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Review on Different Methods of Image Colorization

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ABSTRACT

This review paper is to showcase some of the different methods that have been tried out for the process of image Colorization. There have been different ways to colorize images since early times. Today's trend is focused towards fully automatic image Colorization techniques. This paper gives an overview of some varied methods that have been tried and implemented, along with their advantages and disadvantages, and a comparison between them.

Keywords: Colorization

I. INTRODUCTION

Image Colorization is the process of adding colors to Grayscale images, to make them aesthetically appealing and to have a better visual perception from the image. This could be used to colorise old photos and videos to make them more appealing, CCTV footages to have better understanding of the scenario and make sharper inferences, and possibly even to MRI images, making it easier for doctors to identify problems.

There have been various methods used to colorise images, but it used to be a very sophisticated task, requiring a lot of human intervention. Hence people have been trying different methods to ease this process.

On a broad perspective, Image Colorization techniques can be classified into Manual approach, Scribble based approach, Example based approach, Learning based approach. Currently, the attempt is to produce a system which could colorise images in a fully automatic manner, using deep learning methods.

In this paper, we summarize the different techniques that have been tested along with their comparison of results.

The organization of this document is as follows. In Section 2 (**Literature Survey**), a detail study of existing methods are done. In Section 3 (**Overview of Literature Survey**), we have discussed about the different methods and its limitations. Discussed in Section 4 (**Conclusion**) we have concluded our research.

II. LITERATURE SURVEY

A. Colorization of Grayscale Images and Videos using a Semi-Automatic Approach

This paper [3] presents a semi-automatic approach for Colorization. They make use of segmentation, and color different areas of images should be colorized. The algorithm adds color to each pixel by considering the position of color markers. It first segments the image and then colorises it. They also attempt to colorise videos, by some frames, colorising them, then transferring the color to other frames. Keyframes are selected local minima of block motion. Segmentation is done using rain water simulation technique of

watershed segmentation [1]. This method of segmentation leads to over-segmentation merging operations. of a unique segment, each with a marker after the process. Their results looked visually good for a large number of images.

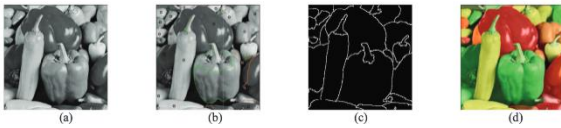


Figure 1. Comparisons with (a): Grayscale image (b): Grayscale image with color markers (c): Segmented image (d): Colorised output image.

B. Infrared Colorization Using Deep Convolutional Neural Networks

The paper [4], deals with Colorization of Near-infrared (NIR) images of road scenes captured from cameras of cars. They make use of a multi-scale deep convolutional neural network. The approach consists of 3 parts, namely pre-processing, inference, and post-processing.

In pre-processing stage, they make up an image pyramid of the input image in multiple resolutions. Then for inference, each element of the pyramid passes through several convolutional layers and max pooling layers.

After this, the result of each element passing through the deep CNN is merged using a fully connected layer. A bilateral filter is applied onto the result of above, as post-processing, to reduce noise produced in the result.

The disadvantage of this method is that the resulting colorised images looks more like paintings that real world pictures.

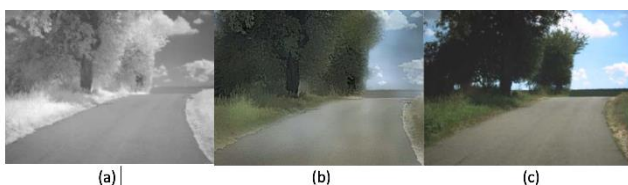


Figure 2. (a): Source image (b): Colorised image (c): Target output.

C. Fully automatic image Colorization based on Convolutional Neural Network

In this paper [5], a feed-forward, 2 stage architecture based on Convolutional Neural Network is used, to predict U and Color channels of an input Grayscale image. Colorization is looked at as a regression problem and is resolved using Anstey make use of the pre-trained VGG-16 classifier, which is already trained on a million images. The architecture consist of the VGG-16 model along with a 2 stage CNN that outputs the predicted U and V color channels of the image. They have used the YUV color model because it has the minimum correlation between the 3 coordinate axes. It produced very good results for some images. They evaluated the performance of the system using Quaternion Structural Similarity Index Measure (QSSIM)[8] , and obtained better values of QSSIM for their results than many of the previous methods which they compared with. Drawbacks of this method are that, if the system cannot clearly identify semantic information in the image, it tends to blur the output with a sepia or brownish tone. Also, sometimes the color information of the bigger semantic regions of the image get transferred to the smaller semantic regions

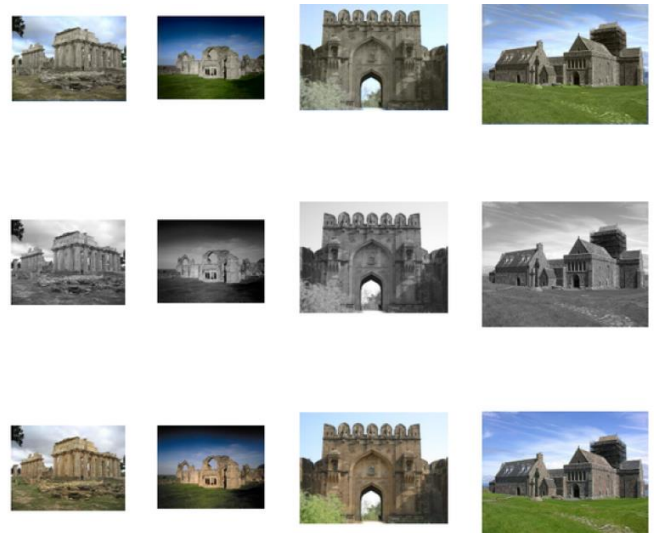


Figure 3. First row shows colorised output images. Second row shows the Grayscale input images , and third row shows the ground truth images



Figure 4. First row : Sepia tone of output image on the right side, with ground truth image. Second row : Spreading of green color.

D. Patch-Based Image Colorization

In this paper, a simple patch-based image Colorization based on an input image as a color example. This method which is based on patch descriptors of luminance features. A color prediction model with a general distance selection strategy. A Total Variation (TV) regularization is also performed on the colorized image to ensure the spatial color coherency of the final result. Experiments show the potentiality of our proposition in order to automatically colorize Grayscale images. The color prediction is performed from the luminance channel of both images. One drawback of automatic color-inaction is the spatial coherency during the color transfer leading to possible inconsistent Colorization in the final result. The image Colorization scheme is described based on patch features as pixels descriptors to capture image textures or complex structures.

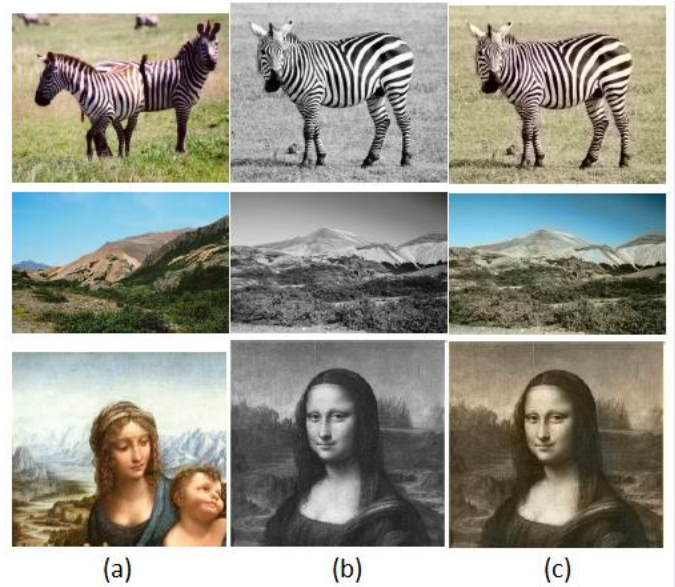


Figure 5. Comparisons with (a): Source image (b): Target image (c): Results

E. Manga Colorization

This Paper [7], Colorization technique that applies color over certain to the pattern continuity as well as that region. This black and white manga or cartoons which has drawing with the intensive number of strokes, halftoning and screening. intensity introduce many kinds of difficulties to Colorization methods which depend on intensity once the user marks on the drawing, a local, statistical-based pattern feature mechanism obtained with Gabor wavelet tarsi's applied to find the pattern-continuity. The boundary is then propagated by the level set method that monitors the level of. regions with same can be segmented by a single scribble. On these segmented regions, various Colorization techniques can be applied to replace Colors, colorize with stroke preservation, or even convert pattern shading

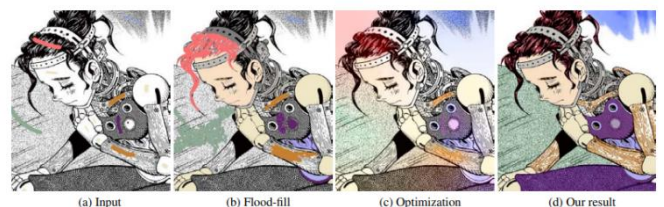


Figure 6. Colorization of pattern-continuous and intensity-continuous regions in manga

This method starts by drawing the desired interested regions. It automatically propagates the color within the pattern-continuous regions. The coloring stops change at the abrupt change, no fixed outline. Figure 5(c) demonstrates our Colorization result after faithfully segmenting the regions with similar patterns. screening pattern (background and bed in Figure 5(a)) or as stochastic as hand-drawn hatching expressing textures and/or structures (hair and wooden arms).

any of these methods 1) leak-proof Colorization of intensity-continuous regions even when the boundaries are open or drawn casually 2) Colorization of pattern-continuous regions while preserving textures or structures of the patterns 3) for patterns expressing shading only.

III. OVERVIEW OF LITERATURE SURVEY

Table 1

| Title | Year | Method Used | Limitations |
|---|------|--|---|
| Colorization of Grayscale Images and Videos Using a Semi-Automatic Approach | 2009 | Segmentation and Color Markers | Depends on human interaction |
| Infrared Colorization Using Deep Convolutional Neural Networks | 2016 | Multi-Layer Deep Convolutional Neural Network | Colorised images tend to look less realistic due to smoothing filter |
| Fully automatic image Colorization based on Convolutional Neural Network | 2016 | 2-Stage Feed- Forward CNN with VGG-16 Classifier Model | Incorrect recognition leads to results being brownish. Color of larger semantic parts affect that of smaller ones |
| Patch- Based Image Colorization | 2012 | Patch Based Method -Based on Patch Descriptors of luminance Feature. | The colorized result can be seen with a desaturation effect |
| Manga Colorization | 2006 | It propagates color over regions exhibiting pattern | Intensity continuity and When two patterns overlap the system identifies them as a distinct pattern |

IV. CONCLUSION

Image Colorization had always been a tedious task, and much attempts have been done to automate this task. In this review paper, we have seen different methods of image Colorization that have been modelled and their results and drawbacks. We have seen approaches that are semi-automatics well as the current models of fully automatic image colourisation using convolutional neural networks and classifiers. We have also seen that the best

results for automatic image Colorization so far, has been obtained by using Multistage convolutional neural networks along with classifiers.

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Extrapolation of Heart Diseases and Breast Cancer using Machine Learning Approaches

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ABSTRACT

A major portion of the world population does not have access to proper healthcare. Heart diseases and Breast cancer is the one of the most important diseases in our day to day life. These diseases is quiet common now a days , different attributes which can relate to heart diseases and breast cancer well to find the better method to predict these disease by machine learning algorithms. Application of machine learning methods in biosciences and health care is presently, more than ever before, vital and indispensable in efforts to transform intelligently all available information into valuable knowledge. In our proposed method Decision Tree approach and Logistic Regression approach are used for predict the Heart diseases and Breast cancer. In existing method reveals that 90.2% and 77.5% accuracy by using decision tree approach in breast cancer and heart disease datasets. In our proposed method reveal that 95% and 83% accuracy in decision tree approach, and Logistic regression approach reveals that 95.8% and 88.3% respectively in breast cancer and heart disease datasets .Its seems to be that our proposed methods are better than the existing method.

Keywords: Decision Tree, Logistic Regression, Machine Learning.

I. INTRODUCTION

In our world there are so many researchers was developed to identified the diagnosis of the diseases, the pattern of diseases is an important part of this. The main cause of breast cancer is when a single cell or group of cells escapes from the usual controls, that regulate cellular growth and begins to multiply and spread. This activity may result in a mass, tumor or neoplasm. Many masses are benign that means the abnormal growth is mainly restricted to a circumscribed, single and expanding mass of cells. Medical data mining has great potential for exploring the hidden patterns in the data sets of the medical domain. These patterns can be utilized for clinical diagnosis. However, the available raw medical data are widely distributed, heterogeneous in nature, and

voluminous. These data need to be collected in an organized form. This collected data can be then integrated to form a hospital information system. Data mining technology provides a user oriented approach to novel and hidden patterns in the data. The term Heart disease encompasses the diverse diseases that affect the heart. Heart disease was the major cause of casualties in the different countries including India. Heart disease is a term covering any disorder of the heart. Unlike cardiovascular disease, which describes problems with the blood vessels and circulatory system as well as the heart, heart disease refers to issues and deformities in the heart itself .Heart disease kills one person every 34 seconds in the United States.

In this research work, the supervised machine learning concept is utilized for making the predictions. A comparative analysis of the two data mining classification algorithms namely Decision Tree and Logistic Regression are used to make predictions. The Stat Log dataset from UCI machine learning repository is utilized for making heart disease predictions in this research work. The predictions are made using the classification model that is built from the classification algorithms when the heart disease dataset is used for training. This final model can be used for prediction of any types of heart diseases and breast cancer. The area under the ROC curve was used as a measurement of accuracy. Illustrated in Figure 1

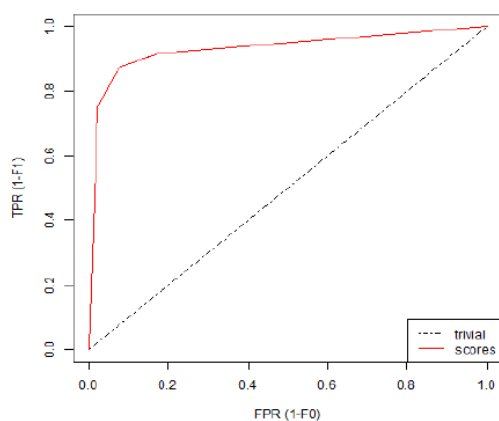


Figure 1. ROC curve

II. RELATED WORKS

During the past few years, various contributions have been made in literature regarding the predicting diseases in precise level. In recent research works, several neural network models have been developed to aid in diagnosis of heart diseases and breast cancer.

