button it will predict the uploaded image results. We provided three separate fields for giving inputs for crop yield prediction parameters which are temperature in celsius, rainfall in meters and acres of land in square feet.

## Training Results

The model training and testing accuracy and loss in the two different graphs respectively.
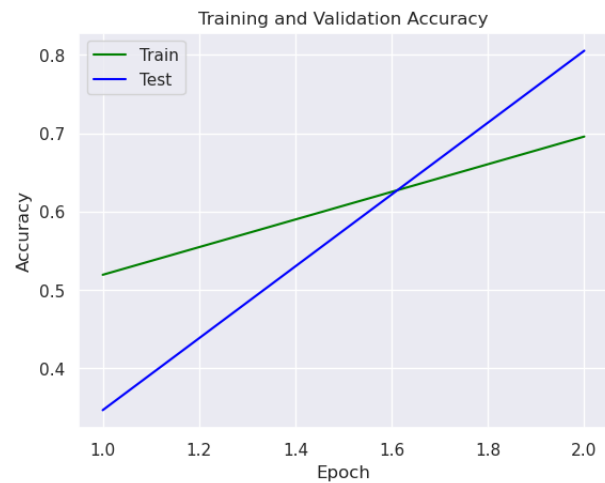


**Figure 12: Model training and validation accuracy**

The above plot of Model training and validation accuracy indicates that the model could be trained more as there is a rise in accuracy on both the dataset for the last few epochs. We can likewise see that the model has not yet over-took in the training dataset showing comparable ability on both datasets.



**Figure 13: Model training and validation loss**

The above plot of Model training and validation loss, indicates that the model has comparable performance on both train and validation datasets. when these parallel plots start to depart then there is a necessity to stop training at an earlier epoch.

## CONCLUSION

The identification of plant disease at the earlier stage is one of the important tasks. A diseased plant reduces the yield in agriculture. Every year the loss due to various plant disease is the challenging task to deal with, which must be solved in agriculture production. The early detection of plant disease with proper segmentation of affected part on variety of plant family is an open area of research. A satisfactory accuracy is achieved with the model created. The model can be created by considering variety of plant species and thus train the model to detect different plant diseases. There are many approaches to detect plant disease but these approaches can be further improved to get better accuracy in plant disease detection. From the various approaches discussed in the above section, K-means clustering method for segmentation is widely used by most of the researchers.

In order to perform classification and feature extraction, SVM classifier was found to give better performance accuracy in comparison to others. A Deep Neural Network with FC layer helped in creating a model and detecting the disease of the plant. Various other parameters like temperature, rainfall , area of land can also be considered to predict yield of the plant.

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# DEEP LEARNING FOR RECOGNIZING HUMAN ACTIVITIESUSING MOTIONS OF SKELETON JOINTS

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## ABSTRACT

*Advance in the consumer electronics the demand has been increased for the greater granularity into differentiating and analysing the human daily activities. As a further matter, the potential of a machine learning especially deep learning, has become apparent as research proceed in application such as monitoring the old age people to detect form the surveillances camera, and the detection of suspicious people and objects left in the public places. Even though some multiple implementation techniques have been made to the count of development for human action recognition (HAR) by using wearable sensors, hence these devices can be placed unwanted physical discomfort on the people, In general for the kids and the old age people. Therefore, the researchers have been focused on an image-based HAR, most importantly for improvement for consumer electronics.*

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*Keywords: Human Action Recognition, skeleton joints, TensorFlow, RJI, Deep convolution neural networks, Deep Learning are some of the terms used in this paper.*

## Introduction

Human action recognition from the video sequences is a difficult in scientific field, and is elemental to a different various applications and it detect problem in computer vision technology, and is fundamental to variety of applications in many different research areas, such as academia, security, industry and consumer electronics. Among these are HAR system used in the video camera surveillance, consumer behavior alienises, and smart, in-home health-care monitoring system for the physically challenged people.

HAR is an important research because a lot of potential accidents can be avoided by recognizing and predicting the activities of human being. On other hand, resend advances in imaging technologies for consumer electronics, namely consumer depth sensors, have drawn a high amount of awareness from researches in developing our Varity of uses for the recognition and identification of human activities.

However, modeling HAR system to generate an exact and systematic outcome remains a problem because of different scale, appearance and deformation. It proposed new approaches for demonstrating HAR in the consumer-electronics world by utilizing color skeleton motion History image (color Sk1- MHI) and relative joint image (RJI) to monitor old age people who are living alone. There are no effective face mask detection applications that can tell whether or not someone is wearing a mask. To maintain safety, more efficient systems for identifying face masks on individuals are needed for transportation, highly populated places, Districts of residence, large-scale production, and other endeavour. This project includes the identification of machine learning with Opencv and Tensorflow to detect facet masks on people.

### CNN (Convolutional Neural Network)

CNN is a series of a pooling layers and convolutional and which allows extracting of the main feature from the images responding to the final object. Convolutional Neural Networks are a class of profound neural networks used mostly in visual imaging in deep learning. This is an architecture specialising in the Artificial Neural Networks (ANN).

### Open CV

OpenCV is a computer vision library, free and open source. This library includes movement tracking and facial identification routines and algorithms, object tracking, classification, and recognition, as well as several additional applications. You can edit images and video streams in real-time to meet your needs.

### TensorFlow

The framework for the creation and development of neural networks is a free learning machine. This includes a set of tools, libraries, and community resources that help develop and deploy machine apps. Google created this and maintains it in 2015.

### Work Accompanying to this

The authors of [2] employed the skeleton-based human activity recognition using information sensed by an RGB-D camera. Thus, the 3-D positions of some relevant joints can be used to describe different movements of the body. To extract these features, we adopted the Kinect device, which has been demonstrated to be an unobtrusive sensor to perform real-time detection (i.e., to determine the 3-D coordinates) of a number of body joints.

The authors of [1] have explores a way for determining 3D body modeling and deep learning approaches Human posture recognition is between these computer vision problems, with large range of application such as ambient favored living and intelligent health care system.

### Salvatore Gaglio et al Suggested

In this research, we offer a method based on the estimation of some relevant joints of the human body by means of the Kinect; three different machine learning techniques, i.e., K-means clustering, support vector machines, and hidden Markov models, are combined to detect the postures involved while performing an activity, to classify them, and to model each activity as a spatiotemporal evolution of known postures. Experiments were performed on Kinect Activity Recognition Dataset, a new dataset, and on CAD-60, a public dataset.

### Ismail charoui et al (2021) Suggested

For recognizing Human posture we offered methods and ideas to outline of an automatic posture recognition system sign an RGB-D. More precisely, this system introduced two supervised techniques to learn and recognize human posture using two main types of data provided by an RGB-D camera the first method id based on convolution features extracted 2D images. Secondly, the system to replica the posture using body joints configuration 3D space.

### Nweke henry Friday et al (2021) Suggested

The goal of the study is to figure out whether Human activity recognition (HAR) is an important area of research in computing and human computer interaction. To recognise activities using the mobile, Data are using appropriate sensor, Segmented, needed feature extracted and activities using discriminative replica and the characteristic extraction is an important step that used to reduce time and recognition.

### Cho Nilar Phyo et al Suggested

The proposed approach detects the a system for recognizing such activities, in which humans interact with various objects, taking into consideration object-oriented activity information, the use of deep convolutional neural networks, and a multi-class support vector machine (multi-class SVM). The experiments are performed on a publicly available cornell activity dataset: CAD-120 which is a dataset of human–object interactions featuring ten high-level daily activities.

### Methodological Approach

Human activity recognitions method into two mains categorized - uni-modal, multi modal. The final output action is generated by pushing the results ofthose two networks.

Deep convolutional neural networks (DCNN) are a multi- layer's convolutional neural network which consists of an output layer, 1 or more than hidden layers, a fully connected layer had an output layer.

The hidden layer of the DCNN contains two operations, namely convolution and pooling and one main function called activation function.

## Human Action Recognization

The three- dimensional deep convolutional neural networks (3DCNN) are applied to color ski-Mhi and Rji for training and recognizing the human action. The final output action is generated by pushing the results of those 2 networks. The deep convolutional neural network is the multi- layer, a fully connected layer, and output layer.

In the output layer, the soft-max function is claimed for transforming the output of the DCNN into the corresponding probability value. The weight values for each convolutional kernel are randomly utilized using some distribution concepts such as uniform distribution and Gaussian distribution.

### Block Diagram
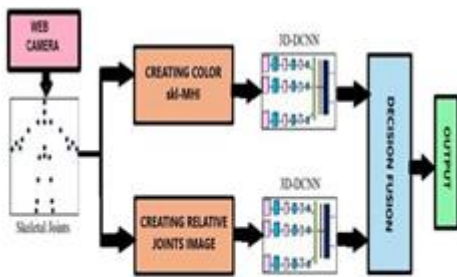


*fig. Human action reorganization of skeleton joints*

The Input data acquisition, the device captures co-ordinator information for the joint of the human body. A color selekton motion history image (SK1-MHI) is created for extracting motion history features.

A relative joint image is created for obtaining for relative distance features between the referenced joins and the other joints. Deep learning is performed, as well as classified into one of the predefined action such as standing, sitting or bending.

Input data of acquistion is done using a dataset [2] that can genarate 5 kinds of ouput streams. RGB, depth, infrad, audio and joints tracking data. This data are very useful for recoginizing human action and interactions.

### Creating color skeleton image.

In this component, color SK1- MHI and RJI are established using joints information that is obtained using the data. Creating a skeleton motion history image (sk1-MHI) [7], firstly involves creating a binary skeleton image using the corresponding joints. Next, a binary sk1-MHI is created by combing the continuous skeleton images within the predefined temporal dimensions.

However,the binary SKI-MHI alone cannot differentiated action that have a similar motion patter, such as sitting down form a standing position, or standing up from sitting position. Therefore, the binary SKI-MHI is added with the color value according to the sequential time interval of each action consequently.

### Creating Relative Joint Image:

The use of the relative position of joints is an intuitive method representing human motion. For example, in detecting action of waving he hands, and position are located above shoulder joints and moving left and right direction. For creating RJI, firstly calculate the relative distance between referenced joints and the other joints.



*Fig: creating images of relative position for four reference joints (j5, j9, j13 and j17).*

The four joints of the left shoulder(J5), the right shoulder(J9), the left hip(J13) and right hip(J17), because they are the most stable joints in most action.

Hidden layer of the DCNN contains two operations, namely convolution and pooling, and one main function called activation function. In output layer, the soft-max function is transforming the output of DCNN into the corresponding probability value. The weight value for each convolution kernel is randomly initialized using some distribution concepts such as uniform distribution .

### Convolution

Convolution is the mixing of information that is obtained from the raw input data and the extracted representative data that can well represent the characteristics of the input training data. The output of convolution is called a feature map, and it can differ, depending on the kernel filter that is used for the convolution operation.

### Pooling

The main purpose of the pooling is to $y_{d,}$ minimize the spatial dimension of feature map in each hidden layer. There are several types of pooling, depending on the operation that is used to for performing the

below, f(x)=max (0, x)
Where, x is the input of the activation function.

### Soft-max function.

The soft-max function is put in after output layer of 3D-DCNN in order to obtain probability of possible action.

$$\sigma(z)_j = e^{zj} / \sum_{K=1}^{N} e^{-zk}$$

Where, j and z denote each action and its network output N represents total number of actions.

### Updating weights using stochastic gradient descent method

The step-by-step calculation for updating the weights of the kernel matrix of all layers using the algorithm as follows:

1) The error value between desired output layer and network output $y_k$ is calculated using.

$$err = y_{d,k} - y_k$$

pooling process, such as maximum pooling (MAX), and average (AVE). The pooling operation is known as sub-sampling,

### Activation Function

It is an important function in DCNN, because it can decide whether the neuron should be operated or not, depending on weather the received input in relevant. The output of the activation function becomes input to the next layer, and data for the multiplexing of the neuron's inputs with the corresponding kernel weight.

2) The error gradient for neurons in output is calculated using $\Delta_k = y_k(1 - y_k)err$

3) The weight and bias correction for output layer $\Delta W_k$ and $\Delta B_k$ are calculated using a Predefinedlearning rate of $\alpha$,

$$\Delta W_k = \alpha y_{hk}\Delta_k$$
$$\Delta B_k = \alpha(-1)\Delta_k$$

Where $y_{hk}$ represents the hidden layer output.

Y=f ($\square$(kernel weight*input) +bias)

In this proposed system, we use the

The error gradient for neurons in hidden layer $\Delta_{hk}$ is calculated using the below Equation,

$$\Delta_{hk} = y_{hk}(1-y_{hk})\Delta_k\Delta W_k$$

5) The weight and bias correction values for the hidden layers $\Delta W_{hk}$ and $\Delta B_{hk}$ are Calculated using predefined learning rate $\alpha$,

$$\Delta W_{hk} = \alpha y_{hk}\Delta_{hk}$$
$$\Delta B_{hk} = \alpha(-1)\Delta_{hk}$$

6) The weights and bias of all layers $W_i$, and $B_i$, except the input later updated using the corresponding weight and bias correction values as described below,

data is 40 (4x10 subjects) and color SK1-MHI based model is 10 (1x10 subjects) for all experiments. Firstly, 3D-DCNN is trained using color SK1-MHI.

The sample color SK1-MHI of 10 daily activities of UT Kinect Action-3D dataset. In

$$W_{i,new} = W_{i,old} + \Delta W_i$$

$$B_{i,new} = B_{i,old} + \Delta B_i$$

7) Steps 2 through 4 are repeated untilstopping criteria are met.

### System Architecture

The 3D-DCNN architecture for training the color SK1-MHI and RJI data for human activity. In this architecture, normalized color SK1-MHI of the size 62x62 and RJI of size 15x19 are used as input data and each hidden layer is composed of the operation of convolution (Conv) and (Pool), dropout (Drop), and neuron activation (ReLU). This architecture includes three hidden layers (i = 1, 2, 3).

The dataset provides 3D locations of 20 joints in the 199 action sequences. The dataset includes variations in viewpoints and high intra-class variations.