Htet Thazin Tike Thein and Khin Mo Mo Tun [1] proposed an approach for breast cancer diagnosis classification using neural network, the network is trained by DE which has been parallelized in order to achieve better performance. This paper presents a result of direct classification of data after replacing missing values using median method for the WBCD

dataset by using island differential evolution algorithm. The training algorithms are compared using accuracy and computing time and finally get 94% accuracy and computing time of 16sec.

Puneet Yadav, Rajat Varshney, Vishan Kumar Gupta[2] proposed diagnosis of breast cancer using decision tree models and svm. The goal of this paper is using machine technique to predict benign cancer or the malignant one. Decision trees, Neural Networks, and SVM are powerful data mining techniques tools that can be used to achieve effective results. These algorithms construct their models using training data set then test the obtained models on the test data. In study machine learning algorithms will be tested using breast cancer Wisconsin data set, and then compared to result. By comparing the two algorithms get an accuracy of 90%

Sanjay Kumar Sen proposed[3] “Predicting and Diagnosing of Heart Disease Using Machine Learning” In this paper, they carried out an experiment to find the predictive performance of different classifiers. select four popular classifiers considering their qualitative performance for the experiment. We also choose one dataset from heart available at UCI machine learning repository. Naïve base classifier is the best in performance. Finally get an accuracy of 77%.

According to H. Benjamin Fredrick David and S. Antony Belcy[4] heart disease can be predicted using data mining techniques. In this research work, the supervised machine learning concept is utilized for making the predictions. a comparative analysis of the three data mining classification algorithms namely random forest, decision tree and naïve bayes are used to make predictions the analysis is done at several levels of cross validation and several percentage of percentage split evaluation methods respectively. the statlog dataset from uci machine learning repository is utilized for making heart disease predictions. In this research work. the predictions are made using the

classification model that is built from the classification algorithms when the heart disease dataset is used for training. this final model can be used for prediction of any types of heart diseases.

Latha Parthiban and R.Subramanian[5] have proposed a method Intelligent Heart Disease Prediction System using CANFIS and Genetic Algorithm, The main objective of this research is to develop a prototype Intelligent Heart Disease Prediction System with CANFIS and genetic algorithm using historical heart disease databases to make intelligent clinical decisions which traditional decision support systems cannot. The publicly available Cleveland heart-disease database consists of 303 cases where the disorder is one of four types of heart-disease or its absence.

Shiv Shakti Shrivastava , Anjali Sant , Ramesh Prasad Aharwal proposed”[6] An Overview on Data Mining Approach on Breast Cancer data. This paper gives the current overview of use of data mining techniques on breast cancer data. This paper also gives the study of data mining on medical domain which has already done from researchers. In this paper we use classification data mining techniques on breast cancer data with using data mining software. A huge amount of medical records are stored in databases. Data are produce from different sources and continuously stored in depositories. These databases are more complicated for the point of analysis. Data Mining is a relatively new field of research whose major objective is to acquire knowledge from large amounts of data.

Freddie Bray, Peter McCarron and D Maxwell Parkin[8] proposed a review about “The changing global patterns of female breast cancer incidence and mortality”. In this paper we review the descriptive epidemiology of the disease, focusing on some of the key elements of the geographical and temporal variations in incidence and mortality in each region of the world. The review includes published studies and some new analyses using incidence data from population-based cancer registries and mortality data

from the WHO databank. We then discuss possible explanations for the results in the light of the changing prevalence of the known aetiological factors, the impact of screening and other preventive strategies, and progress in disease management; we conclude with some comments on future prospects for prevention

Mehmet Fatih Akay[9] proposed an “Support vector machines combined with feature selection for breast cancer diagnosis” In this study, SVM with feature selection was used to diagnose the breast cancer. WBCD taken from the University of California at Irvine (UCI) machine learning repository was used for training and testing experiments . It was observed that the proposed method yielded the highest classification accuracies (98.53%, 99.02%, and 99.51% for 50–50% of training-test partition, 70–30% of training-test partition, and 80–20% of training-test partition, respectively) for a subset that contained five features. Also, other measures such as the confusion matrix, sensitivity, specificity, positive predictive value, negative predictive value and ROC curves were used to show the performance of SVM with feature selection.

Table 1. Comparison of related works

| Author | Algorithms | Accuracy | Year |
|--|--|--------------------------------------|------|
| Htet Thazin Tike Thein and Khin Mo Mo Tun | Neural network | 94% | 2015 |
| Sanjay kumar sen | 1.Naive base classifier 2.SVM 3.Decision tree 4.K-Nearest | 83.49% 84.15% 77.55% 67.23% | 2017 |
| Mehmet Fatih Akay | SVM | 80.29% | 2009 |
| Puneet Yadav, Rajat Varshney, Vishan Kumar | Decision tree and SVM | 90% | 2018 |

III. METHODS AND METHODOLOGY

A. DATA SETS

The Stat Log dataset from UCI machine learning repository is utilized for making heart disease and breast cancer prediction in this research work. Two

sets of data's are used for heart diseases and breast cancer.

S1 - Heart diseases

S2 – Breast cancer

1.Heart diseases (S1)

This database contains 76 attributes, but all published experiments refer to using a subset of 14 of them. In particular, the Cleveland database is the only one that has been used by ML researchers to this date. The "goal" field refers to the presence of heart disease in the patient. It is integer valued from 0 (no presence) to 4. Experiments with the Cleveland database have concentrated on simply attempting to distinguish presence (values 1,2,3,4) from absence (value 0).

One file has been "processed", that one containing the Cleveland database. All four unprocessed files also exist in this directory.

1.1 Attribute information

Only 14 attributes used:

1. age
2. sex
3. Cp = chest pain type
4. trestbps - resting blood pressure
5. Chol- serum cholestoral in mg/dl
6. Fbs- (fasting blood sugar > 120 mg/dl) (1 = true; 0 = false)
7. restecg - resting electrocardiographic results
8. thalach - maximum heart rate achieved
9. Exang- exercise induced angina (1 = yes; 0 = no)
10. Oldpeak- ST depression induced by exercise relative to rest
11. Slope- the slope of the peak exercise ST segment
12. Ca- number of major vessels (0-3) colored by flourosopy
13. Thal- : 3 = normal; 6 = fixed defect; 7 = reversable defect
14. num- diagnosis of heart disease (angiographic disease status)

2. Breast Cancer (S2)

The data set consist of 15 types of attributes

1. Number of instances: 569
2. Number of attributes: 32 (ID, diagnosis, 30 real-valued input features)
3. Attribute information

- 1) ID number
- 2) Diagnosis (M = malignant, B = benign) 3-32)

Ten real-valued features are computed for each cell nucleus:

- a) radius (mean of distances from center to points on the peri)
- b) texture (standard deviation of gray-scale values)
- c) perimeter
- d) area
- e) smoothness (local variation in radius lengths)
- f) compactness (perimeter² / area - 1.0)
- g) concavity (severity of concave portions of the contour)
- h)concave points (number of concave portions of the contour)
- i) symmetry
- j) fractal dimension ("coastline approximation" - 1)

Several of the papers listed above contain detailed descriptions of how these features are computed.

The mean, standard error, and "worst" or largest (mean of the three largest values) of these features were computed for each image, resulting in 30 features. For instance, field 3 is Mean Radius, field 13 is Radius SE, field 23 is Worst Radius.

All feature values are recoded with four significant digits.

4. Missing attribute values: none
5. Class distribution: 357 benign, 212 malignant

B. ALGORITHMS USED

1. Classification using decision tree

Decision Tree (DT) is a simple and easy to implement classifier. The bit through feature to access in depth patients' profiles is only obtainable in Decision Trees. Decision tree builds classification or regression models in the structure of a tree making it simple to debug and handle. Decision trees can handle both categorical and numerical data. The algorithm works by finding the information gain of the attributes and taking out the attributes for splitting the branches in threes. The information gain for the tree is identified using the below given equation

$$E(S) = -P(P)\log_2 P(P) - P(N)\log_2 P(N) \quad (1)$$

2. Classification using logistic regression

Like all regression analyses, the logistic regression is a predictive analysis. Logistic regression is used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables.

C. PERFORMANCE METRICS

1. Precision

Precision Recall graphs of heart diseases and breast cancer are shown below. In Precision is the part of significant instances between the retrieved instances. The Eq. of precision is given in Eq.(2)

$$\text{Precision} = \text{TP}/(\text{TP}+\text{FP}) \quad (2)$$

2. Recall

Recall is the small part of appropriate instances that have been retrieved over the total quantity of relevant instances. The Eq. of recall is given in Eq.(3).

$$\text{Recall} = \text{TP}/(\text{TP} + \text{FN}) \quad (3)$$

3. ROC area

Roc Curves are commonly used to show in a graphical way the connection/ trade off involving clinical sensitivity and specificity for every potential cut off for a test or an arrangement of tests.

4. Accuracy

Accuracy is the most intuitive performance measure and it is simply a ratio of correctly predicted observation to the total observations. One may think that, if we have high accuracy then our model is best. Yes, accuracy is a great measure but only when you have symmetric datasets where values of false positive and false negatives are almost same

$$\text{Accuracy} = \text{TP}+\text{TN}/\text{TP}+\text{FP}+\text{FN}+\text{TN}$$

D. METHODOLOGY

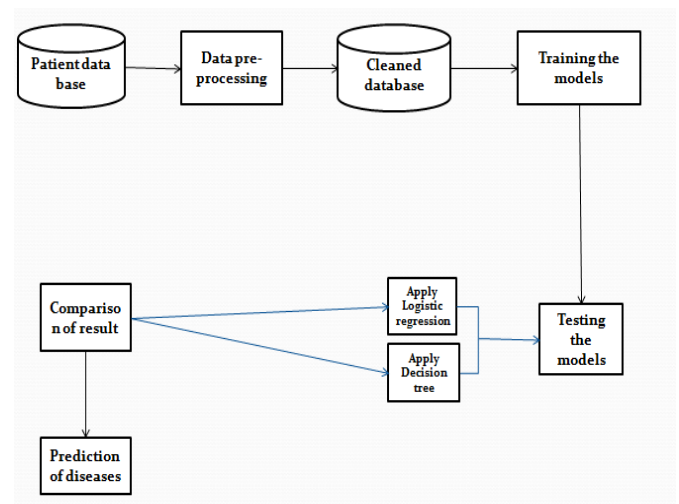


Figure 2. Methodology

The heart disease and breast cancer prediction can be performed by following the procedure which is similar to Figure 1 which specifies the research methodology for building a classification model required for the prediction of the heart diseases and breast cancer in patients.

The following algorithm refers the actual description of the research work

- 1) Initialise the processes
- 2) Collect all the heart diseases and breast cancer database from patients(UCI machine learning repository)
- 3) The collected data undergoing pre-processing
- 4) Clean the two database by removing all the missing values and attributes.
- 5) Train the model
- 6) Test the model by using the algorithm's such as logistic regression and decision tree.
- 7) Comparising both the training result.
- 8) Finally predicting the diseases.

The model forms a fundamental procedure for carrying out the heart diseases and breast cancer prediction using any machine learning techniques. Firstly collect all the datasets of heart diseases and breast cancer, and train all the datasets by using classification algorithms such as decision tree and logistic regression. In the third step the training datasets undergoing testing also using decision tree and logistic regression, Finally applying these two algorithms to the sufficient datasets, prediction of result is obtained and accuracy of these algorithms are compared.

IV. RESULT AND DISCUSSION

This section describes the results of both proposed and existing system. Logistic regression and machine learning algorithms are used to predict the heart diseases and breast cancer in proposed system and some machine learning algorithms are used to predict the breast cancer and heart diseases in existing system. By comparing these two systems(Existing and Proposed systems), proposed system depicts accurate results than existing system. The analysis and identification of the best classification algorithm in this research work is done and the results are provided here. A brief description about the data sets was presented in above section. Accuracy of proposed system, precision and recall values are shown in table 2.

Table 2. Proposed System Accuracy's

| Datasets | Algorithms | Precision | Recall | Accuracy |
|----------|---------------------|-----------|--------|----------|
| S1 | Decision tree | 0.835 | 0.830 | 83% |
| S1 | Logistic regression | 0.897 | 0.877 | 88% |
| S2 | Decision tree | 0.947 | 0.950 | 95.1% |
| S2 | Logistic regression | 0.963 | 0.947 | 95.8% |

1. FIGURES AND TABLES

1.1. S1

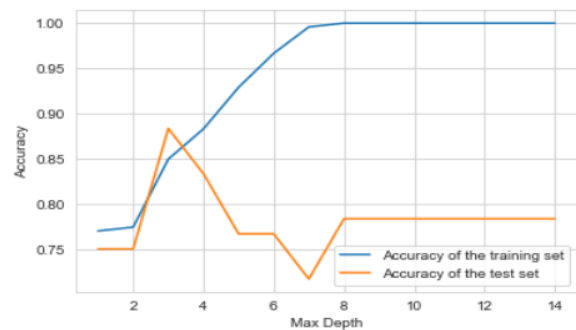


Figure 3 . Accuracy

Figure 3 shows the actual accuracy of heart diseases in both the case of training and testing cases. X axis plot the max depth and Y axis plot the accuracy and get a accuracy above 80%.

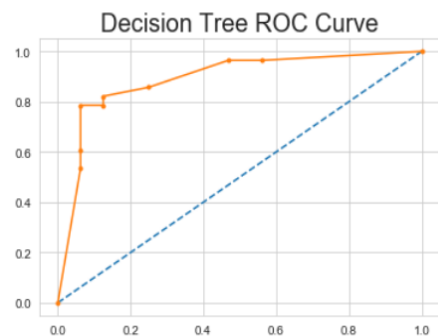


Figure 4. ROC of Decision Tree

A receiver operating characteristic (ROC), or simply ROC curve, is a graphical plot which illustrates the performance of a binary classifier system as its discrimination threshold is varied. It is created by

plotting the fraction of true positives out of the positives (TPR = true positive rate) vs. the fraction of false positives out of the negatives (FPR = false positive rate), at various threshold settings. Fig 4 shows the receiver operating characteristics of decision tree and get a maximum accuracy of 94%. x axis denotes the false positive rate ,y axis denotes the true positive rate

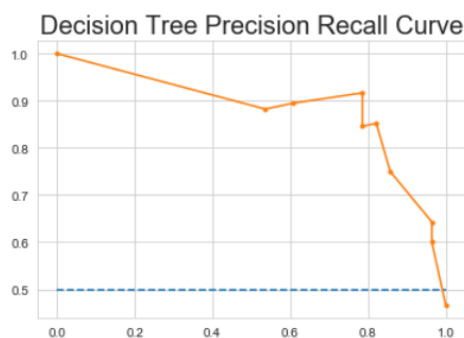


Figure 5. Precision Recall curve of Decision tree

Precision (P) is defined as the number of true positives (Tp) over the number of true positives plus the number of false positives (Fp). Fig 5 shows the precision recall curve of decision tree classifier.

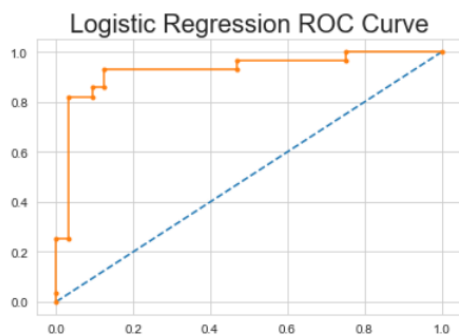


Figure 6. ROC of Logistic Regression

Figure 6 plot the receiver operating characteristics of logistic regression classifier. It shows the average of 94% accuracy.

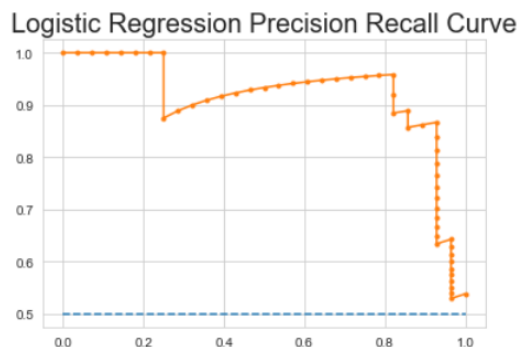


Figure 7. Precision Recall curve of Logistic regression

Figure 7 shows the precision recall accuracy of logistic regression classifier in heart diseases prediction

1.2 . S2

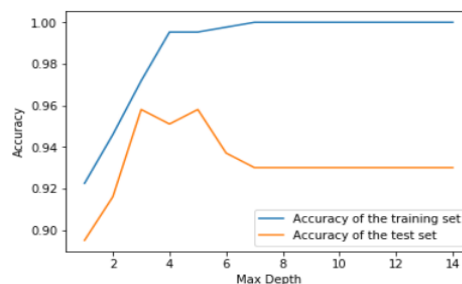


Figure 8. Accuracy

To check the accuracy we need to import confusion_matrix method of metrics class. The confusion matrix is a way of tabulating the number of mis-classifications, i.e., the number of predicted classes which ended up in a wrong classification bin based on the true classes.

Figure 8 shows the actual accuracy of breast cancer above 90%.

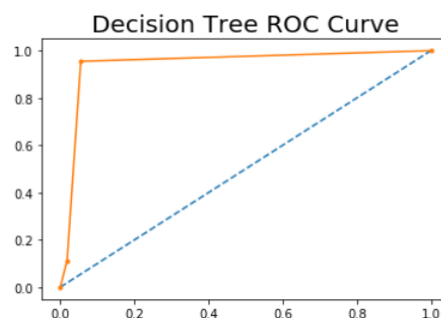


Figure 9. ROC of Decision tree

Figure 9 depicts the region operating characteristics of decision tree in breast cancer prediction and get an accuracy of 94%.

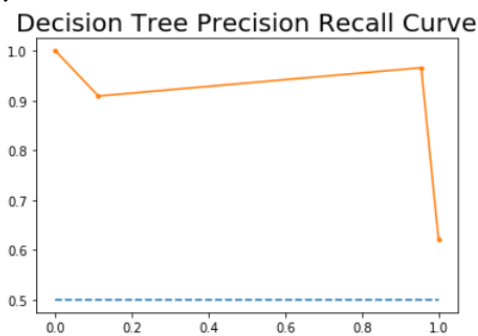


Figure 10. Precision Recall curve of Decision tree

This graph shows the precision recall curve of breast cancer by using decision tree classifier. A precision-recall curve is a plot of the precision (y-axis) and the recall (x-axis) for different thresholds.

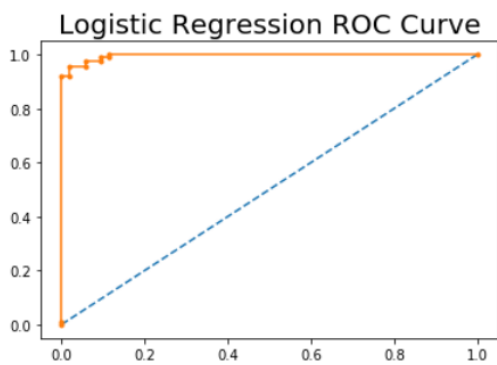


Figure 11. ROC of Logistic Regression

It plots the region operating characteristics of logistic regression classifier used in breast cancer prediction with an accuracy of 95%. It is created by plotting the fraction of true positives out of the positives (TPR = true positive rate) vs. the fraction of false positives out of the negatives (FPR = false positive rate).

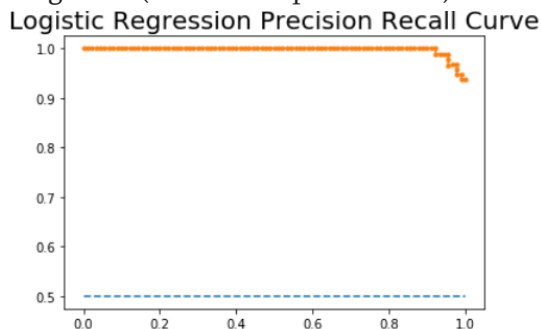


Figure 12. Precision Recall curve of Logistic Regression

The graph shows the precision recall curve of logistic regression in breast cancer prediction. If you graph these points (with precision on the y-axis and recall on the x-axis), you get a precision-recall curve (or equivalently, a precision-recall graph)

1.3 EXISTING SYSTEM V/S PROPOSED SYSTEM

By analyzing both the system's propose system gives better result than existing system. Table 3 shows the accuracy's of both system's by applying machine learning techniques and also comparison of both the system.

Table 3. Existing v/s Proposed system

| Datasets | Algorithms | Proposed system | Existing system |
|----------|---------------------|-----------------|-----------------|
| S1 | Decision tree | 83% | 77.55% |
| S1 | Logistic regression | 88% | Nil |
| S2 | Decision tree | 95.1% | 90.29% |
| S2 | Logistic regression | 95.8% | Nil |

V. CONCLUSION AND FUTURE WORK

From the research work, it has been experimentally proven that Logistic regression provides perfect results as compare to Decision tree in both heart diseases and breast cancer prediction. For predicting heart diseases, significantly 15 attributes and for breast cancer, 30 attributes are listed and with basic machine learning algorithms. Medical diagnosis is considered as a significant yet intricate task that needs to be carried out precisely and efficiently. In this paper the problem of constraining and summarizing different algorithms of data mining used in the field of medical prediction are discussed. The proposed work can be further enhanced and expanded for the automation of Heart disease and breast cancer prediction. In our future work we plan to reduce no. of attributes and to determine the attribute which contribute towards the diagnosis of disease.

VI. ACKNOWLEDGMENT

I would like to express my very great appreciation to Prof: SreeRaj Varma for his valuable and constructive suggestion during the planning and development of this research work. His willingness to give his time so generously has been very much appreciated. I'm sincerely thankful to our principal Dr. P Sreeraj, for providing me facilities in order to go ahead in the development of my research. I express my deep and sincere gratitude to my guide Dr. Nijil Raj N, Head of department, Computer science and engineering for providing valuable advice and timely instructions. I also express my thanks to Prof. Yassir A the project coordinator, for guidance and whole hearted cooperation.

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Monitoring of HR and BP using DFT and Pan-Tompkins Algorithm

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ABSTRACT

In this paper we propose monitoring of blood pressure and heart rate using Discrete Fourier Transform and Pan-Tompkins algorithm to achieve higher wear ability and high accuracy. Motion artifacts induced by the head movements are dealt with machine learning framework to enable practical application scenarios. Here we suggest to place all the electrocardiogram (ECG) and photoplethysmography (PPG) sensors behind two ears to successfully acquire weak ear -ECG/PPG signals using a semi customized platform. After introducing head motions towards, we apply an unsupervised learning algorithm, Pan Tompkins to learn and identify raw heartbeats from motion artifacts compacted signals. Furthermore, we propose another unsupervised learning algorithm to filter out distorted/faking heartbeats, for the estimation of ECG to PPG pulse transit time (PTT) and HR. Specifically, we introduce a Discrete Fourier Transform (DFT) to quantify distortion conditions of raw heartbeats referring to a high-quality heartbeat pattern, which are then compared with a threshold to perform purification. The heartbeat pattern and the distortion threshold are learned by a K-medoids clustering approach and a histogram triangle method, respectively. Afterwards, we perform a comparative analysis on ten PTT or PTT&HR-based BP learning models.

Keywords: Electrocardiogram (ECG), Photoplethysmography (PPG), Pulse Transition Time (PTT), Machine Learning, Signal Processing, Pan Tompkins algorithm, Discrete Fourier Transform.

I. INTRODUCTION

High blood pressure increases the risk of disease and death in the population. As a clinical risk factor it is of major public health importance and compared to other leading risk factors accounts for the third largest proportion of disability adjusted life years lost globally after dietary factors and cigarette smoking. Blood is circulated through the body by the heart, and the beating of the heart leads to peaks and troughs in blood pressure. The peaks are called systolic and the troughs diastolic. Blood pressure is measured as systolic/diastolic, e.g. 140/90 mmHg (pressure equivalent of millimeters of mercury). Blood pressure varies normally from minute to minute, and over days and weeks, but a consistently raised blood pressure increases the risk of certain

diseases. Cardiovascular risk increases above values of 115/70, but blood pressure persistently above 140/90 mmHg is accepted as an appropriate reason to consider treatment. The measurement of blood pressure is an important consideration because it requires a certain level of skill, an appropriate setting and well maintained and calibrated equipment. A measurement should be based on at least two reading.

High blood pressure increases the risk of a range of diseases: coronary heart disease (angina, heart attack), stroke (both that due to a blood clot and that due to bleeding), heart failure (heart strain - especially left ventricular), aortic aneurysm (dilated aorta with risk of rupture and massive internal haemorrhage), peripheral vascular disease (reduced blood supply to

the limbs), chronic kidney disease (including renal failure), retinal disease (visual impairment).

Typical values for a resting healthy adult human are approximately 120 mmHg (16 kPa) systolic and 80 mmHg (11 kPa) diastolic written as, 120/80 mmHg. These measures of arterial pressure are not static, but undergo natural variations from one heartbeat to another and throughout the day, they also change in response to stress, nutritional factors, drugs, or disease. The Table 1 shows the normal healthy Blood Pressure ranges for adults aged 18 and older.

The values of Blood Pressure vary significantly during the course of 24 hours according to an individual's activity. Basically, three factors namely, the diameter of the arteries, the cardiac output and the state or quantity of blood are mainly responsible for the Blood Pressure level. Table 1. Age related Blood Pressure range

Table 1. Age Related Blood Pressure Range

| Age related normal healthy blood pressure range | | | | | | |
|---|--------------------|---------|------|---------------------|---------|------|
| Age | Systolic BP (mmHg) | | | Diastolic BP (mmHg) | | |
| | Mini | Average | Maxi | Mini | Average | Maxi |
| 15 to 19 | 105 | 117 | 120 | 73 | 77 | 81 |
| 20 to 24 | 108 | 120 | 132 | 75 | 79 | 83 |
| 25 to 29 | 109 | 121 | 133 | 76 | 80 | 84 |
| 30 to 34 | 110 | 122 | 134 | 77 | 81 | 85 |
| 35 to 39 | 111 | 123 | 135 | 78 | 83 | 86 |
| 40 to 44 | 112 | 125 | 137 | 79 | 83 | 87 |
| 45 to 49 | 115 | 127 | 139 | 80 | 84 | 88 |
| 50 to 54 | 116 | 129 | 142 | 81 | 85 | 89 |
| 55 to 59 | 118 | 131 | 144 | 82 | 86 | 90 |
| 60 to 64 | 121 | 134 | 147 | 83 | 87 | 91 |

Wearable computers are paving a promising way for pervasive smart health wearables for people around the world, especially for developing worlds where major problems include lack of health infrastructure and limited health coverage. They can provide health management in a more affordable manner than traditional health services, especially when long-term continuous health data collection is needed for effective diagnosis/treatment of chronic diseases like hypertension. Many investigations in wearable BP monitoring have been reported and summarized in several recently published surveys.

The most popular BP estimation theories are based on the fact that BP is often reversely correlated with the pulse transit time (PTT), i.e., the blood wave propagation time between two arterial sites. In the arterial vessel, a higher BP usually generates a higher velocity of propagation, which results in a smaller time (i.e. PTT) for the wave to travel along the vessel, and vice versa. To measure the PTT start and end time, the electrocardiography (ECG) and photoplethysmography (PPG) signals are the most widely used ones. The ECG heartbeat peak corresponds to the pressure wave occurrence time on the proximal site, i.e., the thoracic aorta, and thus can represent the PTT start time. The PPG heartbeat foot corresponds to when the pulse arrives the distal site, i.e., the location where the PPG sensor is placed, and thus can reflect the PTT end time. In these works, the most frequently applied ECG/PPG sensors placement methods are two-wrists/finger, chest/finger, and chest/chest.