For the performance evaluation, a cross-validation method is used involving the omission of one subject. In the case of training 3D-DCNN using RJI data, it needs to train 3D-DCNN models for 4 RJIs: RJI (J5), RJI (J9), RJI (J13), RJI (J17).

Therefore, the total trained models using RJI

the evaluation, the color SK1-MHI based method achieves an overall accuracy of 94%. Then 3D-DCNN is also trained for RJI. The sample RJI for four referenced joints (J5, J9, J13, J17) involved in the action of picking up object and waving hands.
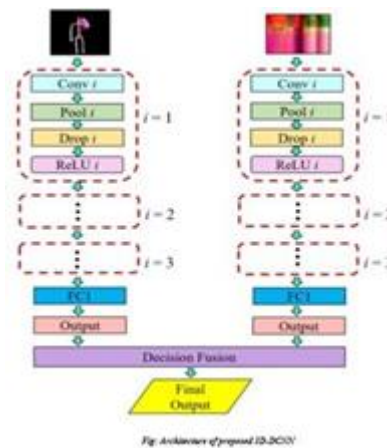


*Fig: Architecture of proposed 3D-DCNN*

### Results and Discussions

### Step 1: Installing tensor flow version:

In this code we used 1. x by running a cell with the Tensor Flow version. Once we are specified version, we import Tensor Flow as normal and the verify whatversion was imported.
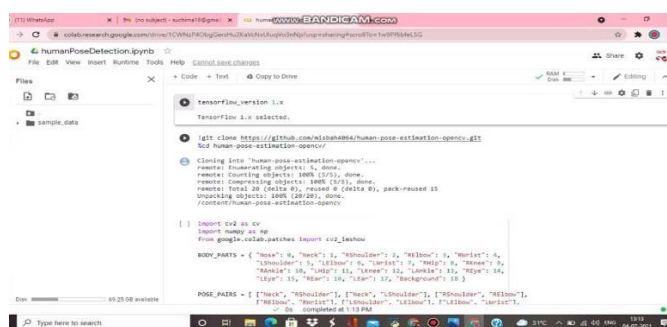


***Fig (a) System implementation step 1***

**Step2: Mounting Google Collaboratory**

Then uploading the data to the Google drive to run the script in Collab shell copy the code of our account and then paste the code into the output shell so that the Google drive will be mounted.
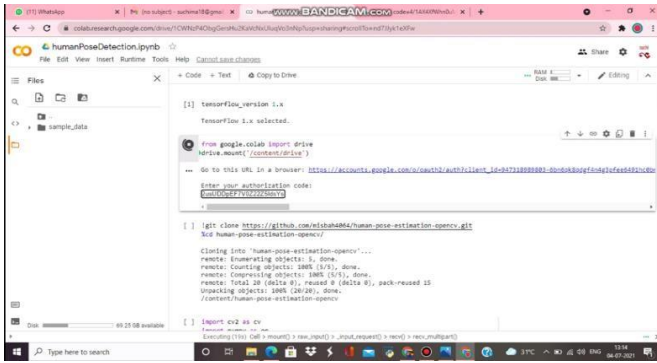


*Fig (b) System implementation step 2*

**Step 3: Improving cv2 and NumPy software:** We are using two libraries:

1) cv2
2) NumPy

cv2 is a cross-platform library using where we can develop a computer version application. It is mainly focusing on image processing capture and analyses the object detection.

NumPy is library for python programming language adding support to large multi-dimensional arrays and matrices along with the large collections of file-level mathematical functions to operate on their arrays.
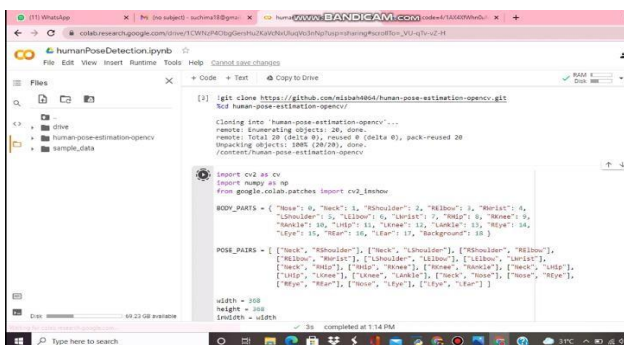


*Fig (c) System implementation step 3.*
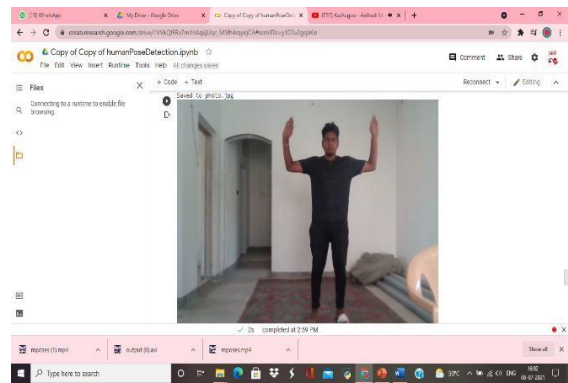


*Fig: (a) processing input image*
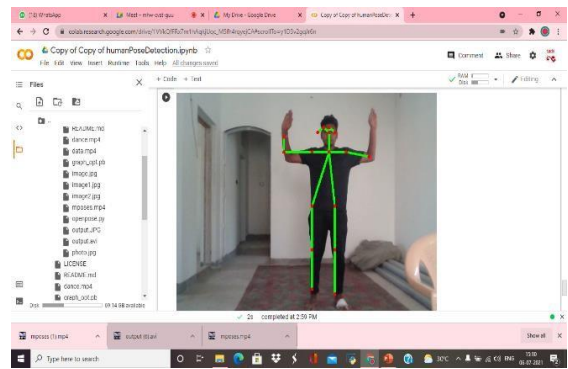


*Fig 6 (b) processing Avi output*

**Conclusion**

The proposed HAR under various conditions using two different datasets: the UT Kinect Action-3D dataset, and the CAD-60 state-of-the-art public human-activity 3D dataset.

**A. UT Kinect Action-3D Dataset:** The videos in this dataset are captured by a single stationary-depth camera, and consist of 10 actions performed by 10 various subjects.

**B. CAD-60 Daily Activity Dataset:** The CAD-60 daily activity dataset contains 12 high-level daily activities.On CAD-60 daily activity dataset, Color Skl-MHI and RJI based 3D-DCNN achieves an overall accuracy of 71.15% and 86.5%, respectively, and the decision fusion approach achieved 92.31%.

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# CONVOLUTION NEURAL NETWORK FOR HUMAN ACTIVITY RECOGNITION IN VIDEOS: LITTERING ACTIVITY DETECTION

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## ABSTRACT

*The earth is what we all have in common. Many people have forgotten how to walk lightly on the earth as its other creatures do. Various organizations and individual volunteers focused on multidimensional work and solutions to stop humans from filling the world with trash. Litter has the potential to harm human health, safety, welfare, as well as the environment. The mass production of disposable goods also produced a growing mountain of waste. The environment can be kept clean and hygienic only through human activities. In this paper, a technique to recognize human littering is proposed and the activity is detected.*

*A convolutional neural network is used to resolve and extract the patterns from video framework and validate with the threshold to make a decision. In this technique, various sample videos are validated and persons with and without littering activities are identified.*

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*Keywords: Human health, litter, humans littering, Convolution neural network, threshold, video framework.*

## Introduction

The goal of action detection is to detect every occurrence of a given action within a long video. There are several challenges to extending and applying CNN during this setting. One of the key motivation, which attracts to researches to work in action recognition is that the vast domain of its application in surveillance video, robotics, sports analysis and other human activities. It is very difficult to monitor each and every person in public areas and major gatherings to restrict them from littering. Therefore, a machine is required to identify persons who litters in an inappropriate area immediately to take up actions.

The main aim of this project is to identify people littering in improper places, who doesn't make use of proper garbage bins. A person can identify someone who litters and who doesn't, but can't monitor when it turns out to multiple persons littering at the same time. Sign boards are written "Do not litter, littering carries a maximum fine of $1000" but we can still figure out some litters below it. This is due to lack of monitoring and identification of persons even if the area is under CCTV surveillance. Keeping pollution free and environment clean as our major priority. This project is centric with a convolutional neural network to resolve all the matters by recognizing persons with littering activity from live stream videos or recorded CCTV footage.

## Literature Reviews

This paper [1] provides a unified framework for the interrelated topics of action spotting, the spatiotemporal detection and localization of human actions in video, and action recognition, the classification of a given video into one of several predefined categories. A novel compact local descriptor of video dynamics in the context of action spotting and recognition is introduced based on visual spacetime oriented energy measurements. This descriptor is efficiently computed directly from raw image intensity data and thereby forgoes the problems typically associated with flow-based features. Importantly, the descriptor allows for the comparison of the underlying dynamics of two Spacetime video segments irrespective of spatial appearance, such as differences induced by clothing and with robustness to clutter. An associated similarity measure is introduced that admits efficient exhaustive search for an action template, derived from a single exemplar video, across candidate video sequences. The

general approach presented for action spotting and recognition is amenable to efficient implementation, which is deemed critical for many important applications. For action spotting, details of a real-time GPU-based instantiation of the proposed approach are provided. Empirical evaluation of both action spotting and action recognition on challenging datasets suggests the efficacy of the proposed approach, with state-of-the-art performance documented on standard datasets.

The field of Action Recognition has seen a large increase in activity in recent years. Much of the progress has been through incorporating ideas from single-frame object recognition and adapting them for temporal-based action recognition. Inspired by the success of interest points in the 2D spatial domain, their 3D (space-time) counterparts typically form the basic components used to describe actions, and in action recognition the features used are often engineered to fire sparsely. This is to ensure that the problem is tractable; however, this can sacrifice recognition accuracy as it cannot be assumed that the optimum features in terms of class discrimination are obtained from this approach. In contrast, we propose to initially use an overcomplete set of simple 2D corners in both space and time. These are grouped spatially and temporally using a hierarchical process, with an increasing search area. At each stage of the hierarchy, the most distinctive and descriptive features are learned efficiently through data mining. This allows large amounts of data to be searched for frequently reoccurring patterns of features. At each level of the hierarchy, the mined compound features become more complex, discriminative, and sparse. This results in fast, accurate recognition with real-time performance on high-resolution video. As the compound features are constructed and selected based on their ability to discriminate, their speed and accuracy increase at each level of the hierarchy. The approach is tested on four state-of-the-art data sets, the popular KTH data set to provide a comparison with other state-of-the-art approaches, the Multi-KTH data set to illustrate performance at simultaneous multi action classification, despite no explicit localization information provided during training. Finally, the recent Hollywood and Hollywood2 data sets provide challenging complex actions taken from commercial movie sequences. For all four data sets, the proposed hierarchical approach outperforms all other methods reported thus far in the literature and can achieve real-time operation [2].

In [3], the authors present a new approach for human action recognition based on key-pose selection and representation. Poses in video frames are described by the proposed extensive pyramidal features (EPFs), which include the Gabor, Gaussian, and wavelet pyramids. These features are able to encode the orientation, intensity, and contour information and therefore provide an informative representation of human poses. Due to the fact that not all poses in a sequence are discriminative and representative, we further utilize the AdaBoost algorithm to learn a subset of discriminative poses. Given the boosted poses for each video sequence, a new classifier named weighted local naive Bayes nearest neighbor is proposed for the final action classification, which is demonstrated to be more accurate and robust than other classifiers, e.g., support vector machine (SVM) and naive Bayes nearest neighbor. The proposed method is systematically evaluated on the KTH data set, the Weizmann data set, the multiview IXMAS data set, and the challenging HMDB51 data set. Experimental results manifest that our method outperforms the state-of-the-art techniques in terms of recognition rate.

The authors in [4] propose a novel representation of articulated human actions and gestures and facial expressions. The main goals of the proposed approach are: 1) to enable recognition using very few examples, i.e., one or k-shot learning, and 2) meaningful organization of unlabeled datasets by unsupervised clustering. Our proposed representation is obtained by automatically discovering high-level subactions or motion primitives, by hierarchical clustering of observed optical flow in four-dimensional, spatial, and motion flow space. The completely unsupervised proposed method, in contrast to state-of-the-art representations like bag of video words, provides a meaningful representation conducive to visual interpretation and textual labeling. Each primitive action depicts an atomic subaction,

like directional motion of limb or torso, and is represented by a mixture of four-dimensional Gaussian distributions. For one--shot and k-shot learning, the sequence of primitive labels discovered in a test video are labeled using KL divergence, and can then be represented as a string and matched against similar strings of training videos. The same sequence can also be collapsed into a histogram of primitives or be used to learn a Hidden Markov model to represent classes. We have performed extensive experiments on recognition by one and k-shot learning as well as unsupervised action clustering on six human actions and gesture datasets, a composite dataset, and a database of facial expressions. These experiments confirm the validity and discriminative nature of the proposed representation.

A shape-motion prototype-based approach is introduced for action recognition [4]. The approach represents an action as a sequence of prototypes for efficient and flexible action matching in long video sequences. During training, an action prototype tree is learned in a joint shape and motion space via hierarchical K-means clustering and each training sequence is represented as a labeled prototype sequence; then a look-up table of prototype-to-prototype distances is generated. During testing, based on a joint probability model of the actor location and action prototype, the actor is tracked while a frame-to-prototype correspondence is established by maximizing the joint probability, which is efficiently performed by searching the learned prototype tree; then actions are recognized using dynamic prototype sequence matching. Distance measures used for sequence matching are rapidly obtained by look-up table indexing, which is an order of magnitude faster than brute-force computation of frame-to-frame distances. Our approach enables robust action matching in challenging situations (such as moving cameras, dynamic backgrounds) and allows automatic alignment of action sequences. Experimental results demonstrate that our approach achieves recognition rates of 92.86 percent on a large gesture data set (with dynamic backgrounds), 100 percent on the Weizmann action data set, 95.77 percent on the KTH action data set, 88 percent on the UCF

sports data set, and 87.27 percent on the CMU action data set.