However, these placement approaches may impact the wearability and comfortableness, considering the former two require extra connection overhead or wearing more than one device, and the last one may need a chest strap to fix the sensors and suffer from sweating. Some works proposed an in-ear PPG signal monitor to measure HR and other information, but they did not acquire ECG signal and measure BP. Another work proposed placing the PPG sensor behind the left ear and placing two ECG electrodes behind the left ear and neck, respectively. However, the signal quality may be impacted if the collar coat touches the electrode on the neck in long-term daily applications. Moreover, this work did not evaluate the BP estimation performance after obtaining the PTT measurements, and did not consider daily movements-induced motion artifacts.

Another significant concern lacking of enough attention and study is whether BP estimation systems can tolerate to large amounts of motion artifacts, since the body movements in long-term daily

applications inevitably induce time varying skin-sensor contact variations which usually impact or even corrupt the ECG and PPG signals acquired. The accelerometers can be applied to track the motion information, which can be used as a reference for motion artifacts removal, such as discarding signal periods or adaptive filter-based motion artifact cancellation.

Moreover, there are diverse BP modeling theories and strategies being studied, to deal with the underlying complicated blood pressure wave generation and propagation mechanisms, nevertheless, the comparative analysis of major BP models is rather limited. One thing worth noting is that, we have previously reported a single-arm-worn ECG&PPG-based blood pressure monitors which can provide a super wearability, but in this study we focus on another novel easy-wearing blood pressure

monitor with novel sensor placement methods. Besides, body movements during blood pressure estimation were not considered in our previous work, however, in this study, we have made lots of efforts to deal with motion artifacts towards all-day application scenarios. One new effective method is need for solving these problems.

II. METHODS AND MATERIAL

A. System Overview

The proposed machine learning-enabled system is illustrated in Figure 1. The top part (Figure 1a) gives the customized hardware prototype and the sensors placement method for ear-ECG and PPG signals acquisition. The bottom part (Figure 1b)

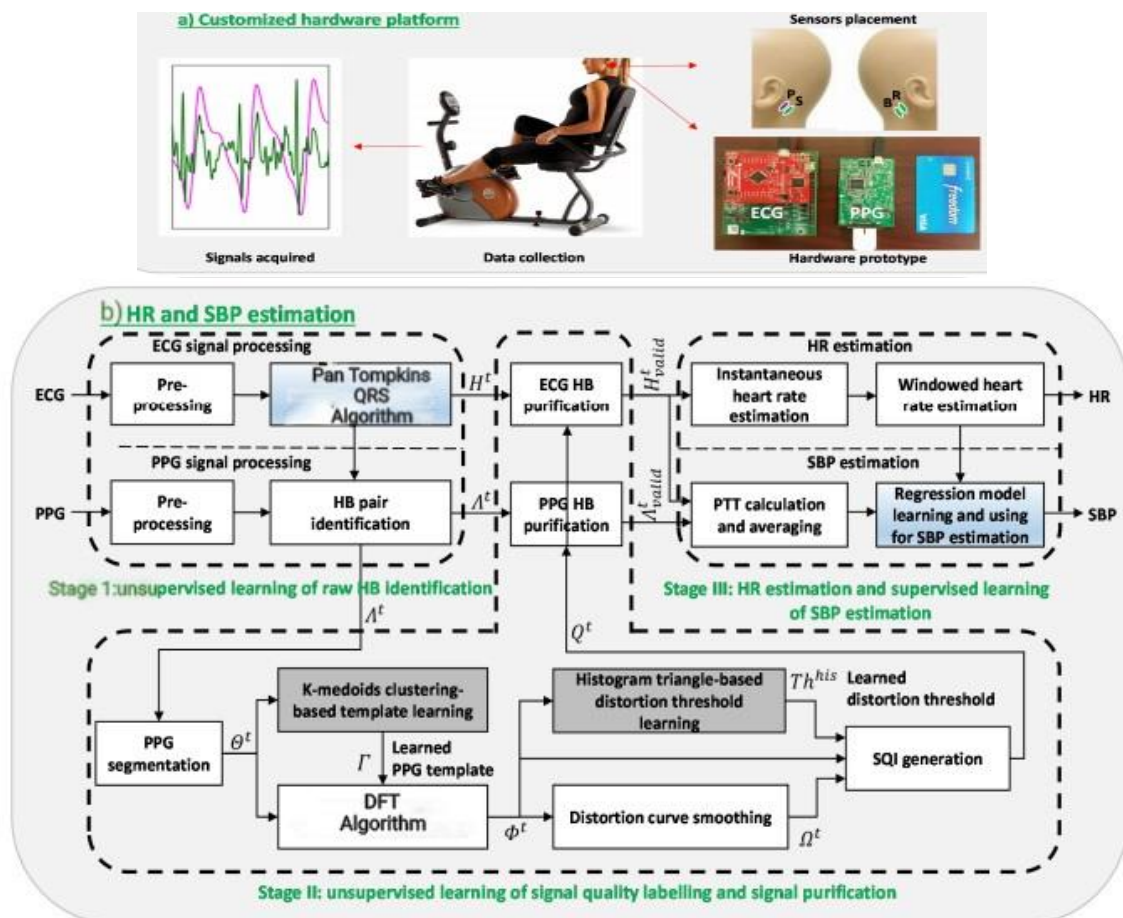


Figure 1. The proposed wearable cuff-less SBP and HR monitoring from motion artifacts-sensitive ear-ECG/PPG signals.

shows the flow of the signal processing and HB/SBP estimation algorithm including three stages, i.e., stage I – supervised learning of heartbeat (HB) identification, stage II – unsupervised learning of signal quality labelling and signal purification, and stage III – HR estimation and supervised learning of SBP estimation. The proposed algorithms can be run on the mobile devices such as cellphones. Therefore, no computation resources will be introduced to the wearables and the form factor will not be increased. One thing worth noting is that the ML-based algorithms are expected to deal with large amounts of motions artifacts in daily applications, which is very challenging but necessary to enable 24-hour continuous blood pressure/heart rate tracking.

B. Customized Hardware Platform and Sensors Placement.

The customized hardware platform shown in Figure 1a includes two parts, i.e., the ECG and PPG subsystems. In the former one, the ECG signal is acquired by an ADS1299 24-bit analog-to-digital (ADC) with a sampling rate of 500 Hz on a TI ADS1299EEG-FE evaluation board (green one) and is then sent through the SPI port to a TI Tiva™ C series LaunchPad (red one), which is equipped with an ARM Cortex M4 microcontroller to configure the ADC and relay the signal to a PC via the USB port. In the latter one, the PPG signal is acquired by a 22-bit ADC with a sampling rate of 128 Hz on a TI AFE4490SPO2 evaluation board, which also owns an MSP430F5529IPN microcontroller to configure the ADC and relay the data to the PC. A higher sampling rate for ECG is based on the consideration that it is used for both HR and PTT estimation. This prototype can be conveniently used in long-term applications after removing evaluation-specific components and adding a wireless module.

The sensors placement method proposed is illustrated in the top right part of Figure 1a, where the R/B/S

correspond to the reference/bias/signal electrodes for single-lead ECG acquisition, and P represents the sensor for PPG measurement. All the sensors can be integrated into glasses or ear headsets to achieve a much higher wearability and comfortableness, compared with the chest or wrists placement.

C. Dataset Recording

The customized platform was applied to acquire an ear ECG/PPG dataset from fourteen subjects, to evaluate the effectiveness of the proposed proof-of-concept system. The data collection was approved by the university IRB office and the informed consent was obtained from all participants. The data collection comprises a thirty-minute training session and a thirty-minute testing session for each subject. Each session can be further split to fifteen two-minute trials. During the first seven trials, the subject stayed still to get low SBP conditions, and during each of the other eight trails, the subject rode a recumbent exercise bike in the first minute and stayed still in the second minute, to perturb the SBP to a larger range similar to the methods used in many studies.. The reference SBP, denoted as SBP_{cuff}, was measured on the left arm in the second minute of each trial, using an ambulatory BP monitor CONTEC ABPM5. Correspondingly, the ear signals in the second minute of each trial are used for HR and SBP estimation. The chest-ECG signal was also collected to obtain the ground truth of heartbeat occurrence time.

One thing worth noting is that deleting time periods with distortions may over-discard signal periods which are still of an acceptable signal quality. It means that there may still be a portion of good heartbeats during a signal period with distortions. So, it may be helpful to provide a high temporal resolution of BP estimates (we aim to report minute-level BP), if the good heartbeats can be extracted from all signal periods based on beat-specific quantitative distortion values. We notice that the ear signals are frequently impacted by

motion artifacts, even the users take a sitting or standing position, there are still lots of motion artifacts, such as continuous background motion artifacts due to uncontrolled neck muscle and blood vessels movements, and motion artifacts induced by little head movements such as slightly looking around or up and down. Taking practical scenarios into account, we further introduced much severer motion artifacts by performing head movements including shaking the head and nodding for one third of each signal period. Specifically, in the second minute of each trial, the subject was asked to shake the head during the first ten seconds and nod during the fourth ten seconds. These head movements corrupt a large portion of signals and make heartbeat identification much more challenging. Therefore, it is necessary to utilize lots of signal periods even distorted by motion artifacts to guarantee the high-resolution BP tracking.

D. Unsupervised Learning of HB Identification

The stage I of the proposed algorithm in Figure 1b performs raw heartbeat identification from both pre-processed ear-ECG and PPG signals. Considering the ECG signal is of relatively richer signal characteristics (especially the QRS complex) than the PPG signal we firstly introduce an advanced unsupervised machine learning approach for raw ECG heartbeats identification, based on which the raw PPG heartbeat pairs are then determined by a minima searching method.

1) Signal Pre-processing

The raw ear-ECG and PPG signals are both processed by a six-order Butterworth bandpass filter (2-30 Hz and 0.5-8 Hz, respectively). Then PPG is resampled to 500 Hz to obtain a same time resolution as ECG. More analysis about the signal quality with deliberately introduced severe motion artifacts will be given later.

2) ECG-based and PPG-based Heartbeat Identification

To identify raw heartbeats from weak ear-ECG signal impacted or corrupted by large amounts of

background and deliberately introduced motion artifacts, our previously reported Pan Tompkins algorithm is applied. An analog filter bandlimits the ECG signal at 50 Hz. An analog-to-digital converter (ADC) samples the ECG at a rate of 200 samples/s. The resulting digital signal passes successively through a sequence of processing steps that includes three linear digital filters implemented in software. First is an integer coefficient bandpass filter composed of cascaded low-pass and high-pass filters. Its function is noise rejection. Next is a filter that approximates a derivative. After an amplitude squaring process, the signal passes through a moving-window integrator. Adaptive thresholds then discriminate the locations of the QRS complexes.

E. Unsupervised Learning of Signal Quality Labelling and Signal Purification (SQLSP)

Considering that large amounts of back ground and head movements-induced motion artifacts usually severely corrupt a large portion of weak ear signals, many highly distorted or faking heartbeats in some signal segments need to be suppressed. Therefore, an unsupervised learning approach is proposed to automatically purify the raw heartbeats, as shown in stage II of the proposed algorithm in Figure 1b. Two major considerations made here include: 1) choosing an unsupervised learning strategy not a supervised one, and 2) further learning motion artifacts-sensitive behaviors of raw PPG heartbeats not ECG heartbeats. The former one is based on the finding that it is hard to generate ground truth signal quality labels for raw heartbeats (e.g., labelled as a good or poor quality level when using a binary labelling method) which are necessary for supervised signal quality learning. Firstly, the background motion artifacts induced by uncontrolled neck muscle and blood vessels movements, especially with exercise stress, usually occur randomly making it difficult to manually label the signal quality for raw heartbeats.

Moreover, the head movements deliberately introduced (shaking and nodding) to generate more critical motion artifacts cannot be strictly control. Therefore, we propose an unsupervised learning approach to automatically label the signal quality after self-learning the diverse behaviors of raw heartbeats corrupted by motion artifacts. Further learning motion artifacts-impacted behaviors of raw PPG heartbeats is based on the observation that the PPG signal is of less signal characteristics and thus more sensitive to motion artifacts than the ECG signal. Therefore, the difference between high quality and low quality raw PPG heartbeats is more learnable for an unsupervised learner. Firstly, the PPG stream is split to raw PPG heartbeat segments (s1-segmentation), which are then fed to a K-medoids clustering-based learner to determine a high quality heartbeat template (s2-template learning). Afterwards, the learned template is used to screen the raw PPG heartbeats to quantify the degree of distortion based on the DTW approach (s3-HB distortion), which can effectively measure the dissimilarity between raw heartbeats owning time varying length/morphology and the learned template using a dynamic programming strategy. The distortion values measured are used to learn by a histogram triangle-based method a distortion threshold (s4-threshold learning), which can be applied to generate binary heartbeat-specific signal quality indices for heartbeat purification purpose (s5-s8).

1) PPG Segmentation

The PPG stream is segmented based on the raw PPG heartbeat locations identified.

2) K-medoids Clustering-based Template Learning

A PPG heartbeat template with a good morphology is needed by the DFT algorithm, to screen the raw PPG heartbeats to calculate their distortion values used in signal quality labelling. However, there is no pre-labeled signal quality information to directly perform PPG template

selection, otherwise, it is unnecessary to perform the unsupervised learning of signal labelling in the proposed system. It is known that when there are more motion artifacts, there is also more morphological randomness in the raw heartbeats, which results in a decreasing consistency among them. If we partition the raw heartbeats into different groups according to beat-to-beat consistency, the high quality heartbeats are more likely to be clustered together benefitting a better inter-beat consistency, and the low quality heartbeats tend to be partitioned into multiple clusters due to much more diverse motion artifacts-induced morphologies. Based on this consideration, a K-medoids clustering approach is introduced to learn a good PPG template from the raw heartbeats. K-medoids clustering is a classical unsupervised machine learning algorithm which breaks the objects (raw heartbeats) up into clusters and attempt to minimize the distance (consistency) between objects belonging to a cluster and the representative object designated as the center (medoid) of that cluster. Therefore, the medoid that represents a highest number of objects is selected as the high quality PPG heartbeat template. Moreover, also to lower the computation load, the Euclidean distance is chosen to measure inter-object distance. Since the time-varying raw heartbeats are usually of different lengths, they are all resampled to own a length of 9, which is the averaged length of all raw heartbeats in, to enable the Euclidean distance calculation.