## Proposed Methodology

In the proposed method, testing videos are collected from KTH database. After the video acquisition, frames extraction is performed. Moving objects are detected and localized based on the Gaussian mixture model. In action recognition, detecting and segmenting the foreground object without the noise produced by camera movements, zoom, shadows etc. is difficult. To do this, the model can be divided into the following steps. Firstly, the Gaussian mixture model (GMM) is used to construct the background and obtain the silhouette by background subtraction. Secondly, the Prewitt edge detector can be used to segment the objects from the foreground. The GMM is a common and robust method in background construction. For the purpose of action recognition in a complex scene condition, the GMM is used to build the background image. Finally, blob analysis based segmented moving objects are localized.
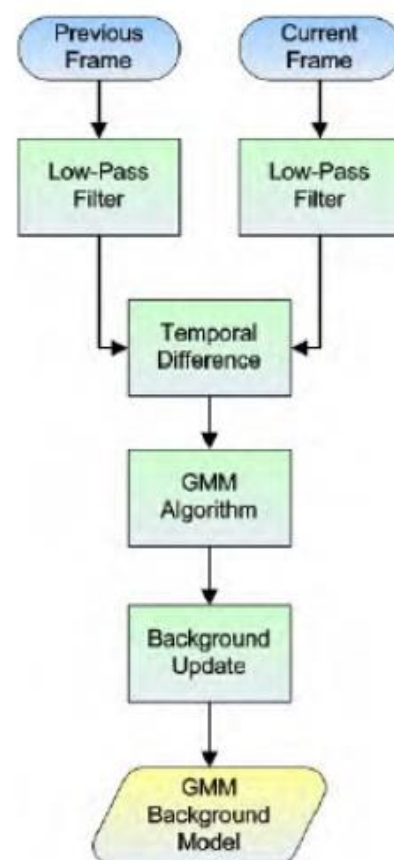


Fig. Architecture diagram for the proposed methodology

Localized moving objects features are extracted and reduced. Features mean detection of interest points in localized moving objects and finding strongest features in objects via Harris Spatio temporal corner detector. The human action recognition process is done over the extracted features. The main novelty here is the adoption of Nearest Mean Classifier (NMC).

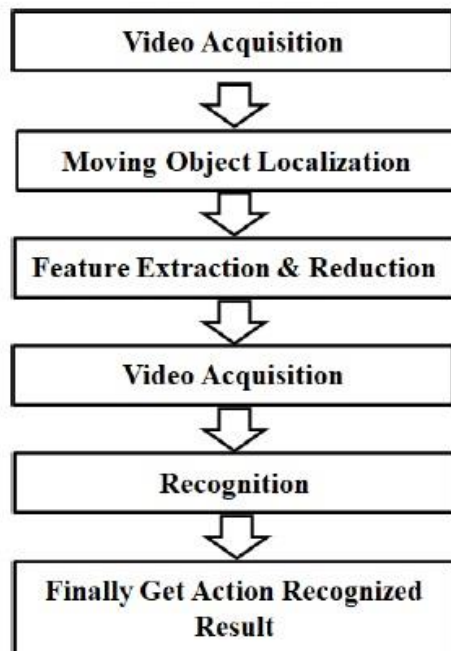NMC is applied over the features and the action recognition is done.



Fig. Initiation of input video



Fig. DFD of the proposed methodology
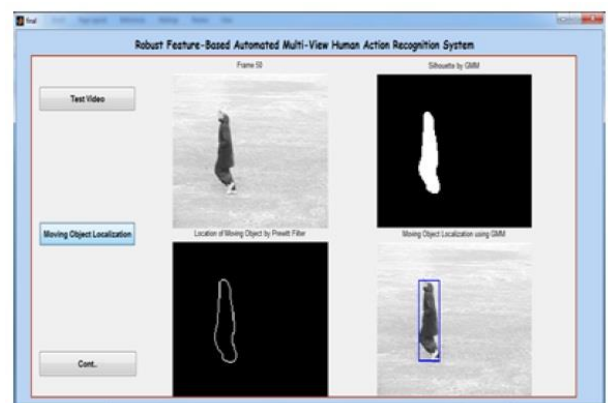


Fig. Processing of Action Frame via a video processing approach.

**Result and Discussions**

The method proposed is implemented after drafting using the MATLAB 2015Ra model. The action recognition is carried out as the primary part of the project to develop an intermediate analysis level to assure the detection of littering. In this project, the actions of common users such as running, jogging and jumping are studied and classified. The study primarily classifies the action of humans and then detects the features of littering via the action using neural networking techniques.



Fig. Action Detection and Rate of Littering Prediction

**Conclusion**

The proposed system has evaluated successfully and processed the activities of humans i.e. littering and non - littering. The proposed technique is relatively effective than the technique available in trend and the accuracy is much higher than the available methods.

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# FIRE DETECTION USING SURVEILLANCE CAMERA BY DEEP LEARNING TECHNIQUES

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## ABSTRACT

*The recognition of artificial catastrophes particularly fire is significant because it motives numerous harm in phrases to human lives. With the current headway of deep learning models, there are many fire detection models. Moreover, a large wide variety of existing research has just been evaluated on adjusted datasets, which can prompt unsatisfied outcomes and misdirect real-world performances. In this paper, the acknowledgment execution and the learning time are assessed via altering the VGG-19 and CNN structure while step by step expanding the convolution layer with a suitable activation function. In general, the accuracy is higher when the image is preprocessed. Also that the preprocessing method, with convolution, pooling i.e., max pooling, and the feature extraction technique have many advantages in phrases of learning speed and classification(fire or non-fire) the use of classifier.*

*Keywords: Image fire detection, Deep learning, CNN, VGG-19, feature extraction, activationfunction, and classifier.*

## I. Introduction

Fire is hazardous that receives intense misfortune naturally and financially. With the fast monetary flip of events, the extending factor and complexity of development have introduced various methods in control of fire. So to manage this, more frameworks are created and being created. Lately, fire acknowledgment strategies have made increasingly greater consideration in the fields of institute and industry. With the quick improvement of the top first-rate camera, the strategies based on photo highlight extraction give every other association which attempts to direct instance acknowledgment to the observing surveillance. Nonetheless, this type of strategy won't be typically and efficaciously because of their insufficiencies which are an immoderate variety of impedance things like lamplight, streetlamp, and car feature. Image recognition is particularly useful in such instances.

In this manner, the early fire recognition alert with large affectability and exactness made fundamentally diminished the fire misfortunes. In any case, conventional fire discovery won't be appropriate they bring about numerous inconveniences like false alerts, space inclusion, signal transmission, and the deferral in alarm, and different issues frequently happens, which makes them significantly harder to accomplish fire warning early. As a new technology, fire detection based on the image has currently made a vital part in diminishing the misfortunes of fire by warning users right on time through identifying fire early. Image fire detection depends on an analysis of images based on algorithms. This technique provides numerous benefits like early recognition, high precision, easy installation, and capability to distinguish fire between enormous areas and complicated designs.

The 3 fundamental stages during the process of fire detection algorithms: processing of the image, features extraction, and classification. In which features extraction is the foremost phase in the algorithm. Image detection algorithm depending on Convolutional neural network (CNN) can naturally acquire and remove complicated features effectively. This algorithm brought time-sequence information into algorithms. The VGG-19 net wasreformed to develop an algorithm in recognizing fire and smoke, VGG-19 is an evolution of the VGG model which in short comprises 19 layers.

It conveys and utilizes some of the ideas from its predecessors and enhances them and uses deep convolutional neural layers to further develop accuracy. However, in the early stage of smoke and fire just covering a small space of the image, the utilization of the whole image

feature without region proposal would diminish the accuracy of detection and delay in detection and alarm initiation. Hence, proposals regions should be decided early image classification to improve on the capability of the algorithm in recognizing early fire. However, it prompted enormous measures of computations and moderate recognition speed. This study reveals 2 sorts of techniques i.e., progressed CNNs and VGG-19 applied in image fire detection.

## II. Related Woks

Young-Jin Kim and Eun-Gyung Kim proposed a paper on "Image centered Fire Discovery utilizing Convolutional Neural Network" [1]. The efficiency of the existing sensor-based fire discovery system is restricted according to the factors in the environment bordering the sensing unit. In this method, first of all, we extract fire applicant location using shading information from video clip overview information and later determine fire using qualified CNN. Likewise, we reveal that the efficiency is considerably enhanced compared with the discovery rate and missing rate discovered in previous research studies.

Panagiotis, Kosmas, Kyriaki Kaza "Fire discovery from images utilizing quicker R-CNN and also the multidimensional structure analysis" [2]. In this proposed work we suggest an image-based fire discovery method, which integrates the strength of contemporary deep learning that connects with multidimensional structure evaluation depending upon higher-order direct dynamical systems. The prospect fire areas are determined by a Quicker R-CNN network qualified for this specific job of fire recognition utilizes a bunch of clarified pictures including real fire just as chosen negatives. Lastly, a vector depiction method is used intending to aggregate Grass-mannia factors are based upon an area criterion on the manifold.

Liang Xu, Haifeng Guo, Qingjie Zhang and Jiaolong Xu suggested a paper "Deep discovering technique for woodland fire discovery" [3]. They suggested a deep discovering technique for woodland fire discovery by training both the complete picture and fine-grained spot fire classifier in a completely linked deep CNN. The fine-grained

spot classifier is complied with to spot the precise place of fire spots. Our fire spot detector obtains 97% and 90% discovery precision on educating and testing datasets specifically.

Khan Muhammad, Syed Hassan Ahmed, et all proposed an "Efficient Fire Discovery for Uncertain Monitoring Atmosphere" [4]. Recently, several CNN-centered techniques through edge intelligence are used for fire discovery. However, these techniques fail to identify fire in questionable IOT climate having smoke, snow, and fog. As a result, in this proposed work, we suggest an efficient CNN algorithm-centered system for fire discovery in video clips caught in uncertain monitoring.

Muhammed and his group from Sejong University proposed a paper under the title "Using Edge detection for Precise Smoke and Fire Detection" [6]. They produced a discovery technique that's more precise and more energy effective. To examine their system, the team made 3 datasets with 4 unique types of video clips, consisting of smoke, no smoke, smoke with haze, and no smoke with haze. This new technique was 98.17% precise, with a false alarm of 1.18% only. The group compared its system to 3 various other smoke discovery systems, which gave false-alarm rates of 2.01 - 4.16%.

## III. Methodology

The majority of the research study over the decades is focused on traditional feature extraction methods for fire discovery. The significant issues with such strategies are their time-consuming process of feature designing and their low execution performance for fire detection. Such methods additionally generate a high number of incorrect cautions, especially in monitoring shadows, varying lighting, and fire-colored objects. To adapt to such issues, we broadly considered and explored deep learning architectures for early fire detection.

### Proposed method-1: CNN

In deep learning a Convolutional neural network (CNN) is a course of deep neural

networks, usually applied to evaluating visual images. CNN is a specific kind of neural network that utilizes convolution rather than matrix multiplication. CNN is a bit extraordinarily different, in light of the shared-weight architecture of the convolution kernels/filters that slide along input features and give an interpretation of Equi-variation responses known as feature maps. Above all, the layers are coordinated in 3 dimensions: height, width, and depth. They have applications in picture and video clip acknowledgment, picture classification, anomaly detection, and time series forecasting.
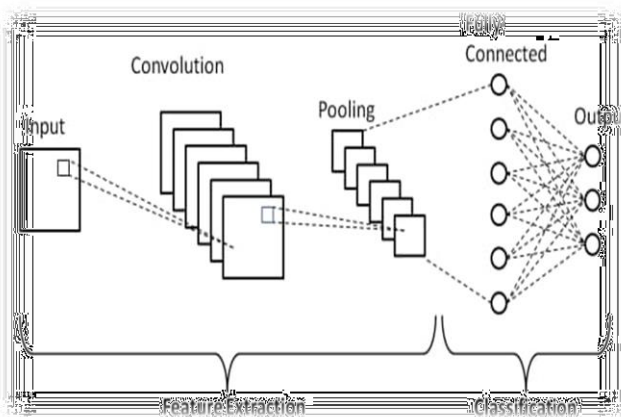


*Figure 1: CNN Architecture*

A breakthrough in building models for image classification accompanied the disclosure that a CNN can be used to progressively extract higher-level representations of the picture web content. CNN takes input as the image's raw pixel data and "learns" how to extract these features. In CNN every layer is comprised of a bunch of neurons, where every layer is completely connected with all neurons in the layer previously.

At last, there is a last fully-connected layer, the outcome layer that represents the predictions. CNN's utilize relatively minimal pre-processing compared with various algorithms. The CNN has three major functions region proposals, feature extraction, and classification.

Initially, CNN takes an image as an input, and after that CNN chooses the existence (or) lack of fire based on features extracted in the proposed region using convolutional, pooling, and fully connected layers. Convolution is the core part of CNN. The convolution layer convolves the info input image data and passes its result to the next following layer. Each convolutional neuron processes information just for its responsive area.

In the Convolutional layer, it utilizes image transform filters called convolutional kernel to generate a feature map. This kernel in earlier layers will learn and extract features like color, shape, edges, etc.. The only preprocessing that was done is that they eliminated the input value from every pixel, computed over the entire training set. The convolution utilizes convolution kernels of (3*3) size with the stride of 1 pixel, i.e., if the stride is set to 1, then the filter will move one pixel at a time in one direction. This enabled us to cover the entire area of the image. The o/p is passed to the relu activation function to eliminate the non-linearity and also to create feature maps (24*24) of the image.

The rectified linear (ReLu) activation function is a linear function that outputs the input directly if it's positive, otherwise, it will give zero.
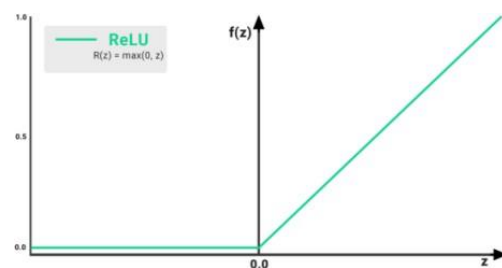


*Figure 2: Relu activation function*

$f(x) = \max(0,x)$ , where x is an input

A model that uses relu is simpler to train and frequently accomplishes better performance.

The convolution operation generates feature maps which are the input to the next operation known as pooling. The function of the pooling layer is to considerably reduce the spatial size of the depiction to minimize the number of parameters and computation in the network. The pooling layer operates on each feature map separately. In this paper, max pooling is selected to reduce more spatial measurements. Max pooling extracts the optimal value of the

patch in the feature map. Max pooling was performed over a (2*2) pixel window with stride 2.
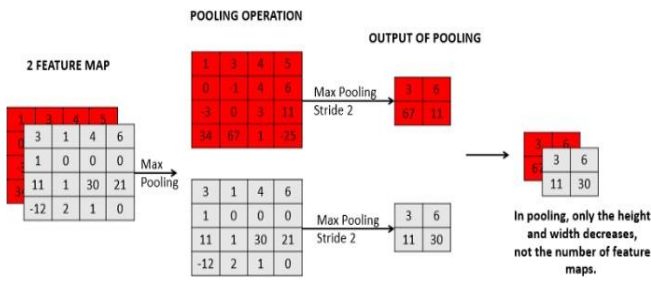


*Figure 3: operation of max-pooling layer*

Another important layer of the CNN architecture is a fully connected layer. After finishing of series of convolutional, nonlinear and pooling layers, it is important to append a fully connected layer. This layer takes the output data from convolutional networks.
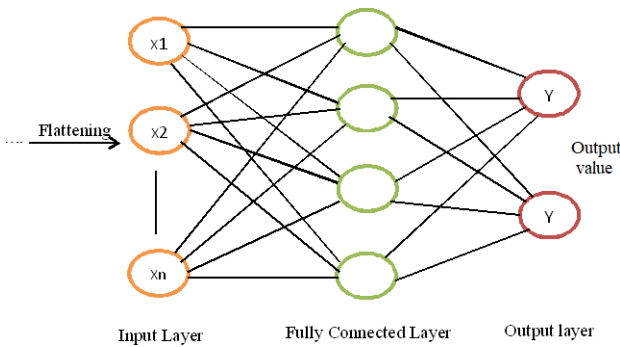


*Figure 4: Fully Connected layer*

The function of the fully connected layer is to carry out classification depending upon features extracted by the convolutions into the label. The fully connected layer will acts as a classifier in addition to these extracted features. CNN uses convolutional filters that are trained to extract the features. Among these 3 primary procedures, the convolution and fully connected layer have neurons whose weights are learned and re-adjusted for a better depiction of the input data during the training process.

### Proposed method-2: VGG-19

VGG-19 (Visual Geometry Group-19) is an evolution of the VGG model which in brief comprises 19 layers where 3 are fully connected, 16 convolution layers, 1 Softmax layer, and 5 max pool layers. There are different evolutions of VGG like VGG-11 and

VGG-16 and others. VGG-19 is a trained convolution network, developed by the visual geometry group at Oxford University. The model achieves 92% accuracy of top-5 check accuracy from the ImageNet dataset.
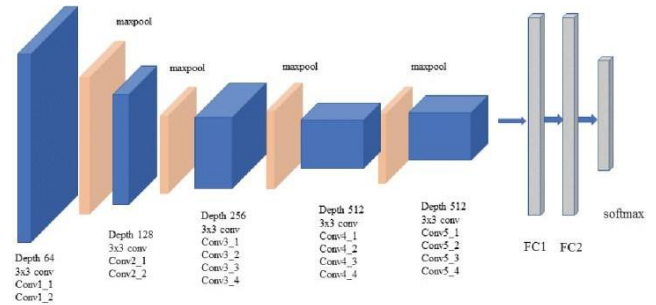


*Figure 5: Architecture of VGG-19*

VGG-19 is helpful because of its simplicity as $3 \times 3$ convolutional layers are mounted on the top to increment with depth level. To decrease the extent size, max-pooling layers were utilized as a controller in VGG-19. Two FC layers were utilized with 4096 neurons in the training phase, and convolutional layers were utilized for the feature extraction and max-pooling layers to decrease the feature dimensionality. The initial convolutional layer, $3 \times 3$ filter size of 64 kernels is given to feature extraction. Fully connected layers were utilized to set up the feature vector. Finally, in the testing phase, cross-validation is used to identify the images based on the sigmoid activation function and at last, the classifier classifies the presence or absence of fire depending on the features extracted.

The sigmoid function is a non-linear activation function utilized in neural networks. Sigmoid actuation work is continuous and differentiable at all points and consistently delivers an output between the numbers 0 and 1.
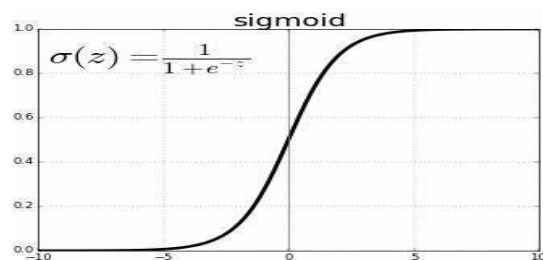


*Figure 6: Sigmoid activation function*

$$F(x) = 1/ (1+e^{-x})$$

## Software Requirements

- Python 3.7 Version coding software.
- Computer (Operating System: Windows7/10 with 64bit, RAM: 4GB, 2GHZ Processor).
- Google Drive, TensorFlow1.x, Keras, OpenCV for programming.
- Google Colaboratory.

## IV.    Implementation

The operation of fire detection primarily based on the image is shown in the beneath flow diagram. Initially, the input image is given into 2 blocks for testing and training (i.e., 6000 images are considered as input where 4000 images are given to the training block and 2000 to the testing block). Training performs computations that minimize the output predictions on a training dataset used to train the model and validate them. A validation set is utilized to estimate the models in the training process. The testing block is used to test the CNN model after it is trained, to evaluate the overall performance of the final model. In this proposed work we used two methods of approaches for fire detection that is Convolutional Neural Network and VGG-19.

First, the model was trained using CNN for the gathered training data, and their categorization performance was evaluated using different kinds of datasets.
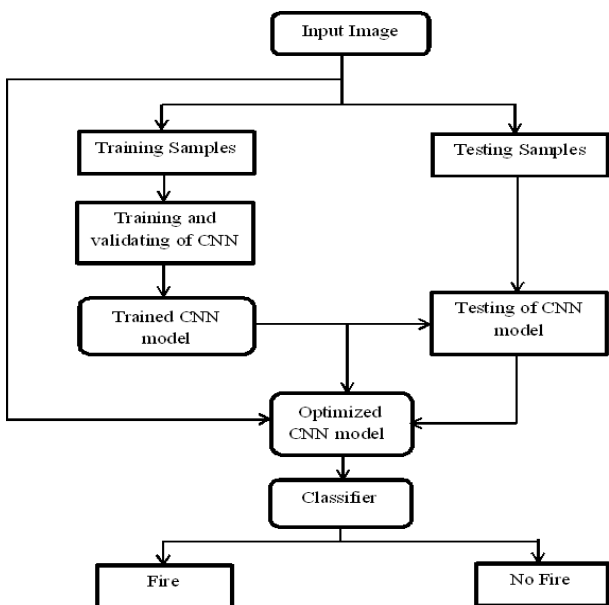


***Figure 7: Flow diagram of fire detection based on the image.***

The input image $224 \times 224 \times 3$ pixels on which 64 kernels of size $7 \times 7$ are applied with stride 1, resulting in 64 feature maps of size $112 \times 112$. Then, a max-pooling with kernel size $3 \times 3$ and stride 1 is used to filter every activation. Next, another convolution with filter size $3 \times 3$ and stride 1 is applied, resulting in 192 feature maps of dimension $56 \times 56$. This is followed through another max pooling layer with stride 2, filtering discriminative-rich features from less essential ones.

The architecture avoids uncontrollable increases in the computational difficulty and networks' flexibility. To attain this, the approach used here is to add $1 \times 1$ convolutions for reducing the dimensions, which in turn minimizes the computations. The computations keep occurring till the last layer followed by a dropout layer to avoid overfitting. At this stage, we modified the architecture in accordance with our classification with the aid of maintaining the range of output classes to 2 i.e., fire and non-fire. The following operation takes place for VGG-19 with a sigmoid activation function.

## V.    Result

The experimentations were performed using a dataset of 6000 images, collected from ImageNet fire datasets of images. We used 4000 images from the dataset for training and 2000 images for testing.
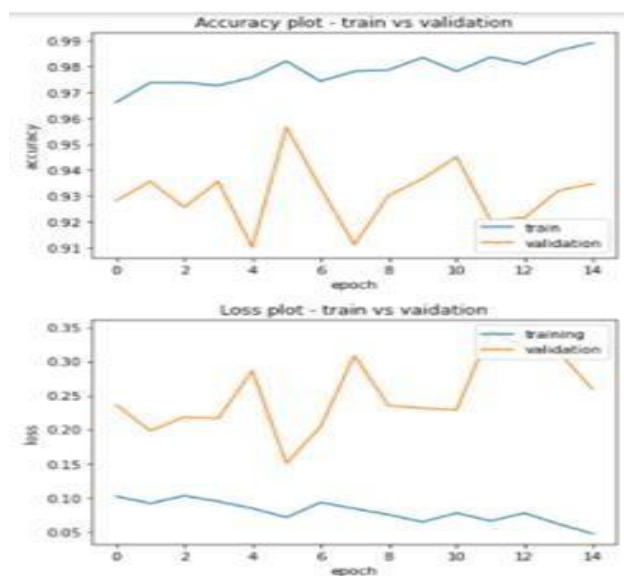


***Figure 8: Accuracy & Loss obtained for CNN model***

By this, we trained 19,551,009 parameters and 0 untrained, in which 2000 images we found belonging to 2 classes in each (training, validation, and testing). The weights are selected from the h5 model which is a built-in code. The total accuracy obtained in this paper for the CNN model was about 94.85% and for VGG-19 was 90% accuracy. The accuracy increases as the epochs increase, which are shown in the below plots.
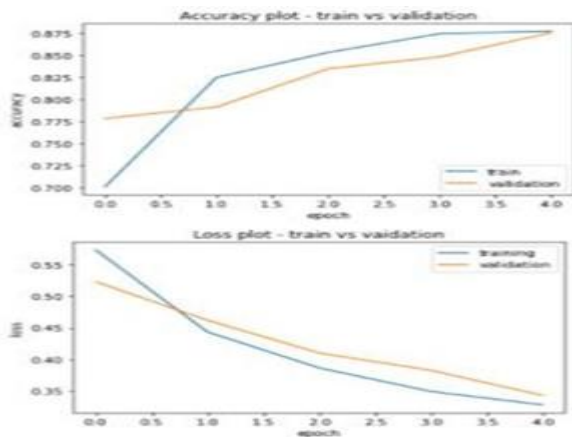




*Figure 9: Accuracy & Loss obtained for VGG-19 model*

## VI. Conclusion

Considering the advancements in surveillance processing skills it is viable to discover fire at its early stage which can be beneficial to disaster administration systems, avoiding huge ecological and economic losses. With this motivation, we proposed an early fire detection approach primarily based on pleasant tuned CNN and VGG-19 in the course of surveillance. Incorporating deep elements in our framework we have shown that fire can be detected at early stages with increased accuracy in varying outdoor and indoor environments whilst minimizing the false fire alarms.

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# BITCOIN PRICE PREDICTION USING MACHINEL EARNING TECHNIQUE

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*Abstract -In this 21th century of advancing science and technologies, digitalization is emerging rapidly and is much gravitating in the current marketing and business activities. The attention towards cryptocurrencies like Bitcoin is being increasing deliberately. So with this former view, In our thesis we have attempted to predict the Bitcoin price accurately in consideration of some major parameters that affect the Bitcoin value. In our investigation, we aim to monitor then capture the frequent price fluctuations and identify daily trends in Bitcoin market and predict the Bitcoin price much concisely. Our data set precisely consists of various features relating to the Bitcoin price and payment network over the course of five years, recorded daily. With this available particulars and along with the aid of machine learning technique specifically using SARIMA technique we intend to extract more appropriate results and thereby accomplish the thesis objective with an efficacious conclusion.*

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*Keywords*—Bitcoin ,cryptocurrency, machine learning SARIMA.

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## I. INTRODUCTION

Bitcoin has attracted extensive attention from investors, researchers, regulators, and the media. Main feature of that Bitcoin's price often fluctuates significantly, which has however received less attention. In this paper, we investigate the Bitcoin price fluctuation prediction problem, which can be described as whether Bitcoin price keeps or reversals after a large fluctuation.

In November 2008, Bitcoin systematic structural specification was published by an unknown person or group of people using the pseudonym Satosh**i** Nakamoto. Since then, introduction of thousands of new cryptocurrencies and many fluctuations in its price, Bitcoin is still the most popular and the most valuable cryptocurrency in the world. At the time of writing this thesis, Bitcoin has a total market capitalization of more than 71 billion U.S. dollars.

By using SARIMA model we are going to find the price of abitcoin, asSarima model is best fitted for the fluctuating values.

For this process, the large data set we have taken as daily trends from 2012 to 2020. The remaining part of this paper is given as follows. Insection II, the related works of this project is explained in detail. In section III, the proposed scheme is completely explained. Results of our method are given in section IV.Section V concludes the paper.

## II. RELATEDWORKS

S Nakamoto et al [1] proposed " A peer to electronic cash system"In this paper cash would allow online payments to be sent directly from one party to another without going through a financial institution.

Zibin Zheng et al, [2] proposed "enhancing bitcoin price fluctuation prediction using attentive LSTM and embedded network" In this paper, an attentive LSTM network is used to capture time dependency features of bitcoin in this the accuracy obtained was 61%.

Lekkala Sreekant reddy et al[3] proposed "A research on Bitcoin price prediction using machine learning algorithm".in this paper

KNN ridge regression linear regression polynomial regression random forest are done and results are compared and maximum accuracy obtained through linear regression 94% compared to other models.

Kejsi struga et al [4] proposed a "Bitcoin price prediction using machine learning". In this paper they used SVM, RNN, ARIMA, LOGISTIC REGRESSION models, and obtained a maximum accuracy of 53% in ARIMA model.

Kalpana sonica et al. [5] proposed a "Bitcoin price prediction using deep neural network technique", in this paper uses deep neural network concept for preprocessing cleaning, dataset scaling and normalization is performed. And the test score of RMSE is 5.66RMSE not able to put prediction of various currencies and algorithms in one program.