3) Histogram Triangle-based Distortion Threshold Learning

Based on quantified distortion evaluation of the raw PPG heartbeats, the next is to learn an appropriate distortion threshold to differentiate heartbeats with a good or a poor quality. The same consideration used in K-medoids clustering-based template learning is applied here, i.e., low quality raw heartbeats owning much more diverse distorted morphologies due to random motion artifacts. Therefore, statistically, in a distortion histogram,

the raw heartbeats with a relatively good quality should concentrate in the low distortion area (the left side of the x-axis), while the ones with gradually worse signal quality conditions usually spread over the higher distortion area (the middle and right side of the x-axis), due to poor consistency induced by random motion artifacts. Leveraging this interesting left-skewed histogram, we use an unsupervised learning approach called histogram triangle method to learn the distortion threshold

4) Distortion Curve Smoothing

To further enhance the robustness before separating the raw PPG heartbeats to binary groups with a good or poor signal quality levels, the raw PPG heartbeats distortion values are smoothed by a 10th order moving average method. This is based on the consideration that when some raw PPG heartbeats own high distortion values, they are either real heartbeats highly corrupted by severe motion artifacts, or motion artifacts-induced interferential spikes. Therefore, their neighboring raw PPG heartbeats with lower distortion values may also have a high possibility to be impacted by motion artifacts. The smoothing operation can elevate the low distortion values for these neighboring heartbeats, and help cluster raw heartbeats in suspicious time periods to the low signal quality group more strictly.

5) SQI Generation

Based on the learned distortion threshold and the smoothed distortion curve, the raw PPG heartbeats can now be clustered to binary groups with a good or poor quality level. Firstly, although the smoothed distortion curve V in the trial can help elevate low distortion values when they are close to high distortion values (i.e., suspicious time periods), the smoothing operation usually lowers the high distortion values at the same time. It means that the unsmoothed distortion curve C can still contribute to highlight the heartbeats with high distortion values. Therefore, we compare not only the

smoothed distortion curve but also the unsmoothed one to the learned distortion threshold ST for the SQI set generation. Secondly, the motion artifacts due to time-varying electrode-skin contact variations are so random that it is impractical to cover all motion artifacts scenarios in the training session. If there happen to be some severe motion artifacts resulting in very high distortion values in the testing session, they may over-elevate many low distortion values in the corresponding suspicious time periods. Consequently, this strict SQI generation procedure may filter out too many raw heartbeats in some trials. However, based on our observation, even after aggressively introducing twenty-second head movements-induced motion artifacts in each trial (the subjects are usually asked to stay during estimation, but we aggressively asked them to perform movements for one third of each trail time), the heartbeats corrupted are still lower than fifty percent. Leveraging this observation, we introduce a heartbeats protection strategy to protect the best heartbeats in each trail, by adaptively increasing the learned threshold ST with a step size of \ast (1%) until at least heartbeats are labeled with a good quality level. To guarantee the consistency of the proposed SQI generation algorithm, this protection operation is also applied to the training session. The BP estimate quality indicator is also reported to reflect the percentage of raw heartbeats left after step 2 but before heartbeat protection. The indicator can be used to select out high confident BP estimates according to specific application requirements, After strictly labelling low quality raw PPG heartbeats and performing necessary heartbeats protection operations, the generated SQI set based on raw PPG heartbeats can now be used for heartbeats purification.

6) PPG and ECG Heartbeats Purification.

Considering there are still many residual highly corrupted and faking heartbeats, both raw ECG and PPG heartbeats are purified according to the SQI information, i.e., filtering raw heartbeats with an SQI

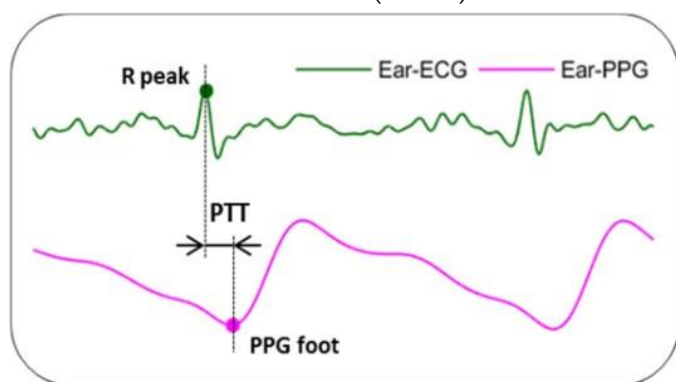
of 0 and keeping those with an SQI of 1. The purified heartbeats are then sent to the stage III of the proposed HR and SBP estimation algorithm.

F. HR Estimation and Supervised Learning of SBP

Estimation Based on the purified ECG heartbeats, the HR estimates can now be achieved, and together with purified PPG heartbeats, the PTT can also be measured. Afterwards, the SBP model can be firstly calibrated in the training session by a supervised learning process referring to the left arm cuff-based ground truth SBP, and then used for SBP estimation on the unseen data in the testing session.

1) Heart Rate Estimation

As mentioned above, the ECG signal is of a relatively better motion artifacts-tolerant ability than the PPG signal, therefore, the purified ECG heartbeats are used for instantaneous heart rate estimation. Then the windowed heart rate (denoted as HR, with a unit of beats-per-minute, denoted as BPM) estimates can be achieved, where the window corresponds to the second minute in each two-minute trial during which the SBP cuff is measured. The performance of the estimated HR will be evaluated in terms of mean error \pm standard deviation ($ME \pm STD$), mean absolute error (MAE) and root mean absolute error (RMSE).



2) Pulse Transit Time Calculation

Figure 2 Pulse transit time (PTT) measured with ECG and PPG signals (This illustration of PTT is based on ear-ECG/PPG signals).

Pulse transit time is the time consumed by the pressure pulse to flow from the proximal (PTT start time) to the distal (PTT end time) arterials sites. As shown in fig 2 the ECG R peak represents when the pulse leaves the proximal site, i.e., the thoracic aorta, and the PPG foot corresponds to when the pulse arrives the distal site. Similar to windowed HR, the instantaneous PTT measured in the second minute of each trial is also averaged to obtain the windowed PTT estimates. Pulse transit time (PTT) measured with ECG and PPG signal.

3) Blood Pressure Model Learning and Testing

Due to the complicated underlying blood pressure wave generation and propagation mechanisms, many SBP learning models have been reported based on diverse assumptions and strategies. To thoroughly compare them and determine an appropriate one for ear application scenarios, ten popular SBP learning models including seven PTT-SBP models, and three PTT&HR-SBP models with HR information enhanced. Among PTT-SBP models 1 to 7, various styles of equations are applied, such as linear, quadratic, exponential ones and so on, based on different deduction processes. For example, the model 2 reflects the reverse correlation between PTT and SBP shown by large amounts of studies, based on the fact that a high SBP will reduce the time consumed by the pressure pulse to propagate from the proximal to the distal sites, and vice versa. The model 7 is based on the combined action of the pulse wave and the energy of wave. Among PTT&HR-SBP models 8-10, the HR information is introduced to model establishment. They are based on the consideration that when HR increases, the cardiac output flow usually increased at the same time which causes a higher SBP, and vice versa. One thing worth noting is that, for simplicity and convenience purpose, the PPT measurement method introduced above actually includes another extra item, i.e., the pre-ejection period (PEP). PEP corresponds to the aortic valve opening time and usually significantly

increases the PTT measured. PEP can be measured by adding extra hardware components, such as the phonocardiogram (PCG) sensor or the impedance cardiography (ICG) sensor. Here, the PEP term is ignored for simplification purpose which is a common strategy used in many previous works. The HR information has been used to enhance the SBP model, therefore, we also consider PTT&HR-SBP models, for comparison purpose. The HR information is already carried by the ECG signal and no extra hardware components are needed. In future, new sensors can be added to measure PEP for further model enhancement. The SBP models are learned on the training data and tested on the unseen testing data to show the generalization ability. The left-arm cuff-based SBP is used as reference to enable a supervised learning process. The performance is reported in terms of $ME \pm STD$, MAE and RMSE

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surface where the PPG sensor is placed on similar to windowed HR, the instantaneous PTT measured in the second minute of each trial is also averaged to obtain the windowed PTT estimates.

III. RESULT AND DISCUSSION

A. Signals Acquired

After situating the ECG electrodes behind two ears and the PPG sensor behind the left ear, our semi-customized bio-potential acquisition platform successfully collected the ear-ECG (fig 3a) and ear-PPG (Figure 3b) signals, where the chest-ECG signal is also given for comparison purpose. The acquired ear-ECG signal is only around 5% of the chest-ECG signal in terms of peak-to-peak voltage, resulting from a much smaller potential difference between the back locations of two ears. Although the ear-ECG is highly weak, it can still show distinguishable heartbeats, especially clear QRS complex morphologies, even with continuous background motion artifacts due to uncontrolled neck muscle and blood vessels movements, indicating the effectiveness of the proposed non-standard highly convenient single lead ECG configuration.

Meanwhile, the acquired PPG signal also owns a clear heartbeat morphology leveraging many blood vessels around the back location of the ear. When performing

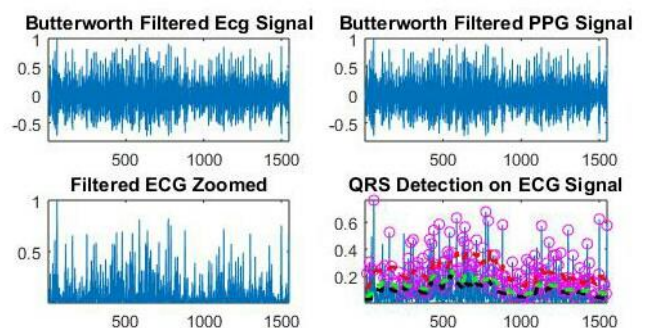


Figure 3

- i. Butterworth filtered ECG signal.
- ii. Butterworth filtered PPG signal.
- iii. Filtered ECG Zoomed.
- iv. QRS detection on ECG signal.

head movements, many motion artifacts are induced to both ear-ECG and ear-PPG signals (Figure 4d and 4b) which make heartbeats identification highly challenging. Therefore, advanced signal processing and machine learning algorithms for robust heartbeat recognition are proposed to enable this highly wearable ear signal acquisition solution .

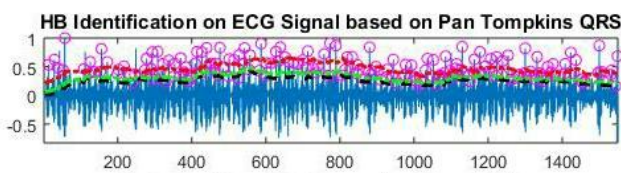


Figure 4. distortion quantification using threshold learning

Figure 4. An example of the signal segments acquired (chest-ECG, ear-PPG, and ear-ECG), showing that the weak ear-ECG has a peak-to-peak voltage only around 5% of that of the chest-ECG.

B. Heartbeat Identification

To identify raw heartbeats from motion artifacts-impacted or even corrupted ear signals, our previously proposed Pan Tompkins algorithm is applied on the weak ear-ECG signal. Heartbeat identification results in the testing session of subject 1 are given in Figure 4, where the raw ECG heartbeats are firstly identified and then the PPG heartbeats are determined by a simple minima searching method. There are several interesting observations as follows to support why we firstly identify the raw heartbeats from the ECG signal, and why we need to learn signal quality labelling based on the PPG signal in an unsupervised manner and purify both ECG/PPG heartbeats.

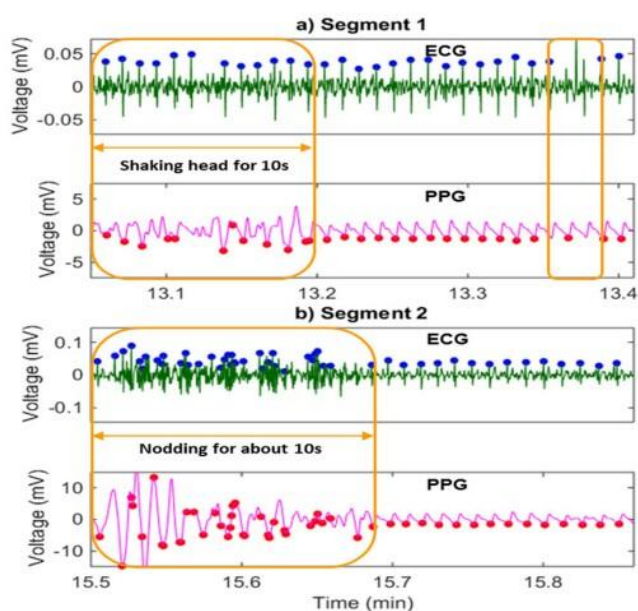
Firstly, the ECG signal acquired with the non-standard signal lead configuration is so weak that it

is continuously impacted by the background motion artifacts due to uncontrolled neck muscle and blood vessels movements. Specially, in the signal periods not covered by the wide orange rectangles, the PPG Figure 5 Heart Beat identification on ECG signal based on Pan-Tompkins QRS detection method signal owns a better signal morphology compared with the ECG signal, which is even highly corrupted by the background motion artifacts. Therefore, we firstly perform raw heartbeat identification from the ECG signal. Since PPG heartbeat morphological characteristics (PPG feet) during these signal periods cannot reflect the heartbeat occurrence time for PTT calculation, we need to filter out these signal segments according to the signal quality of these raw PPG heartbeats. Heartbeat identification results in the testing session of the subject 1. Blue dots: identified raw ECG heartbeat locations; red dots: identified raw PPG heartbeat locations; wide orange rectangles: signal periods with deliberately introduced motion artifacts due to head movements; narrow orange rectangle: signal period with missing or fake heartbeats due to severe background motion artifacts; all the weak ECG signal is continuously impacted by background motion artifacts. Based on these considerations, we choose an unsupervised learning approach to learn how to generate the SQI information for each raw PPG heartbeat.