### III PROPOSEDMETHOD

Bitcoin price prediction using machine learning algorithm can be implemented by using ARIMA Model algorithm.

### ARIMA /SARIMA

The steps to modeling SARIMA are as follows:

1. Gather, explore, and visualize the data.

2. Difference the data and check for stationarity.

3. Plot the ACF and PACF for the differenced data.

4. Start modeling by searching for the best parameters.

5. Train and test the model with the optimized parameters.

**Bitcoin Price Data-**The first thing we have to do is retrieve the historical data of Bitcoin which can be downloaded as a convenient CSV file from Yahoo Finance. Once we have that, we can begin by formatting the CSV file as a Pandas Data Frame. Then, we use that same Data Frame for the rest of our plotting and calculations. Next, we plot our

dataframe to see Bitcoin's price movement over the last two years. The last two years were selected because Bitcoin, and Cryptocurrency in general became very popular and are formatting the CSV file as a Pandas Data Frame. Then, we use that same Data Frame for the rest of our plotting and calculations. Next, we plot our data frame to see Bitcoin's price movement over the last two years

**Stationarity-**Let's prepare the data for modeling by making the data *stationary*. We do this by simply differencing the data and testing for stationarity by using something called the **Dickey-Fuller test.** We are aiming for a P-Value of less than the critical value of 5%, or simply trying to get as close to zero as possible. For even a lower P-value, we'll take the log of the prices, then difference the log instead of just differencing the prices. You might be wondering why we care about stationarity. Simply put, stationarity removes trends from the dataset which can be extremely intrusive to our models. Basically, stationarity makes our models perform and predict better.

## ACF and PACF- Next, we'll have to plot

The Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF). Since we are working with daily data, the ACF shows us which day in the past correlates the most with the current day with respect to the days in between. PACF shows us which day in the past correlates directly to the current day by ignoring the days in between. SARIMA Modelling By knowing the PACF and ACF, we now better understand our dataset and the parameters to potentially choose. Now, we can move on to modelling our data by using the SARIMA model.

**Optimizing Parameters-**In order to get the best performance out of the model, we must find the optimum parameters. We do this by

trying many different combinations of the parameters and selecting the one with the relatively lowest AIC score. Don't worry, we wrote a function that will do this for us. Depending on your computer, the process of finding the best parameters may take a while. For some like us, we'll have to settle for the best parameters limited by our computer's specifications. Unfortunately, not all computers are equal and some models will perform better based on the computer that is running them**.**

**Fitting and Training**- Now that we have our parameters, let's go ahead and train and fit the model to Bitcoin's prices. To test the model's performance even further, we can see how its predictions line up with the values that we already know by plotting them out. The model tests okay because the actual values still remain within our confidence intervals (shaded in gray) and the prices are rising as forecasted. The rest of the training data seems to fit well within our intervals (green shade) and line up with the model's predicted values.

**Forecasting Future Prices**- Now we can get to the part that we really want to know about — Predicting Bitcoin's future prices! We do this by forecasting from the present day and seeing where it might go in the future. According to the model, it appears that Bitcoin will continue slightly upwards in the next month. However, do not take this as a fact. The shaded region shows us where Bitcoin's Figure1.Flowchart of the Machine learning Figure1. Flowchart of the Machine learning price may potentially go in the next month, but it also happens to show that Bitcoin may potentially go down. Although, the model seems to be tilting towards the price rising instead of declining. SARIMA's forecast should not be the only forecast to take into consideration. There are other time series models and procedures to consider and one of them was actually created by Facebook's Data Science team. models and procedures to consider and one of them was actually created by Facebook's Data Science team.

Figure1.Flowchart of the Machine learning

- **Data collection** – here we are collecting the raw statics and information generated by research study

- **Train data and test data** – train data is implemented to build up a model and test data is used to test it

- **Preprocessing techniques**–the preprocessing techniques steps help us to enhance the quality of data.

- **Machine learning algorithm techniques** – SARIMA model.

    a) **DATASET NAME**

- coincheckJPY_1-min_data_2014-10-31_to_2018-01-08.csv
- bitflyerJPY_1-min_data_2017-07-04_to_2018-01-08.csv
- coinbaseUSD_1-min_data_2014-12-01_to_2018-01-08.csv
- **bitstampUSD_1-min_data_2012-01-01_to_2021-03-08.csv**

CSV files for select bitcoin exchanges for the time period of Jan 2012 to Jan 2018, with minute to minute updates of OHLC (Open, High, Low, Close), Volume in BTC and indicated currency, and weighted bitcoin price.

   b) **Attributes count and Attributes list.**

There are 8 attributes.
- Timestamp (Unix time)
- Open
- High
- Low
- Close
- Volume_(BTC)
- Volume_(Currency)
- Weighted Price

All the attributes are of numeric type

c) **Class count and class list**

We are predicting continuous numerical values.

d) **Instance count**

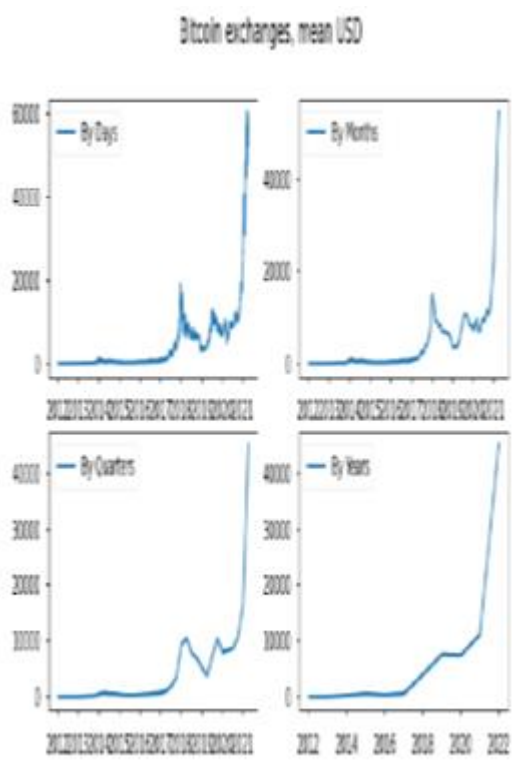3,161,057 instances approximately**.**
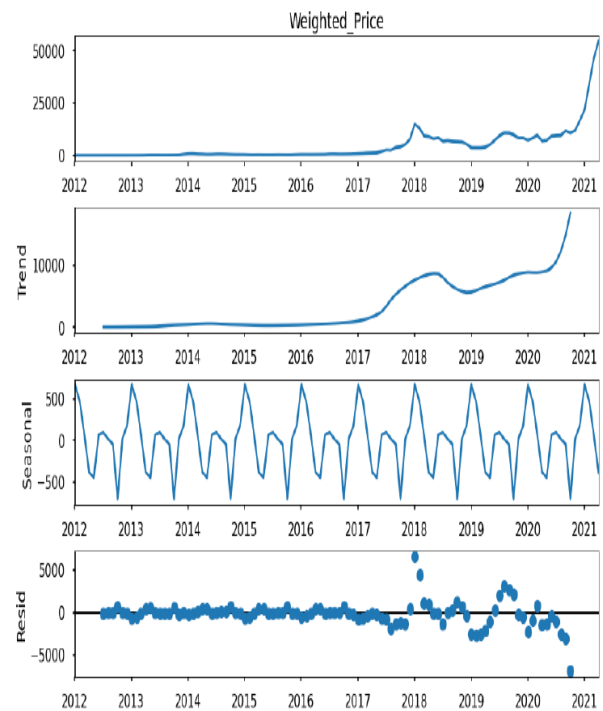
*Figure2 : Bitcoin exchanges ,mean USD*



*Fig 3: Bitcoin prices in terms of Seasonal, trends and resid.*

**Modeling Time Series**

The machine learning models we are going to implement are called Time Series models. These models will examine the past and look for patterns and trends to anticipate the future. Without these models, we would have to do all of those analyses ourselves and that would take just way too much time. Luckily, we can program these Time Series models in Python to do all of that work for us, which is what we will be doing today. Bitcoin exchanges by days, months, quarters and years is observed. And also it is observed by trends, seasons and resids.

**ACF and PACF**

Next, we'll have to plot the **Autocorrelation Function (ACF)** and Partial **Autocorrelation Function.(PACF).** Since we are working with daily data, the ACF shows us which day in the past correlates the most with the current day with respect to the days in between. PACF shows us which day in the past correlates directly to the current day by ignoring the days in between

**(PACF).** Since we are working with daily data, the ACF shows us which day in the past correlates the most with the current day with respect to the days in between. PACF shows us which day in the past correlates directly to the current day by ignoring the days in between.
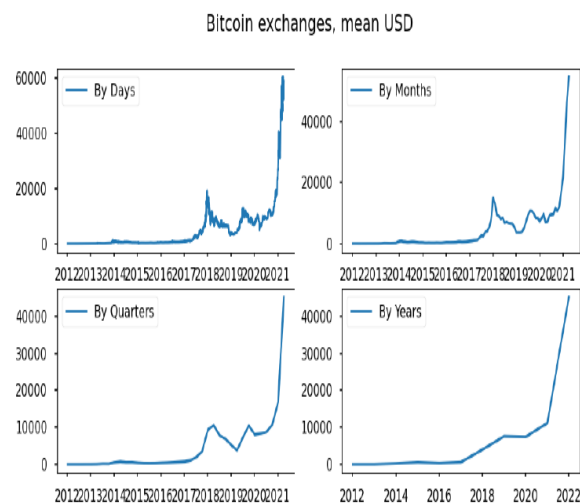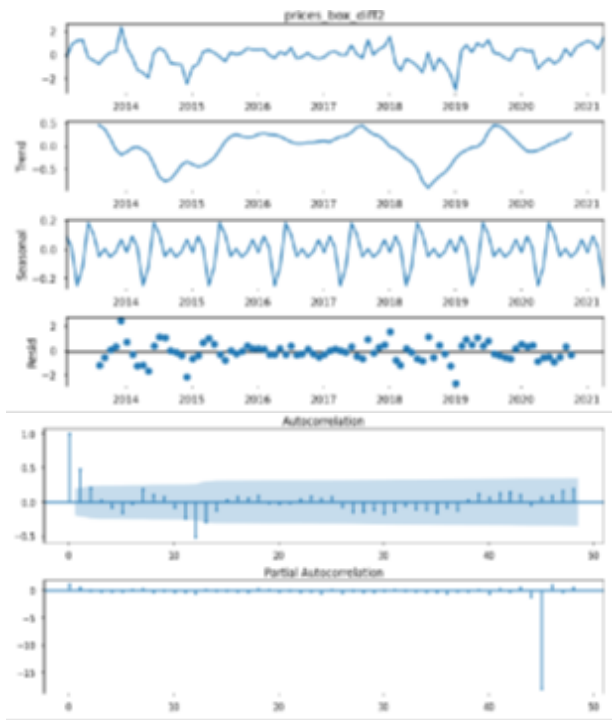
**Fig 4:** *ACF, PACF and Box differentiation results*
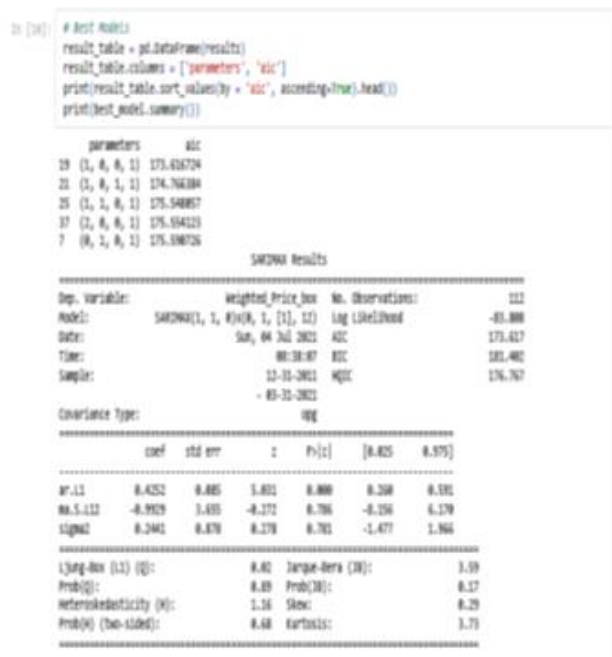


## SARIMA Modeling

By knowing the PACF and ACF, we now better understand our dataset and the parameters to potentially choose. Now, we can move on to modeling our data by using the SARIMA model.

### a)  **Optimizing Parameters**

In order to get the best performance out of the model, we must find the optimum parameters. We do this by trying many different combinations of the parameters and selecting the one with the relatively lowest **AIC score.** Don't worry, we wrote a function that will do this for us. Depending on your computer, the process of finding the best parameters may take a while. For some like us, we'll have to settle for the best parameters limited by our computer's specifications. Unfortunately, not all computers are equal and some models will perform better based on the computer that is running them.
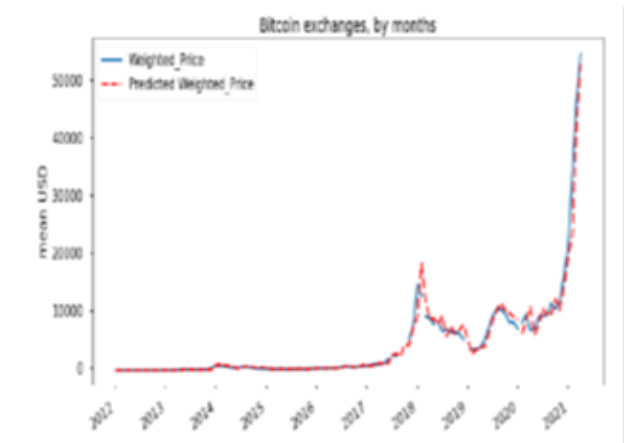


*Fig 5 SARIMA model results with AIC Score*

**Forecasting Future Prices** — Predicting Bitcoin's future prices! We do this by forecasting from the present day and seeing where it might go in the future. According to the model, it appears that Bitcoin will continue slightly upwards in the next month. The shaded region shows us where Bitcoin's price may potentially go in the next month, but it also happens to show that Bitcoin may potentially go down. Although, the model seems to be tilting towards the price rising instead of declining. SARIMA's forecast should not be the only forecast to take into consideration.
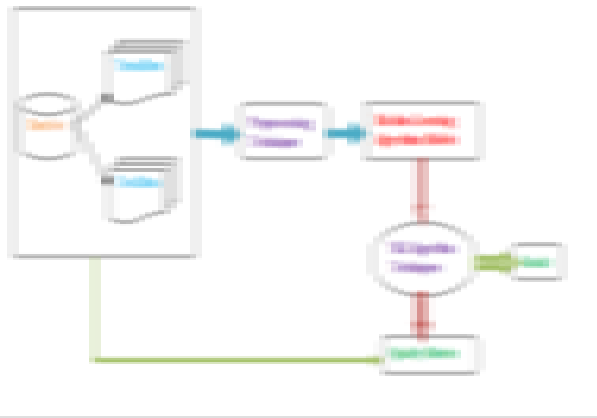
## III EXPERIMENTALRESULTS

***Fig 6 .Comparison of actual and predicted weight***

***Price***

## IV. CONCLUSIONANDFUTUREWORK

Bitcoin is a successful cryptocurrency, and it has been extensively studied in fields of economics and computer science. In this study, we analyze the time series of Bitcoin price with

ARIMA using Blockchain information in addition to macroeconomic variables and address the recent highly volatile Bitcoin prices.We wrote a custom algorithm to hopefully predict future prices for all of our listed digital cryptocurrencies similar to Bitcoin. If you are looking for crypto currencies with a good return on your investment, BTC could potentially be a profitable investment option for you.

Contents we learned:

1. How to gather real-time Bitcoin data.
2. How to prepare data for training and testing.
3. How to predict the price of Bitcoin using Deep Learning.
4. How to visualize the prediction result.

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# VLSI IMPLEMENTATION OF TURBO CODES FOR LTE SYSTEMS

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## *Abstract*

*Communication is act of transmission of information. Everyone in the world experiences the need to receive information almost simultaneously. To achieve communication, it is essential that sender and receiver understands a common language. When signal is transmitted there are 3 sources of transmission errors, they are: Signal bit errors, burst errors and erasure. Errors in signal may lead to miscommunication between system. So, error correction codes are used to correct the errors and responsible for getting the original input as an output. In order to detect and correct the error, turbo codes are used. Verilog HDL code is used to design the encoder and decoder of Turbo codes. Turbo decoding is time consuming process. Sequence estimation decoding algorithm is not so complex as compared to symbol-by-symbol estimation algorithm. Therefore, Sequence estimation algorithms are preferred. The Viterbi algorithm only generates hard decision output values, whereas the Viterbi soft output method generates soft output values. To reduce latency and enhance throughput, the SOVA Algorithm is applied. Hence, SOVA Algorithm is preferred. Xilinx Vivado is used which achieves simulation and synthesis of proposed turbo encoder and decoder. The Xilinx Vivado is also used to obtain Schematic of Turbo Coder.*

*Keywords: Turbo Codes, Turbo encoder, Turbo decoder, SOVA Algorithm, Xilinx Vivado, Viterbi Algorithm.*

## I. INTRODUCTION

Communication is an exchange of information between individuals using a common channel. When these data are transferred, a signal error may develop, necessitating the correction of those faults in order to recover the original message. Authors Glavieux, Berrou, and Thitimajashima created turbo codes in 1993. If a code has the long frame length, then the results produced by the Turbo codes is extremely impressive. Due to the rigorous study and efforts of the turbo coding, it has evolved at a new rate and has reached a degree of maturity in just a few years since its inception. A turbo code is created by concatenating two codes separated by an interleaver in simultaneously. Although the overall concept allows for the selection of encoders and interleavers, the two encoders utilised in this application are usually identical. The code is organised in such a way that the input bits appear in the output as well. The bits are read in a pseudo-random order by the interleaver. Turbo codes be used as an error correcting codes in the field of wireless communication systems. Error correcting capability is comparatively high for turbo codes. The performances of the turbo codes approach the Shannon limit. To achieve this limit, it made used of one of a fundamental method i.e. channel coding. Turbo codes perform very close to the channel capacity. In addition, the author berrou invented Recursive Systematic convolutional codes (RSC) which are used in implementation of turbo codes. In an iterative exchange of information between two decoders, he used a principle of decoding which is called an extrinsic information for decoding, SOVA Algorithm is used.

## II. LITERATURE REVIEW

Kavinilavu, Salivahanan, Kanchana worked on [1] convolutional encoder and Viterbi decoder using Forward error correction for encoding the input and Viterbi algorithm for retrieving the original input data. Modalism and Xilinx are used for simulation and synthesis. Bit error ratio amongst convolutional, turbo, polar and LDPC codes are compared [2] and reached a conclusion, besides convolutional code

others perform close to it. Performance among turbo and polar codes are compared [3] and reached a conclusion, that each codes have desirable performance and turbo codes have excessive error correction capability than other codes. The [4] paper presents the implementation of Turbo coder and error correcting capability; the turbo decoder makes uses of Viterbi algorithm to decode the information and it is capable to correct mistakes. Power estimation for advanced turbo coder is done [5]. The power of whole and each block is estimated. Turbo decoders are implemented using reverse recalculation and the overall power is reduced greatly. The Turbo decoders are implemented based on Max-Log MAP algorithm [6]. The proposed approach reduces the area and power consumption of each block and increases the throughput without reducing the bit error rate. Fixed point, Vedic, and booth multipliers are used in the Low Latency Max Log MAP based Turbo decoder[7]. and reached a conclusion, Vedic multipliers use greater resources as they have lesser delays than booth multipliers.

## III. IMPLEMENTATION

## A. ARCHITECTURE OF TURBO CODER

The complete wireless communication system consists 3 important components and they are the transmitter, channel and the receiver. The Turbo encoder and the Turbo Decoder are used to create Turbo codes. Turbo codes are having widest

application in wireless communication system because of its error correcting capability closer to Shannon's limit Parallel combination of two or more convolutional codes leads to creation of the class of Turbo codes. The general overview of Turbo coder is that the output from the source encoder. The Turbo encoder receives this as input. Turbo encoder adds come redundant bits to protect the original data from the errors over the channel and produces turbo encoded data as output. Turbo decoder decodes the turbo encoded data from the channel and produces the original output by correcting the errors. Due to heavy, the channel turbo coding is causing noise and blockage ,very necessary and it has to performed repeatedly to

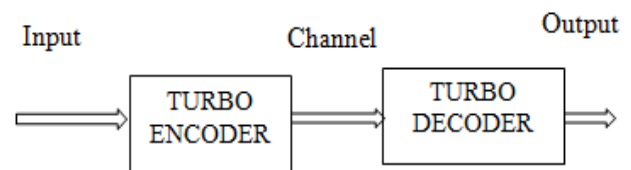shield the encrypt the digital from various types of noises.



Fig 1: Turbo Coder

## 1. Turbo encoder:

The fundamental components of turbo encoder are 2 identical recursive systematic convolutional encoder,1 pseudo random interleaver and a data assembler. The architecture of turbo encoder consists of 2 identical rsc encoders which are concatenated in parallel fashion. The input for 2 rsc encoders is separated by the presence of a pseudo random interleaver between 2 rsc encoder. Here interleaver is used to shuffle the input bits in a random fashion. Initially the input data is allowed into the first elementary rsc encoder, next interleaving process is carried out after this second rsc encoder is fed by the input. The input bits will be transmitted systematically and the redundant bits will be produced by rsc encoder1 and encoder 2 respectively. Purpose of selecting a rsc as the fundamental encoder rather than conventional non-recursive nonsystematic convolutional encoder is due to its recursive property and not for its systematic behavioral property. The output is collected from the first elementary rsc encoder next from the second elementary rsc encoder and systematic output is given to the data assembler. Data assembler will concatenate 3 outputs and gives one single output which has to be transmitted over the channel.

## Fig 2 shows the Turbo Encoder block diagram.

2. Turbo Decoder:

The architecture of turbo decoder is constructed using 2 Soft-In-Soft-Out decoders and 2 pseudo- random Interleaver and 1 pseudo random deinterleaver. The turbo decoder's decoding technique is iterative. The input data passes via the interleaver, deinterleaver, and SISO decoder before being processed. Turbo decoding can be done using either the Maximum A posteriori Method (MAP) or the soft output Viterbi algorithm. While the complexity is relatively large, the Turbo decoder constructed utilizing the MAP algorithm contributes the best Bit-Error-Probability. Turbo decoder designed using SOVA algorithm saves area and power and

also provides high throughput and less complexity. First the parity bits and systematic output from the channel is given asinput to the first SISO decoder. The systematic output is theninterleaved, and the parity bits are fed into the second SISO decoder as input. De-interleaver receives the input from SISO-2 and carry out the process of deinterleaving. SISO-2 receives input from deinterleaver and performs the comparison with the original output. If the comparison result is true, the final output will be produced from SISO-2 otherwise decoding operation is performed iteratively until we get the correct output. Fig3 shows the Turbo Decoder block diagram.
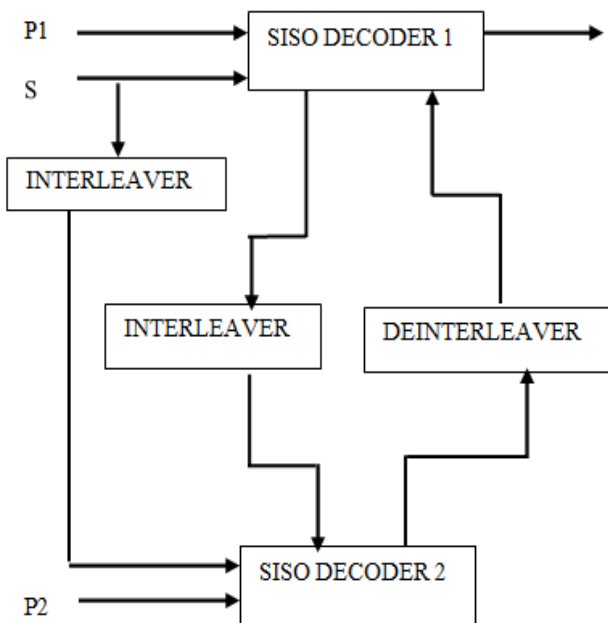


Fig 3: Turbo Decoder
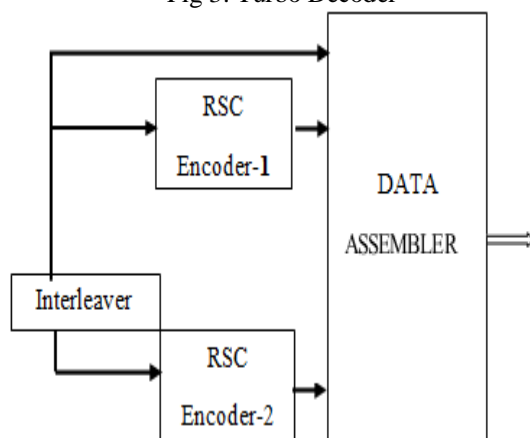


Fig 2: Turbo Encoder

## B. RSC Encoder

The Recursive Systematic Convolutional Encoder as constituent encoders in a parallel concatenation scheme. The information bit given as input m2 is same for interleaver alsowhere reordering of information bits take place. The original data m2 is the systematic output. The RSC1 produces Parity1 bit and RSC2 produces parity2 bit. Hence, both encoders are parallel concatenated, the same input is fed to both convolutional encoders. Recursive encoders are feedback encoders as there is feedback from output going to input. To have large minimum distance of codes, feedback encoders are used. As larger the minimum distance of code, higher is errorcorrecting capability. Parallel concatenation is recommended because the first encoder's output is supplied as input to the second encoder in serial concatenation.

## C. Pseudo-Random Interleaver

An interleaver's primary function is to spread the sequences of bits in a bitstream in order to reduce the impact of burst mistakes produced during transmission. In most cases, an interleaver is used in conjunction with some sort of error- correcting code. The random interleaver changes the input sequence to the permutation order using a specified random permutation. The length of the input sequence is intended to be L. A random interleaver with L=4 is shown in Figure 4. The interleaver writes in [1 0 0 1] and reads out [1 0 1 0] as shown in Fig 4.
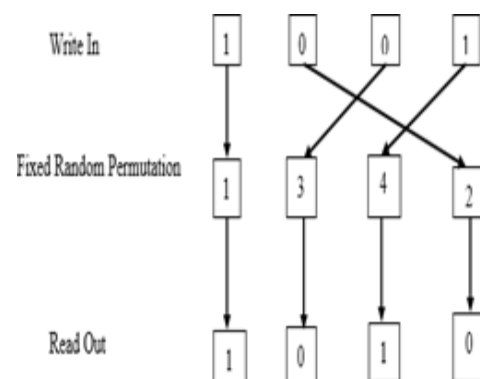


Fig 4: Pseudo-Random Interleaver

values are denoted. The main components of SISO decoderare: Branch , LLR Computation Unit and State Metric Unit.

## E. Steps to Implement Turbo Coder

Step 1: Write the Verilog code for Recursive ConvolutionalCode in Xilinx Vivado 2020.2 version.

Step 2: Write the Verilog code for

Interleaver. Step 3: Write the

Verilog code for SISO Decoder.

Step 4: Write the Verilog Code for Turbo Coder and call allthe subprograms to it.

Step 5: Save all the Programs and generate the Waveforms for Turbo Coder by Running the Simulation and Observe the waveforms generated.

Step 6: Observe the Schematic

of Turbo Coder. Step 7: Run the

Synthesis of Turbo Coder.

Step 8: Run the Implementation of Turbo Coder.

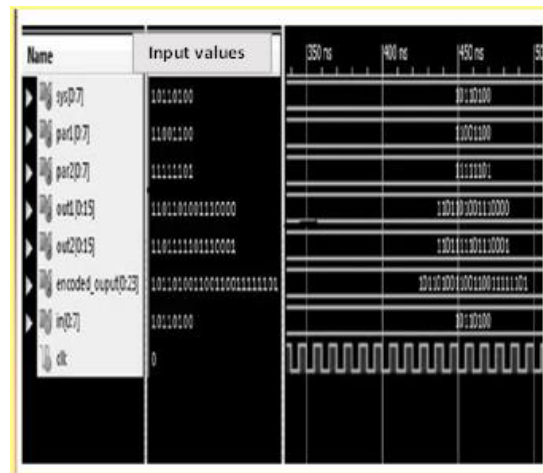Step 9: Observe the output for each block of Turbo Coder and finally the Turbo Coder is implemented.