C. PPG Segmentation and Template Learning

To perform unsupervised learning of signal quality labelling, we apply a DFT method to quantify the degree of distortion for each raw PPG heartbeat. The PPG template for the DFT method is learned by the K-medoids clustering approach on the segmented raw PPG heartbeats. The clustering results are given in Figure 5 where raw heartbeats with a relatively good quality concentrate in the M1 cluster, and raw heartbeats with a poor quality are grouped into many other clusters due to the high randomness induced by motion artifacts. Consequently, the medoid in cluster 12 which

represents a highest number of instances (#=65%, i.e., 65% of raw heartbeats in the second minute in the first trial are grouped into cluster 12) is selected as the high quality PPG heartbeat template. One interesting observation is that some slightly distorted heartbeats are also grouped into this cluster since the other clusters correspond to raw heartbeats so randomly corrupted by severe motion artifacts due to head movements. The high quality PPG template can still be well learned, because the K-medoids clustering algorithm makes each medoid represent the majority of instances in each cluster, i.e., minimizing the object-to-medoid dissimilarity as . Figure 5.



D. PPG Distortion Evaluation and Threshold Learning

After quantifying the degree of distortion for all raw PPG heartbeats using the DTW method, the histogram triangle-based approach is proposed for PPG distortion threshold learning which will be used to generate the SQI information. An example is given in Figure 6, where a skewed intensity histogram of the DTW distances is constructed. The relatively good quality heartbeats concentrate in the low distortion area (the left side of the x-axis) and poor quality heartbeats spread over a larger range resulting from high and diverse distortion values due to random and severe motion artifacts.

Figure 6 Figure 5. Two examples of heartbeat identification results in the testing session of the subject 1. Blue dots: identified raw ECG heartbeat locations; red dots: identified raw PPG heartbeat locations; wide orange rectangles: signal periods with deliberately introduced motion artifacts due to head movements; narrow orange rectangle: signal period with missing or fake heartbeats due to severe background motion artifacts; all the weak ECG signal is continuously impacted by background motion artifacts.

The global searching process effectively captures the transition point of the histogram and determines the normalized threshold $\hat{O}ST$ in this example as 0.07, which is then de-normalized and multiplied by a shrinkage factor to get the final distortion threshold ST which is 11.9 in this example. Figure 6.PPG distortion threshold learning in the first trial in the training session of subject 1. Blue line: the histogram hypotenuse; red curve: the histogram envelope; green line: the maximum perpendicular distance; green dot: the learned normalized (0-1 range) threshold.

E.SQI Generation and Heartbeats Purification

Based on the DFT distance-based distortion values and the learned distortion threshold, we now can generate the SQI information for all PPG raw heartbeats in the training or the testing session. The acquired thirty-minute ear-ECG and ear-PPG streams are shown in Figure 7a and 7b, where fifteen pink segments in each stream corresponding to the second minute in each of fifteen trials. In each pink segment, there is head shaking movement during the first ten seconds and nodding movement during the fourth ten seconds, resulting in many severe motion artifacts which increase the peak-to-peak voltage. In the last eight black segments, there are exercise-induced signal variations (riding the bike), especially in the ear-PPG stream. In the first seven black segments, there are also some signal variations due to normal head

movements. The calculated unsmoothed DFT distance and the smoothed one are given in Figure 7c, which shows diverse degree of distortion caused by both background and deliberately introduced motion artifacts. Based on SQI algorithm proposed, the distortion threshold is adaptively elevated if the (the best) heartbeats need to be protected. Finally, the raw PPG heartbeat-specific SQI information is generated as Figure 8d. During deliberately introduced head movements (wide orange rectangles), the DFT distance-based distortion values (black bars) are much higher than those in other time periods. The smoothing operation of the distortion values can make the low distortion values above the distortion threshold and thus pose a more critical distortion evaluation during these highly suspicious periods (wide orange rectangles). On the other hand, the unsmoothed distortion values can still highlight the heartbeats with a high distortion condition (around minute 13.37).

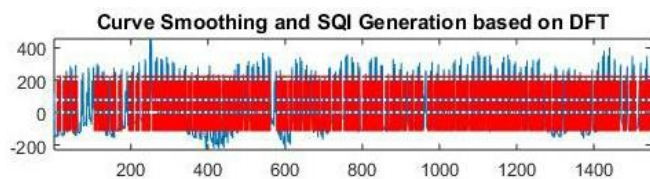


Figure 7. Curve smoothing and SQI Generation using DFT

Besides, the motion artifacts are so random that it is difficult to include all motion artifacts scenarios in the training session. If there happen to be some highly random motion artifacts. The corrupted PPG morphologies may induce dramatically high distortion values which generate a large range of suspicious period. This shows the necessity to introduce a protection mechanism to adaptively elevate the distortion threshold for some trials to protect the (the best) (20%) heartbeats. Based on the proposed SQI generation algorithm, the raw heartbeats are labelled as accepted (SQI = 1) or rejected (SQI = 0), which helps filter out many signal segments highly corrupted by severe motion artifacts such that the remaining purified heartbeats

can be used in HR and PTT estimation later. Figure 7. The whole SQI generation process in the testing session of subject 1, including the signals acquired, quantified degree of distortion for raw PPG heartbeats, the adaptive distortion threshold and the SQI sequence generated

F. Heart Rate Estimation

The windowed heart rate estimates are achieved based on the ECG heartbeats. A Bland-Altman plot for estimated and reference HR is given in Figure 8 to illustrate the HR estimation performance. It shows that most of the HR estimates concentrate in the low error area, indicating the potential of using ear-ECG for robust long-term HR monitoring applications. Averaged over the acquired ear signal dataset, the $ME \pm STD$, MAE and RMSE of HR estimation are 0.8 ± 2.7 , 1.8 and 2.8 BPM, respectively. In table 2, the HR estimation performance using our approach greatly outperforms KLMF and DFT. For KLMF, a smoothing operation is applied to suppress the abnormal measurements based on the outlier indicators generated by the impulse rejection filter. However, the robustness of the outlier indicators is still very low due to the fact that the beat-to-beat checking rules used in this filter cannot effectively cover highly random cases due to large amounts of motion artifacts. For DFT, the low performance mainly suffers from the fact that the motion artifacts usually own a frequency spectrum highly overlapping that of the ECG signal. Therefore, there are still many residual motion artifacts in the reconstructed signal which lower the HR estimation performance

G. Blood Pressure Estimation

Based on HR and PTT estimates, ten diverse SBP models including seven PTT-SBP models (1-7) and three PTT&HR-SBP models (8-10) are thoroughly compared to explore their abilities in SBP estimation. According to the Advancement of Medical Instrumentation (AAMI) standard, the BP estimation

error should be less than 5.0 ± 8.0 mmHg in terms of mean error (ME) \pm standard deviation (SD). To thoroughly evaluate the SBP estimation performance, we consider four different criteria including ME, STD, MAE and RMSE. Moreover, although many wearable BP estimation studies only reported the performance on the training data, we test the proposed algorithm on the unseen testing data to emphasize the generalization ability of the learned SBP models. The performance comparison of ten SBP models and three signal processing approaches on the unseen testing data is summarized in Table 3. Using the proposed framework, model 8-10 effectively outperform model 1-7 leveraging the additionally introduced robust HR information, with the ME \pm STD, MAE and RMSE no more than -1.4 ± 5.2 , 4.2 and 5.4 mmHg, respectively. Compared with our framework, MLMF and DFT both show a worse performance due to the reason mentioned above, i.e., many residual motion artifacts. One thing worth noting is that model 8-10 for KLMF and DFT may even own worse performance than model 1-7, due to the introduction of low robust HR information into the BP models. To further illustrate the performance difference between the PTT-SBP models and the PTT&HR-SBP models. The latter one owns a smaller mean error and a more concentrated distribution (a smaller standard deviation) compared to the former one, indicating that the PTT-SBP model can be enhanced by the HR information, yielding a more robust PTT&HR-SBP model. On thing worth noting is that we have introduced exercise to perturb the BP to make the trained SBP model be able to cover a large range of BP (similar to many studies), and we did find strong correlations between heart rate and SBP (similar to the previous study), but more data acquisition protocols are also necessary considering that the relation between heart rate and SBP may need to be further explored.

IV. CONCLUSION

In this paper we propose monitoring of blood pressure and heart rate using Discrete Fourier Transform and

Pan Tompkins algorithm to achieve higher wear ability and high accuracy. Motion artifacts induced by the head movements are dealt with machine learning framework to enable practical application scenarios. Here we suggest to place all the electrocardiography(ECG) and photoplethysmography(PPG) sensors behind two ears to successfully acquire weak ear -ECG/PPG signals using a semi customized platform. After introducing head motions towards ,we apply a unsupervised learning algorithm ,Pan Tompkins to learn and identify raw heartbeats from motion artifacts compacted signals. Further more, we propose another unsupervised learning algorithm to filter out distorted/faking heartbeats, for the estimation of ECG to PPG pulse transit time(PTT) and HR. Specifically, we introduce a Discrete Fourier Transform(DFT) to quantify distortion conditions of raw heartbeats referring to a high quality heartbeat pattern, which are then compared with a threshold to perform purification. The heartbeat pattern and the distortion threshold are learned by a K-medoids clustering approach and a histogram triangle method, respectively. Afterwards, we perform a comparative analysis on ten PTT or PTT&HR-based BP learning models. This study is expected to demonstrate the feasibility of the proof-of-concept system in wearable ear-ECG/PPG acquisition and motion-tolerant BP/HR estimation, to enable pervasive hypertension, heart health and fitness management. In future, we will acquire data from more subjects, and also further introduce motion artifacts from more scenarios, such as walking, running, sleeping, eating, etc. Another interesting work is to enhance the power efficiency of this easy-wearing blood pressure system for long-term wearable application scenarios.

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Multisensory Fire Detection and Alerting System Using Fuzzy Logic

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ABSTRACT

This paper presents the design of a fuzzy logic based multisensory fire detection system and a web-based notification system. Recently, most fire detection systems working with the help of only smoke detectors. The problem is the lack of adequate alert and notifying mechanisms. A typical system relies on the physical presence of a human being to act on the alert. In developing countries, poor planning and addressing negatively affects the fire and rescue crew's response time. To address this problem, a fuzzy logic system was implemented using an Arduino development board with inputs from an MQ2 smoke sensor, a TMP102 temperature sensor, and a DFRobot flame sensor. The output of the detection system is sent over short message service (SMS) using a SIM900A global system for mobile communication (GSM) module to the web-based system and the house owner or caretaker in real-time. With access granted to the web-based system, the fire and rescue crew also get notified in real-time with location information. A comparison between the efficiency of the notification system employed by standard fire detectors and the multisensory remote-based notification approach adopted in this paper showed significant improvements in the form of timely detection, alerting, and response.

Keywords: Data Fusion, fire Detection, Fuzzy Logic, Microcontroller-Based, Real-Time, Web-Based.

I. INTRODUCTION

In India, every year about **25,000 persons die** due to fires and related causes. Female accounts for about **66%** of those killed in fire accidents. It is estimated that about **42 females and 21 males die every day in India due to fire**. According to the statistics released by the National Crime Records Bureau, fire accounts for about **5.9% (23,281)** of the total deaths reported due to natural and un-natural causes during the year 2012. Probably many of these deaths could have been prevented. No comprehensive data is available in India on the economic losses suffered on account of fires. However, according to one estimate the major losses reported by the Indian Insurance Companies in the year 2007-2008 indicate, that about **45% of the claims are due to fire losses**. According to another estimate about **Rs.1000 crores are lost every year due to fire**. Fire losses are reported

both in industrial and non-industrial premises like hospitals, commercial complexes, educational institutions, assembly halls, hotels, residential buildings, etc... According to Fire Risk Survey (FRS) 2013, carried out by Pinkerton & Federation of Indian Chambers and Industry, in India, **fire accounted for 8.45% of the overall ranking of risks**. FRS also revealed that **fires has been rated as the 5th highest risk in industry in 2013**. Even though it is important to adhere to fire safety measures, putting in place early detection systems greatly mitigates the effects of fire outbreaks. This has led to a lot of novel contributions in the field of fire detection. The need to produce a more reliable fire detection system devoid of false alarms has led to the adoption of a multisensory approach. Unlike fire-detection approaches relying solely on smoke, this approach relies on the detection of more than one fire signature. Due to the effectiveness and efficiency of multisensory-based fire

detection systems, current research on fire detection is largely focused on developing better algorithms and processing techniques based on the data received from the sensors, thereby reducing false alarms. An emerging phenomenon in fire detection is the use of multiple parameters and sensors in the detection mechanism. The system employed an adaptive fuzzy classification system to automatically generate a rule base, based on data from the three sensors. Most existing fire detection systems automatically actuate an audible alert via a siren or a strobe light on detecting fire. Remote notification has been done traditionally using the public switched telephone network; however, GSM has been adopted due to its secure and reliable nature. This paper presents the design and development of a fuzzy logic based multisensory fire detection system with a real-time web-based alert notification system. The fuzzy logic approach to fire detection was adopted because it simplifies the fusion of data from the multiple sensors.

II. PROPOSED METHOD AND DESIGN

The fire detection system greatly depends on the sensors used and their ability to register accurately the fire signatures being monitored. The sensors were chosen based on detection range, size, and cost. The sensors are TMP102 Temperature Sensor, DFRobot Flame Sensor, and MQ2 Smoke Sensor. By adopting a multisensory approach, the need to fuse the data arises. Fuzzy logic provides an easy way of dealing with uncertain data from multiple sensors by aggregating these to make a decision. For instance, a crisp temperature value may be classified into cold, normal, or hot, a crisp flame value may be classified into far, not far or near, and a crisp smoke value may be classified into low, medium or high fuzzy set with a degree through fuzzification. This allows the use of the “IF THEN” rules defined in the rule base to make a decision. This fuzzy decision is then defuzzified into a crisp output value. For each sensor input (linguistic variable), three (3) fuzzy sets were created using grade, reverse grade, and triangular membership

functions. The center of area defuzzification method was used to obtain the system output.

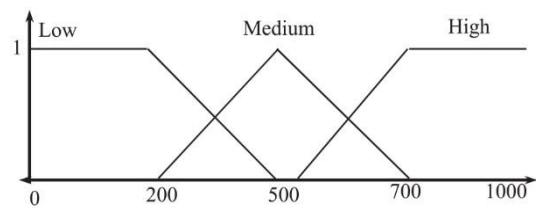


Figure 1. Fuzzy membership sets for smoke density.