## IV. RESULT AND DISCUSSION

Xilinx Vivado 2020 with Verilog HDL is used to simulate the Turbo encoder and decoder. Xilinx Vivado is used to simulate recursive systematic convolutional encoders, Turbo Encoder, and Turbo Decoder outputs. Xilinx's Verilog Design Suite is a Xilinx-based programme. It can be used to create and analyse HDL designs.

A. Turbo Encoder simulation Result

The turbo encoder receives an 8-bit input and produces a 24-bit output. Input bits make up the first eight output bits, whereas parity bits make up the remaining bits.
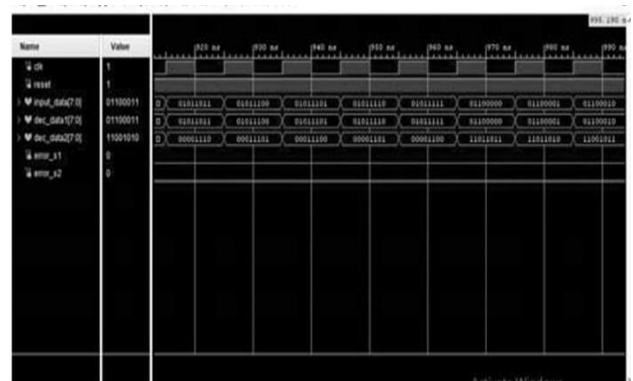
## D. SISO Decoders

Forward metrics, LLR computation, memory blocks, and backward metrics make up the SISO decoder architecture. Turbo Decoder is made up of two SISI Decoders. The flow of incoming symbol data will be governed by LIFO and FIFO memory blocks. The input data symbols are buffered using the FIFO 2 and 1, as well as the LIFO 2 and 1. LIFO 4 and 3 store the forward state metric and LLR values, respectively. There are two backward state metrics units in the SISO decoder , one of which is utilised to supply state metric values and the other of which computes LLR values using the backward state metric. The forward state and branch metric



Fig 5: Output of Turbo Encoder

## B. Turbo Decoder Simulation output using Vivado.

Each of the two SISO decoders produces an output of 8 bits.Both SISO decoders generate Nil errors.



Fig 6: Output of Turbo Decoder
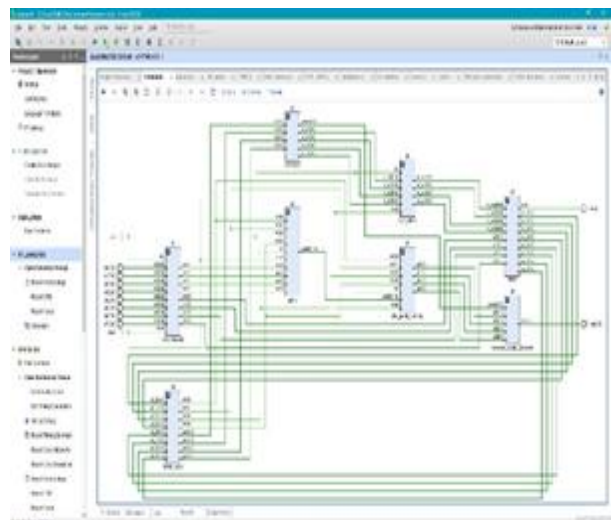
## C. Schematic Diagram of Turbo Coder



Fig 7: Schematic of Turbo Coder

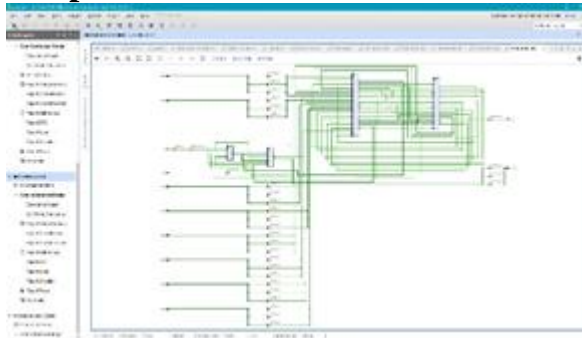## D. Schematic of Turbo Coder after Implementation.



Fig 8: Implementation of Turbo Coder

## V. CONCLUSION

In Xilinx Vivado 2020.2 version, using Verilog HDL, for 8- bit input, the Turbo encoder and Turbo Decoders were built and modelled. The 8-bit data is encoded into 24 bits in Turbo encoder and the encoded data is given via channel to the turbo decoder. There may be errors in the data received by the decoder, using SOVA algorithm the errors are detected and corrected and the original input is obtained has output at the decoder. Here, the original message is retrieved and errors are corrected at the decoder successfully. Waveforms are observed in Xilinx Vivado 2020.2 version and Synthesis is done.

## VI. FUTURE SCOPE

Turbo codes constructed using machine learning algorithms can be used in Deep space exploration. Turbo codes has the brightest future in multimedia system because of its extreme property of low latency and high throughput. Recently NASA started turbo codes rather than reed Solomon codes to develop their own applications.

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# PRINTED CIRCUIT BOARD FAULT DETECTION USING IMAGE PROCESSING IN MATLAB

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## ABSTRACT

*Printed circuit boards are blooming in current trends in the electronic field where it is easy to design with less cost. But there are design faults during the manufacturing of PCBs which may lead to huge losses in production. PCB fault detection plays a vital role; generally, it's difficult to manually detect PCB faults. So many emerging technologies as came into existence to detect the fault in PCBs. Since there are some drawbacks regarding accuracy. We are using Image processing-based technologies to detect faults in PCBs with much accuracy and get results faster than other technologies. Using these techniques, we can group 14 defects in PCB: This will be easy to analysis the fault and correct them. We take the standard image and test image use Morphological operation and classify the above defects. If we use the binary image so we get the exact output in the form of either level zero or level one by varying the intensity level of RGB the binary image is obtained in MATLAB. We are using the median filter to remove the noise from the image and we use surf descriptors to help to detect the matching features of the PCB datasets. Region props in Matlab we use the bounding box to find area, length, and height for defected areas. We will find the accuracy and precision using the confusion matrix.*

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*Keywords: Surf descriptors, binary images, morphological operations, segmentation, median filter, region props, bounding box, confusion matrix, Image processing.*

## Introduction

In the electronics industry, in the manufacture of printed circuit boards is becoming very important, because of consumer electronic products. It's very important for our day-to-day life. Currently, it is the vision of the verification process, it is essential to improve the quality of a PCB. It is responsible for the identification of both the cosmetic defects and functional defects. It consists of three main PCB management processes like defects location, defects classification and defects identification.

If the printed-circuit board (PCB) manufacturing industry has developed rapidly, PCB as the most important components of electrical and electronic products, which have become the main devices of the computer, cell phone or other electronic devices, with the increase of production, complexity, PCB's and outputs, the quality will not only have an impact on the performance of the product, as well as to the security of the product. The environment, the temperature of the equipment, and inappropriate use will lead to failure. To ensure the quality and safety of the tile that is to be opened for the purpose of this study is the quality at the right time.

By using manual inspection system for each of the PCB is not so preferable, as it consist of human error, more time utilized, cost is higher, and lead to a huge loss. Therefore, an automated monitoring system is needed. Where we can classify defects into 14 types, which are shown in the following table 1.

## Literature Survey

S. H. Indera Putera, 2010, [1] and I've got one of the preparatory works, He has a 7-in groups, instead of the 5 groups, so that the accuracy is higher.

Heriansyah, 2002 [2] proposed a method for the identification of PCB from damage with the help of neural networks. And they come with several stages: segmentation, window display, image, link, and detected faults, the lack of detection, the use of e-mail templates, standardization, and ranking.

Rongliliu, Xuedong Xue and Kang Cheng in

2015, [5], a study is carried out for the detection of printed circuit boards. This method is implemented by the circuit design, combine and / or software of the microprocessor in the phase of monitoring and research. The proposed system demonstrates the speed and accuracy of the detection of the board of the defects.

Moganti [6] for the first time, are presented in three main PCB inspection algorithms: a reference approach, where a comparison is made between the test and the test image. No-reference approaches to: general principles for design to be tested-for example, the width of the conductor and the insulator.

S. H. Indera Putera, [1] Z. Ibrahim, known as the automatic control of bare PCB. The morphological process, subtraction operation, and the segmentation operation can be used to detect errors on the PCB.

Liying Yuan, XueXu in 2010, [5] proposed an algorithm for the global edge detection can border on all four sides, with the help of an adaptive and efficient filtering algorithm with the canny operator. An algorithm is proposed as a way to take control of the local area, not on the edge. For edge detection, weighted-average method and the k-mean method is used.

### Methodology

The below block diagram shows that the test image and template image is pre-processed which we are taking as the data set in this project for that we will convert RGB to binary and removal of noise and detection of an edge is done in the image correction. After that, we perform the required morphological operations like Xor, and subtraction operations.

### Flow diagram for PCB fault detection

Fig. 1 is the schematic block diagram of PCB fault detection using image processing, and fig. 2 represents the flow chart of the proposed method, which written briefly and each method are explained step by step after the flow chart.

Table 1: Defects table

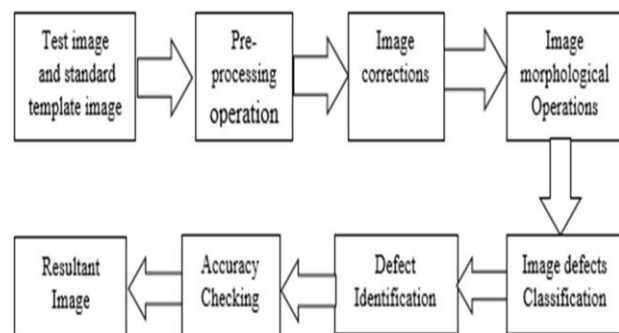| No. | DEFECTS |
|---|---|
| 1 | BREAK OUT |
| 2 | PIN-HOLE |
| 3 | OPEN CIRCUIT |
| 4 | UNDER-ETCH |
| 5 | MOUSE-BITE |
| 6 | MISSING CONDUCTOR |
| 7 | SPUR |
| 8 | SHORT |
| 9 | WRONG SIZE HOLE |
| 10 | CONDUCTOR TOO CLOSE |
| 11 | SPURIOUS COPPER |
| 12 | EXCESSIVE SHORT |
| 13 | MISSING HOLE |
| 14 | OVER-ETCH |



Fig 1: Schematic Block Diagram

### Image Acquisition

It is the process where the image is captured using the light source and sensors. The captured image is monitored using a console-like PC or some other display device. In the image figure below, they capture the PCB image using an acquisition setup consist of light, sensors, workbench, support, image process unit, and camera.

### Standard and defected image

The below two images are the standard and defected images of our datasets. The standard images is common for all the because PCB will be manufactures many at a time. So the defected images will be different compared with the
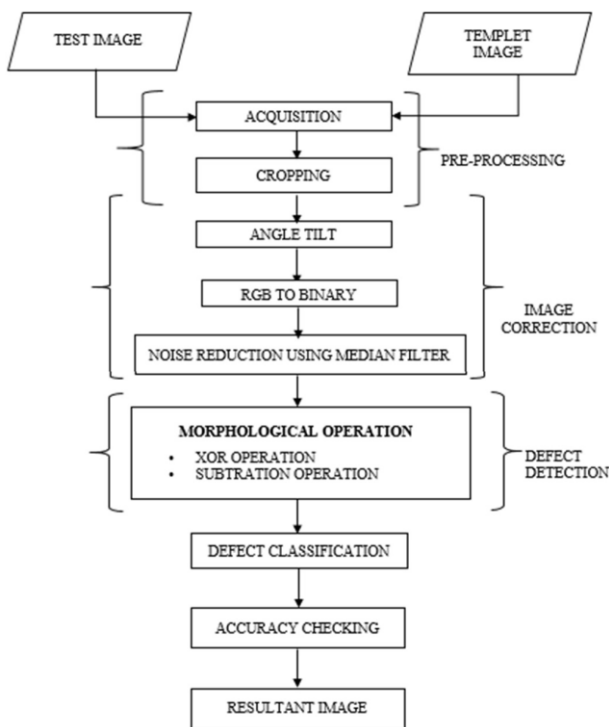
standard image.



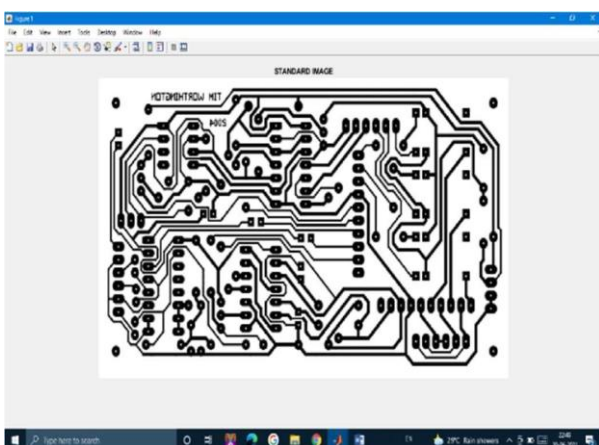**Fig 2 Flow chart of PCB fault detection**



**Fig 3 Image Acquisition**



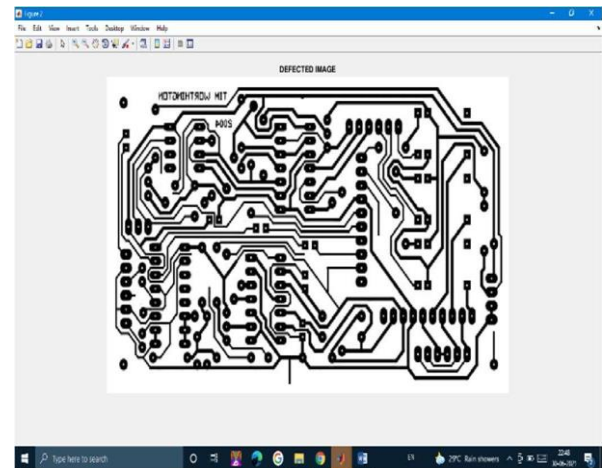**Fig 4: standard image**



**Fig 5: Defected images**

**Median Filter**

The median filter is used to calculate all pixel values to be sorted by the surrounding neighbourhood into numerical order and then replace pixel are considering the middle pixel value and the median filter is the best and only filter to remove salt and pepper noise which is also called impulse noise.

Since we use MATLAB for PCB fault detection there is a command for the median filter, which is shown below is the syntax

$$J = medfilt2 \, (image) \qquad (1)$$

$$J = medfilt2 \, (image, [x \, y]) \qquad (2)$$

**Morphological operations**

And we also perform a ground truth operation which is nothing but a two-step process of subtraction.

Step 1) Subtracting a standard image with a defected image.

$$G1 = standard \; image - defected \; image$$

Step 2) Subtracting a defected image with a standard image

$$G2 = defected \; image - standard \; image$$

Finally, ground truth image is obtained by adding resultants of step 1 and step 2 i.e.

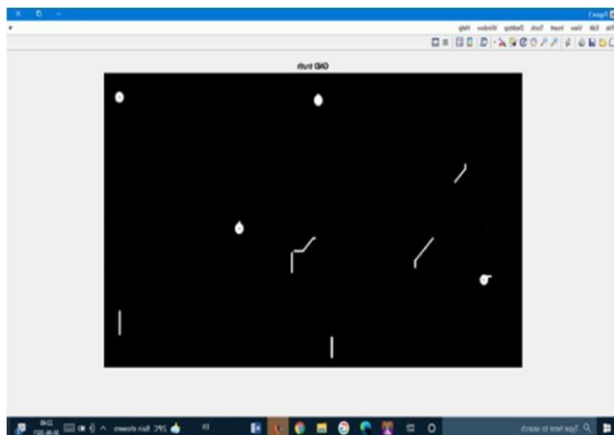$$GT = G1 + G2$$

Where GT = Ground truth image

**Fig 6: Ground truth image**

The below image is the resultant of the X-or operation of standard and defected images.
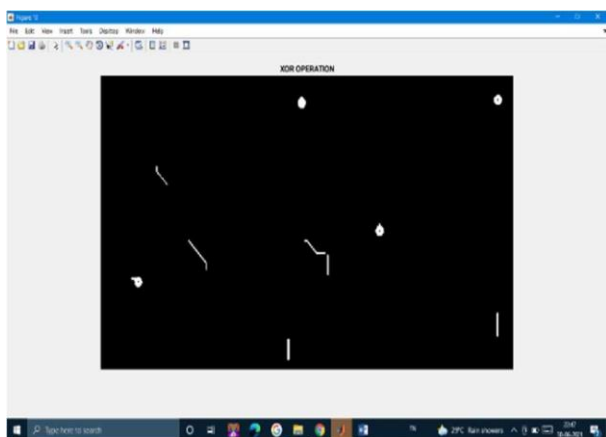


**Fig 7 X-or operation**

## RGB to Binary Conversion

The below images are the RGB image and binary image which are taken from the datasets. We convert the RGB image to a binary image to reduce the levels of output, so we get in either level one or level zero.
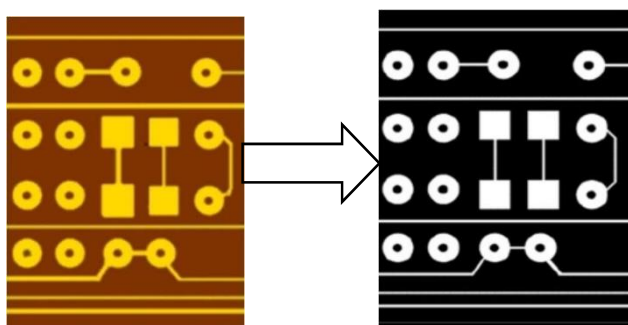


**Fig 8: RGB to Binary**

## Techniques used

### Algorithm of Surf in Matlab

The below is the algorithm for the surf descriptor for Matlab for the PCB defects detection.

Step 1: Start.

Step 2: Clear and close all the execution done before.

Step 3: Load the images in Workspace.

Step 4: Covert the images into grayscale.

Step 5: Remove the noise (if found) using the filters. Step 6: Apply the surf techniques to detect the surf features in the image.

Step 7: Find the Strongest feature points in the image by initializing the point values.

Step 8: Calculate the strongest feature point and compare the images.

Step 9: Match the matching point, from the compared image, according to their geometric Shapes.
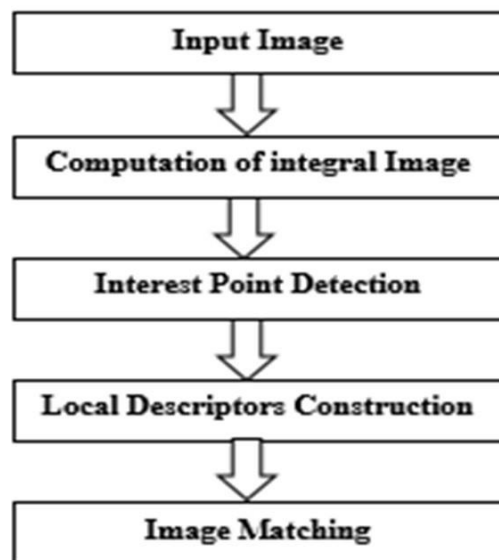
Step10: Display the Matched and Unmatched feature.



**Fig 9: Surf Algorithm**

The above is the flow of the surf algorithm in Matlab for both the defective image and standard image.

The speeded-up robust features (SURF) algorithm search about the orientation of the point by making directions and sizes to each key point. Next, it calculates the descriptor that represents the nearness of the key point. After that, it calculates the distance on the resulting descriptors which are not on the key point locations, as shown in the below figure.
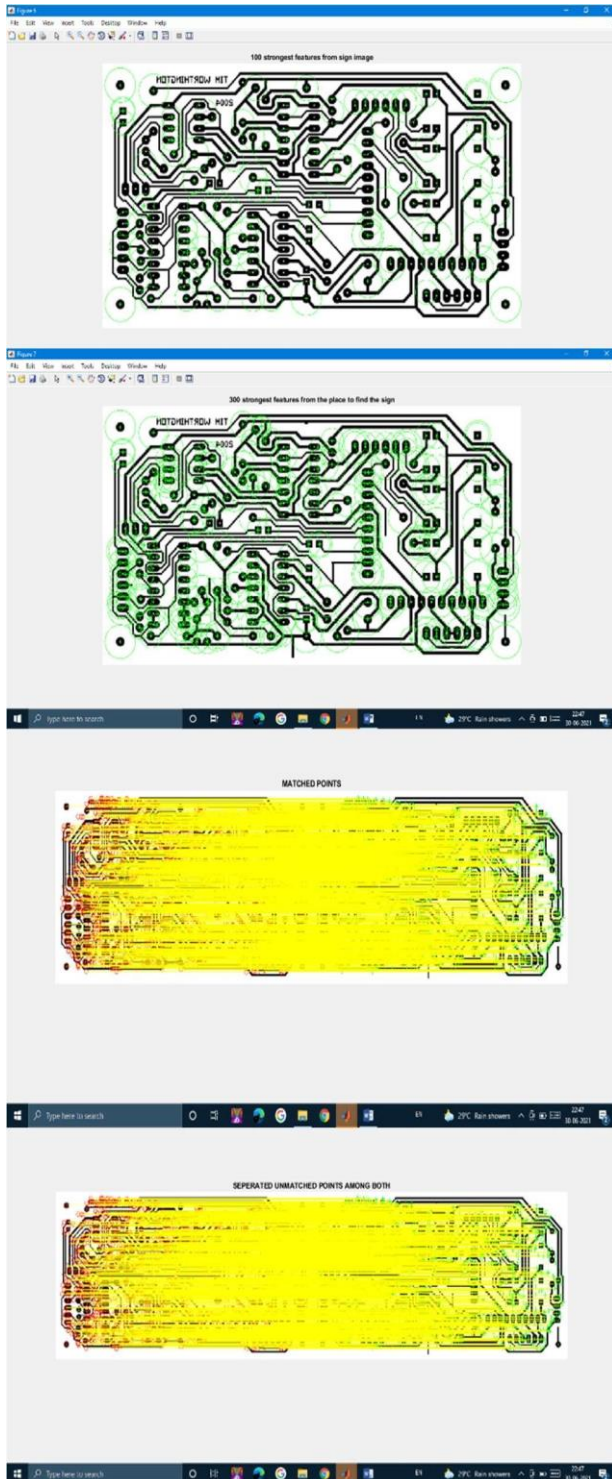


**Fig 10: Outputs of Surf**

**Region Properties in Matlab**

Measure properties of image regions are called region properties which are shortly called region props.

**Area**

The actual number of pixels in the area and will be returned as a scalar. This value may be different from the value returned is a black-and-white, the area that it weighs a different pixel pattern and other). In order to obtain the equivalent surface area of a three-dimensional volume, and the Amount of the property of the regionprops3. For the purposes of a white field (A1), a black area, or A2, in the end, we are in the area.

$$Total\ Area = A1/A2 \qquad (3)$$

**Length**

It is measuring the length of the large array size in X variable. The vectors for length is no different from the total number of pixels. Large number of parameters, the length is max (size (X)).

$$Length = \max(X) - \min(X) \qquad (4)$$

**Height**

It is the measures of the number of rows in the image Height is equal to the size (T, 1).

$$Height = Max\ (Y) - Min\ (Y) \qquad (5)$$

**Bounding Box**

The position and the size of the smallest field containing the fields of the feedback is in the form of a vector, a 1 - (2*Q)). The first Q elements, the coordinate of the minimum corner of the box. In the second, the Q-factors, the size of the box along each of the dimensions.

The above figure is bounding box applied for single error to find length, area and height of the errors in PCB. We have cropped the output to make it visible clear in the output screen.

**Fig 11: Bounding box**

## Confusion matrix

The below fig.12 shows confusion matrix of two- class, standard and defected classifier. Information about actual and predicted classifications. Confusion Matrix is a tool to determine the performance of the give input data. Using true positive, true negative, false positive and false negative the following parameters are evaluated as accuracy, false alarm rate, precision and error rate. Table 2 is evaluated the area, height and length, by this observation can identify the variation range of printed circuit differences.



**Fig 12: Confusion matrix**

The below are the formulas for the calculating the tabulated values for table 3.

*Accuracy*: This parameter defines how effectively predicting actual accuracy

$$ACC = \frac{(TP+TN)}{(TP+TN+FP+FN)} \qquad (6)$$

*False alarm rate*:

$$FAR = FP/(FP + TN) \qquad (7)$$

*Error rate*:

$$ERR = (TP + TN)/(TN + TF + FP + FN) \qquad (8)$$

*Precision*:

$$P = TP/(TP + FN) \qquad (9)$$

Using the above formulas, we can calculate the accuracy and precision of the defected image. This formula logic can used in the Matlab to extract the output of the confusion matrix.
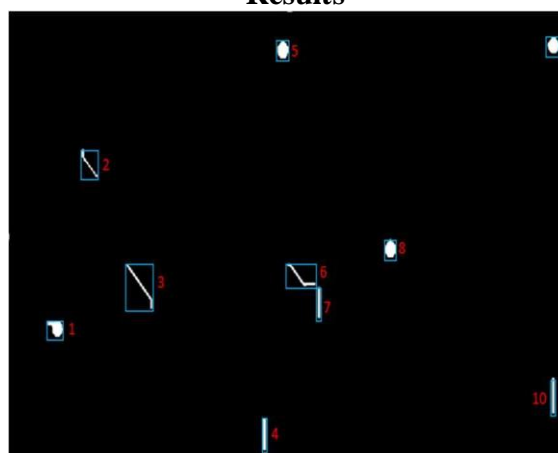
## Results



**Fig 13: X-or result**

The table 1 are the values for all the error from the PCB board using bounding box for the figure 13.

**Table 2: Output values of bounding box**

| Defect No. | A1 | A2 | H | L |
|---|---|---|---|---|
| 01 | 50.5 | 261.5 | 13 | 19 |
| 02 | 91.5 | 118.5 | 23 | 19 |
| 03 | 145.5 | 214.5 | 37 | 30 |
| 04 | 308.5 | 342.5 | 27 | 3 |
| 05 | 325.5 | 27.5 | 15 | 13 |
| 06 | 337.5 | 213.5 | 19 | 33 |
| 07 | 373.5 | 233.5 | 26 | 3 |
| 08 | 453.5 | 193.5 | 15 | 14 |
| 09 | 648.5 | 25.5 | 13 | 14 |
| 10 | 653.5 | 308.5 | 30 | 3 |

**Table 3: Outputs for different datasets**

| DATA SETS 1 | DATA SETS 2 |
|---|---|
| TP = 1077 | TP =2482 |
| TN = 257974 | TN =90401 |
| FP =21 | FP =40 |
| FN =8 | FN =5 |
| Accuracy =0.9999 | Accuracy =0.9995 |
| Far =0.7241 | Far =0.8889 |
| ERR =0.11 | ERR =0.842 |
| P =0.9809 | P =0.9841 |

The below table 2 shows the details of two data sets for complex and simple datasets and the accuracy, precision values with true positive, true negative, false positive and false negative by using confusion matrix.

## Conclusion

The PCB fault detection is used to determine defects in the PCB board in an easier and quick way by using image processing techniques and we do angle tilt and cropping to remove unwanted areas. We covert the data sets to binary image and use median filter to remove noise in the dataset image during pre-processing step.

The proposed system was able to determine accuracy of 99 % and precision of 98 % using the confusion matrix. We generate the ground truth image using subtraction operation and we also find the X-or operation between standard and defected image. Finally, we compare ground truth and X-or results to find the better accuracy and precision

It will also able to detect defect area, length, and, height of the pcb board using region props in an accurate way for industrial uses in the single layer PCB boards. In the future work we can use for Multilayer PCB board from VLSI and embedded systems.

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