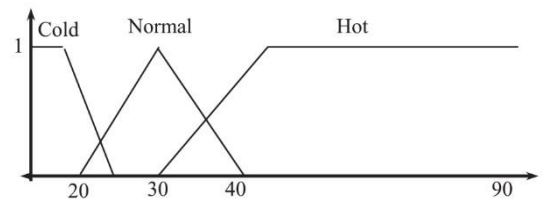


Figure 2. Fuzzy membership sets for ambient temperature.

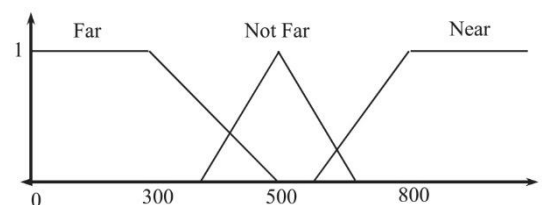


Figure 3. Fuzzy membership sets for flame intensity.

Three membership functions were chosen for each input. The size of the rule base of a fuzzy logic system is affected by its inputs and sets used. The ambient smoke density data from the smoke sensor were grouped into three fuzzy sets (low, medium, and high), which is shown in Figure 1. The MQ2 sensor readings that are analog voltage levels are converted into digital data. Since the analog to digital converter (ADC) on board the Arduino has a 10bit resolution, possible sensor readings range from 0 to 1023. Figure 2 shows the fuzzy sets for the ambient temperature. The temperature sensor readings have been classified into cold, normal, and hot fuzzy sets. The range of possible values for the ambient temperature was set to 16°C to 90°C. The fuzzy membership sets for flame intensity that was measured using a DFRobot flame sensor are shown in Figure 3. This sensor relies on the UV radiation given off by flames. A large fire will

give off more UV radiation and vice versa. The sensor output is also affected by the proximity of the flame to the sensor. The data from the flame sensor also undergo ADC, thereby resulting in values from 0 to 1023. These values are the digital equivalent of the analog voltage values outputted by the sensor. The output fuzzy variable (status) shown in Figure 4 consists of three fuzzy sets. These include no fire, potential fire, and fire fuzzy sets. To determine the fire status (the output), crisp sensor readings of the ambient environment are fuzzified (assign to a fuzzy set with a certain degree of membership), and then these inputs are processed using the rule base shown in Figure 6. The fuzzy rules used are shown in Table I. The total number of rules adds up to 27.

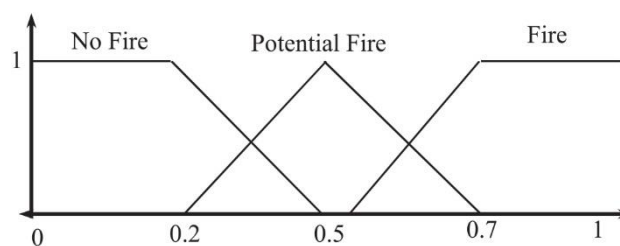


Figure 4. Fuzzy membership sets for fire status.

When the three sensor inputs are supplied to the system, the inputs are then fuzzified using the various membership sets. The output of this process gives the fire status where a fire alert may be activated. Based on the output of the system, a fire event is either dispatched to the web-based notification system and house owner(s) or no action is taken. To establish a communication channel between the fire detection system and the web-based notification system, an SMS over GSM network was used. Figure 6 shows an overview system indicating the flow of information. The device consists of a fire sensor suite, a microcontroller, and a GSM module. These two subsystems are interconnected using the GSM infrastructure via SMS. An API upcode is also send to the thingspeak server(Web-based notifying mechanism) with the help of GSM, which gives the time and location of the fire outbreaks in the thingspeak. An integral part of a fire detection system is its ability to notify people when a fire is detected. The notification also relays fire events to the fire and rescue service and the owner of the structure in real-time.

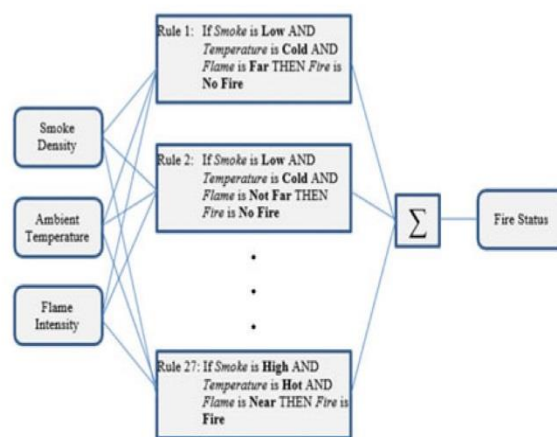


Figure 5. Fire detection fuzzy logic system.

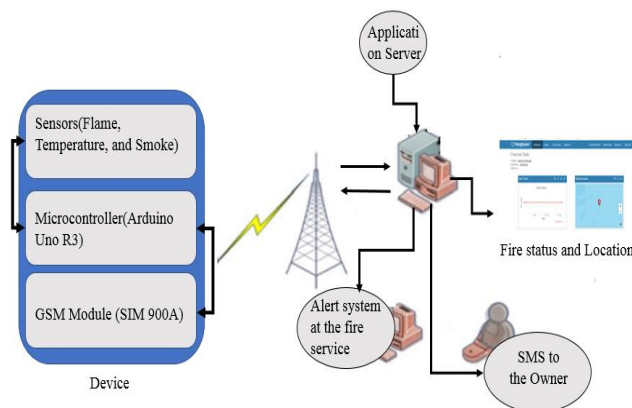


Figure 6. System architecture of multisensory fire detection and the notification system.

Table 1. Rules For Fire Status When Smoke Is Low

| No. | Smoke | Temperature | Flame | Fire Status |
|-----|-------|-------------|---------|----------------|
| 1. | Low | Cold | Far | No fire |
| 2. | Low | Cold | Not far | No fire |
| 3. | Low | Cold | Near | Potential Fire |
| 4. | Low | Normal | Far | No fire |
| 5. | Low | Normal | Not far | No fire |

| | | | | |
|-----|--------|--------|---------|----------------|
| 6. | Low | Normal | Near | Potential Fire |
| 7. | Low | Hot | Far | Potential Fire |
| 8. | Low | Hot | Not far | Fire |
| 9. | Low | Hot | Near | Fire |
| 10. | Medium | Cold | Far | No fire |
| 11. | Medium | Cold | Not far | Potential Fire |
| 12. | Medium | Cold | Near | Fire |
| 13. | Medium | Normal | Far | Potential Fire |
| 14. | Medium | Normal | Not far | Potential Fire |
| 15. | Medium | Normal | Near | Fire |
| 16. | Medium | Hot | Far | Potential Fire |
| 17. | Medium | Hot | Not far | Fire |
| 18. | Medium | Hot | Near | Fire |
| 19. | Hot | Cold | Far | Potential Fire |
| 20. | Hot | Cold | Not far | Potential Fire |
| 21. | Hot | Cold | Near | Fire |
| 22. | Hot | Normal | Far | Potential Fire |
| 23. | Hot | Normal | Not far | Fire |
| 24. | Hot | Normal | Near | Fire |
| 25. | Hot | Hot | Far | Fire |
| 26. | Hot | Hot | Not far | Fire |
| 27. | Hot | Hot | Near | Fire |

A. System Requirements

The fire notification system is a web-based application used for remote monitoring and management of the fire detection devices. To increase the response time of the fire and rescue crew and house owners, real-time delivery of fire alerts was done using SMS. The

navigational details of fire scene were sent to the web-based application sever (thingspeak) using GSM. Table 2 shows the complete system components needed.

Table 2.System Components

| Components | Description | Qty. |
|----------------------|--|------|
| Power supply | Power supply for the fire detection system | 1 |
| Arduino Uno R3 | Microcontroller board | 1 |
| GSM module | Quad-band GSM module from cooking hacks | 1 |
| Flame sensor | DFRobot flame sensor | 1 |
| MQ2 smoke sensor | Smoke sensor | 1 |
| Temperature sensor | TMP102 digital temperature sensor | 1 |
| Perforated board | 10 cm×5 cm circuit board | 1 |
| SIM card | SIM card with airtime for sending SMS alerts | 1 |
| Connectors Wires | for connecting circuit components | 300m |
| Plastic case | 10 cm×6 cm | 1 |
| Internal GSM antenna | Internal GSM antenna | 1 |

B. Design Considerations

An Arduino development board was used for the device because of its relative ease of programming and its suitability for rapid prototyping. The detection software for the device was programmed using Arduino. The detection module only interacts with the GSM module when an alert event is detected. A great feature of a fire detection system is its ability to feedback instantly of its state. This is a necessity when a fire is detected. The buzzer provided with the device ensures fire events result in audible feedback and remote alerts to whoever is concerned. Even though a simple alert on a fire outbreak would have sufficed, visualizing fire outbreaks using the location of the

device and providing useful information on the structure of fire provides more information. The choice of web-based application to perform the was informed by the cross-platform nature of web applications, remote access, and the ability to extend web applications easily through APIs, making them mobile device friendly.

III. SYSTEM IMPLEMENTATION PROCESS

This section outlines the implementation of the various sub systems. An overview of the fire detection system is shown

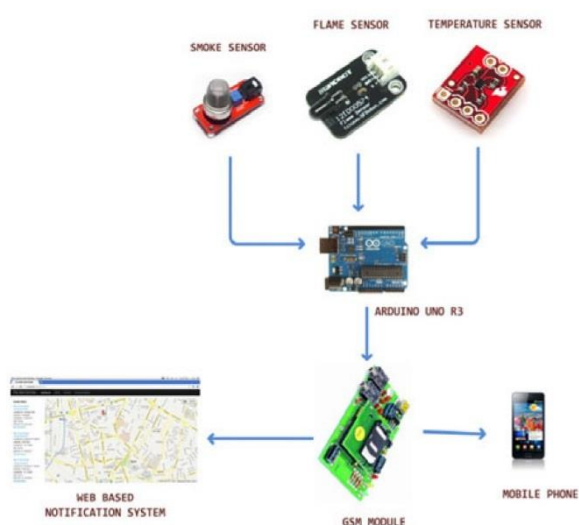


Figure 7. Fire detection subsystem implementation modules.

In Figure 7. This shows all the sensors interfaced with the microcontroller. A fuzzy logic system was implemented on the Arduino development board by using an embedded fuzzy logic library (eFLL). It is convenient to use the eFLL in this implementation because it is particularly optimized for constrained environments. The flowchart presented in Figure 8 shows the operation of the fire detection device. For a no fire output, the process is restarted. A potential fire output only leads to the activation of the buzzer. When the output is fire, the buzzer gets activated, an SMS alert is sent out and an API up code is also send to the thingspeak server. The thingspeak server gave a graphical representation showing time when the fire

incident occurs and also show the location of the fire incident.

IV. RESULTS AND DISCUSSION

The smoke and flame sensors, being analog devices, rely on the ADC on board the Arduino to perform the conversion. The ADC on board the Arduino produces outputs from 0 to 1023. For the flame sensor a higher value of about 900 indicates a flame with high intensity and a lower value indicates a flame of low intensity or no flame for values below 200. The same principle applies to the smoke sensor: A higher value indicates high smoke obscuration and vice versa. With three output states of the fuzzy logic algorithm, fire alerts get activated only when either the potential fire state or fire state pertinence is high. The sample input values for fire and potential fire status is show in Table III. Unlike conventional fire detectors or single signature-based detection system, which operates by comparing the sensor output with a set threshold, but our multisensory approach makes a decision based on the weight of each input. This implies that the system is able to operate without necessarily relying on all signatures. This implies that the system is able to detect a flaming fire, which produces flame and heat with little or no smoke. This property of the system allows for a potential fire warning to be issued. The system should be ceiling mounted, so it will not trigger false alerts to burning candles under normal use but nonetheless remains sensitive.

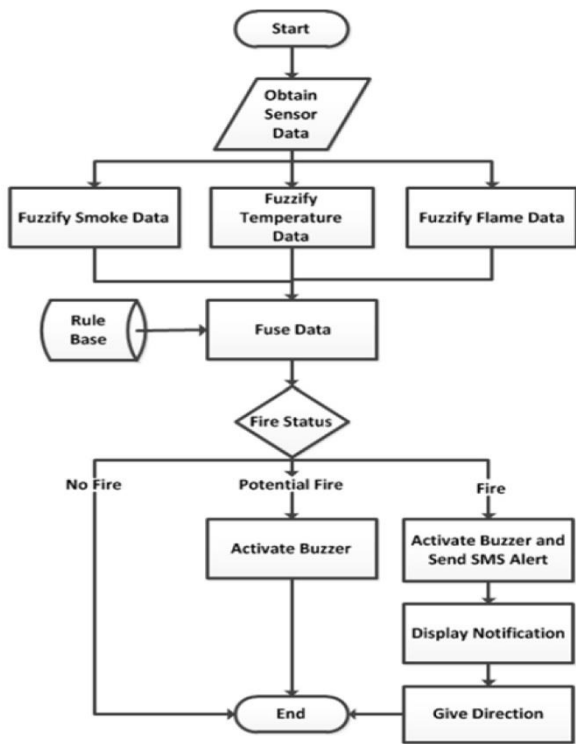


Figure 8. Fuzzy logic fire detection flow chart.

When the fire status triggered, SMS has been send to the owner or caretaker and also send API upcode to the thingspeak server with the help of GSM. The thingspeak website shows the time and location of the fire outbreak, which can be seen in Figure 9.

Table 3. Performance Of Fire Detection

| Smoke | Flame | Temperature | Status |
|----------|--------|-------------|------------------------|
| 647.1ppm | 0 | 83.31°C | Fire(0.708) |
| 548.5ppm | 918.49 | 28.93 °C | Potential fire (0.459) |

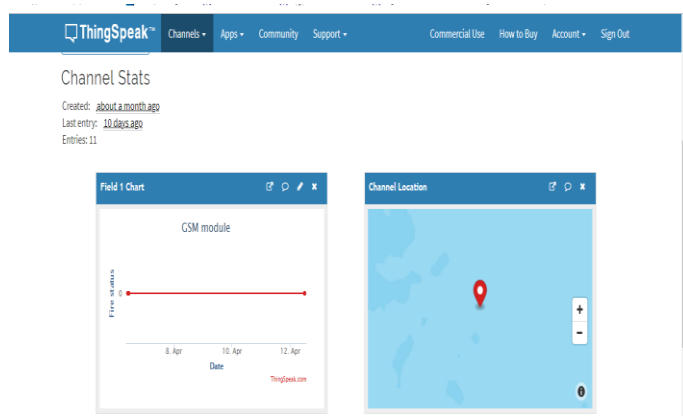


Figure 9. Screenshot of web-based notification system

V. CONCLUSION

Unlike the existing fire detectors, this system employs a multisensory approach whereby the outputs of three sensors sensing three different fire signature parameters (smoke, flame, temperature) contribute to the fire alert decision and hence produce a more reliable fire detection system devoid of false alarms. When a fire alert is detected, the system automatically reports them to owner(s) through SMS messaging on their cellphones. The system also provides a map-assisted navigation system to help locate the scene of a fire outbreak.

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Hermes : The Buddy For Drivers

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ABSTRACT

The recent report of WHO proves that there has been a soaring rise in road traffic injuries every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. There were several efforts to develop safety. The goal of our system is to detect driver drowsiness and health monitoring. We use open CV for detecting behavior of the driver. In our proposed system healthcare monitoring unit is constructed as a wearable one where physiological sensors and transmitter are integrated into it. The physiological parameters such as pulse rate, breathing rate, temperature and etc. are measured. The Health care monitoring system will be connected to a gateway which consists of raspberry pi 3B with inbuilt BLE and a GPRS module to communicate with the Drivers Community. A webcam is connected into this gateway. This project provides an eye blink monitoring system that alerts the driver during the state of drowsiness. Separate machine learning along with human assistance is provided to evaluate the driver status. Thereby sending message that will be converted into speech is initiated to wake the driver. Our project aims to provide safety with a confirmation security system. From the conventional model with the help of machine learning data set, the training data from various components are analyzed and output is predicted in the form of a supervised learning procedure. A mobile application is also provided to inform the relatives and authorities about the driver's current status.

Keywords : Bluetooth, Raspberry pi, Machine learning, Open CV, GPRS

I. INTRODUCTION

Road accidents are a major problem that modern era is facing. Even though there is a well-maintained traffic system in our nation, level of accidents is less tending to decrease. Our traffic system emphasizes less neither on safety system nor on accident monitoring system. Accidents can occur due to health issues of the driver, due to drink and drive, drowsiness and reckless driving. The present system fails to take in account of information from pile of scenarios implemented for drowsiness, health care, drunk and drive into single unit, also failing in taking account on rash driving condition. During cases of any emergency as Heart attack or sudden fatigue driver may have to wait for another Pearson for help, this may make condition of

driver worse and there has not been much of a development in these areas.

Hermes is a prototype for driver drowsiness alertness and health monitoring system. The system comprises of various modules such as a drowsiness detection system, health monitoring system, alcohol detection system and an accident detection system. Hermes makes use of technologies like IOT and machine learning. The system uses an eye blink sensor and camera that takes picture of the driver, if he closes his eyes more than 3 sec then drowsiness will be confirmed. Heartbeat and temperature is constantly monitored for checking health condition. An alcohol sensor is used to detect whether the driver is intoxicated or not. With the help of sensors information about drowsiness, health condition and

alcohol intake can be obtained and updated to the web page. The web page is maintained by an admin, who update the web page and inform the authorities if any adverse conditions occur.

In addition, Safety with conformation is provided with machine learning and IOT, the training data from various components are analysed and output is predicted in the form of a supervised learning procedure as separate unit.

The existing system only implements sensor based drowsiness detection ,while in our proposed system we take account of both drowsiness detection, alcohol detection and the health status of the driver and it also monitor any accident of the vehicle has happened or not. Providing human assistance for the driver at critical condition along with the current status of the driver with a picture. And an external machine learning analysis is provided for providing the state of the driver and vehicle emphasizing the clarity in accuracy in prospective of data processing and data gathering along with an effective cloud storage platform.

II. PROPOSED SYSTEM

The system provides driver alertness and health monitoring functions. The health care monitoring system measures various physiological conditions of the driver. The drowsiness alertness system comprises of an eye blink monitoring system that alerts the driver during the state of drowsiness. An android application is also used, which help to update the driver status to his loved ones and co-workers. The system has various modules such as, **Accident Detection, Drowsiness Detection, Alcohol Detection, and Health Care.**

Accident Detection: The accident detection is based on the change in the vibrations of the vehicle. For this we use a MPU-6050 sensor. The MPU-6050 sensor contains a MEMS accelerometer and an MEMS gyro in a single chip. The results from this sensor will be

very accurate because it contains 16-bits analog to digital conversion hardware for each channel. Therefor it captures the x, y, and z channel at the same time. When no vibration is detected, Vibration sensor output will be 0 (low voltage), otherwise its output is 1(high voltage). When sensor detects rash drive with high vibration the system decide some accident happen. So system gives alert to particular department or guardian.

Drowsiness Detection: Eye Blink sensor is IR based. Here we use the concept that the variation across the eye will vary as per eye blink. The output will be high if the eye is closed otherwise output is low. This helps to know whether the eye is in closed or opening positions. This output is given to a logic circuit and which provides warning.

Alcohol Detection: The alcohol sensor we use is the MQ-3 sensor. This is a sensor that is not only sensitive to alcohol, but mainly ethanol, which is the type of alcohol that is found in wine, beer, and liquor. This sensor circuit can also be used as a breath analyser to check a person's blood alcohol level. Just as we exhale carbon dioxide when we breathe out, the drunken person will also breathe out some alcohol. Any Alco meter device can measure this alcohol content. The more ethanol in his blood, the more there is in the air on exhalation. This alcohol content gives a good indication for if a person is drunk and how drunk they are.

Health Care: The heartbeat sensor is based on the principle of photo phlethysmography. This sensor measures the change in volume of blood through any organ of the body which causes change in the light intensity through that organ. In case of applications where heart pulse rate is to be monitored, the timing of the pulses has atmost importance. The flow of blood volume is decided by rate of heart pulses and considering the fact that the light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses. The basic heartbeat sensor comprises of a light

emitting diode and a detector like a LED or a photodiode. If there any variations in blood flow the heart beat sensor output is 0 (low voltage), otherwise its output is 1(high voltage). It counts every pulse per minute. If the bpm is less or very high then system identifies that driver having some health related issues. Figure 2.1 shows the system design of the proposed system.

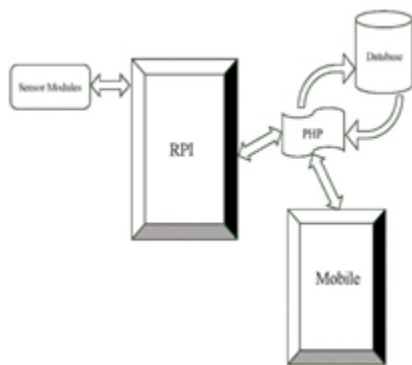


Figure 2.1. System design

All these modules are connected to each other and to the main server using IOT. The information from these sensors are monitored continuously either by an admin ore using supervised learning. Both of these options are implemented in our system. Despite of monitoring the driver status using either one of these, the collected information are updated into a web page for the use of admin and inform to respective authorities if any adverse condition occurs. The system also includes an android application which updates driver status to his relatives and co-workers.

This system could be a huge help to drivers and we can extend it for the use of driver communities which would bring down the accident rates.

III. LITERATURE SURVEY

[1] SAFETY DEVICE FOR DROWSY DRIVING USING IOT

IOT or the Internet of Things refers to the Interconnection of different devices or machines or things through any possible mode. The Internet of Things definition: “Sensors and actuators embedded in

physical objects are linked through wired and wireless networks” IOT gives us the capability to control digital devices or things through a user friendly GUI over the internet. This paper presents a safety device for drowsy driving using IOT. In this paper a self-powered IRIS scanner will be fitted into the dashboard in front of driver that will be scanning the driver eyes. So whenever a driver is drowsy or feeling siesta his/her eyes may go shut very frequently and for longer durations the sensor will trigger the action and activate the alarm so the alarm makes the driver conscious. The general structure of this proposed safety device is a block of different processes clubbed into one so as to make it successful operation in the work of computation and in turn make it useful for the human – computer interaction as this is the main aim of the safety enhancement.

From this paper we have taken the concept of human –computer interaction for drowsiness alertness.

[2] DRIVER BEHAVIOR MONITORING THROUGH SENSORS AND TRACKING THE ACCIDENT USING WIRELESS TECHNOLOGY

Monitoring the behaviour of the driver is one of the ways to prevent the fatal accidents and it is necessary to alert the driver when they are drowsy or in a distracted state. In this new proposed system (sensors) there is a possibility of self-controlling the vehicle when the driver was drunk or reckless or fatigue in order to reduce the major accidents. The paper also give an over view about the driver behaviours as (i)normal behaviour which points to driving task by controlling speed of vehicles ii)Drunk behaviour is analysed when the driver is drunk or if there is sudden rise in acceleration (iii)Fatigue behaviour is assumed when there is no alcohol intoxication in blood but exhibits the behaviour of being drunk.(iv)Reckless behaviour is calculated when the driver drives at high acceleration, not maintaining proper line position and makes other traffic participant’s at risk.

This paper also gives a possibility of tracking the location of the accident, if occurs, through wireless access technology like GSM or GPS so that proper measures are taken at a correct time. The GPS tracker will track the accident location from at least three orbiting GPS satellites. Then the related information is send to a server (computer), and it will display it on a web-based portal which is in-line with mapping software. The information system of accident will get activated and the message will transmit immediately to the respective authority whenever an accident occurs. This process is done by GSM.

From this paper we have taken the concept of classifying the driver behaviour and tracking accident location using GPS. The concept of web page to display driver status is also taken from this paper.

[3]ACCIDENT PREVENTION SYSTEM USING EYE BLINK SENSOR

This paper presents the design and implementation of the accident alarm system based with wireless network communications like ARM, GPS and GSM. This paper presents a system consists of wireless communication for communication with the accident sense system and the Pre-set of treatment centre. Individual vehicle is equipped with an accident sense system, which consists of GSM and GPS. When the accident occurred, Vehicles state and locations will be transmitted to the Pre-set of treatment centre though wireless communication technologies of GSM through short message format.

This paper also implements an alcohol sensor is suitable for detecting alcohol concentration on your breath. It has a fast and high sensitivity response time. It provide alarm, when detect alcohol engine will be stop and message with location sent to owner. Obstacle Detecting Sensor is used to detect objects and obstacles in front of sensor in a narrow angle useful in robotics applications. The system also uses an Eye Blink sensor for drowsiness detection. The output will be high if the eye is closed otherwise output is low.

This helps to know the eye closing and opening positions. If the driver close his eyes more than 3 seconds it provide alarm, engine will be stop and message with location sent to owner.

From this paper we have taken the concept of using different sensors for drowsiness detection and health monitoring.

IV. HARDWARE IMPLEMENTATION

The various hardware component used in our system are Raspberry Pi 3 Model B, Heartbeat Sensor, Alcohol Sensor, Camera, Temperature Sensor, MEMS Sensor, Eye blink Sensor and Global Positioning System.

The proposed system uses a **Raspberry Pi 3 Model B** which is the third generation Raspberry Pi .The Raspberry Pi 3 Model B is a more powerful processor, than the first-generation Raspberry Pi. Raspberry Pi works in an open source platform. It has **1GB RAM, 64 Bit CPU**, 4 x USB ports, 4 pole Stereo output and Composite video port, 10/100 Base Ethernet socket, CSI camera port for connecting the Raspberry Pi camera which we used for drowsiness detection, DSI display port for connecting the Raspberry Pi touch screen display, Micro SD port for loading your operating system and storing data. Micro USB power source helps in running the Raspberry Pi. The camera is connected to raspberry pi using the USB ports available on this board. Three GPIO pins are used , one for capturing an image, another for control and finally for shutting down the system respectively. The board is operated in such a way that the installed code starts executing when it is powered ON.

The heartbeat sensor is based on the principle of photo phlethysmography. This sensor measures the change in volume of blood through any organ of the body which causes change in the light intensity through that organ. In case of applications where heart pulse rate is to be monitored, the timing of the

pulses has utmost importance. The flow of blood volume is decided by rate of heart pulses and considering the fact that the light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses. The basic heartbeat sensor comprises of a light emitting diode and a detector like a LED or a photodiode. If there any variations in blood flow the heart beat sensor output is 0 (low voltage), otherwise its output is 1(high voltage). It counts every pulse per minute.

The MQ-135 Gas sensors are used in air quality control equipment's and is suitable for detecting or measuring of NH₃, NO_x, Alcohol, Benzene, Smoke, and CO₂. In our system we use this sensor to detect whether the driver is drunk or not. The MQ-135 sensor module comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. The sensor can be activated at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breath analysis. Its Operating voltage range is 2.5V to 5.0V.

Camera is used to capture the image of the driver and it is also used to monitor the facial behavioral of the driver. Here we use a Logitech C270 HD Webcam with Focal length: 1.12mm, F value 2.2.

The LM35 series are precision IC temperature devices with an output voltage which is linearly-proportional to the Centigrade temperature. It also helps to monitor driver's health condition The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output in order to obtain convenient Centigrade scaling. It has low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a temperature range of -55°C to 150°C. And it is Operates from 4 V to 30 V range.

MEMS Systems combines mechanical and electrical components. MEMS inertial sensors that include an

acceleration sensor and an angular velocity sensor called gyroscope (simply "gyro") are the most popular devices.

Eye Blink sensor is IR based. Here we use the concept that the variation across the eye will vary as per eye blink. The output will be high if the eye is closed otherwise output is low. Eye blink sensor is used to predict whether the eye is in closed or in open position. The resultant output is given to a logic circuit to indicate the alarm. It is mainly used to prevent the accidents.

A liquid crystal display (LCD) is a flat, thin display device which is made up of number of monochrome or color pixels which are arrayed in front of reflector or a light source .The features of LCD are Energy efficient, cost effective, Space economy, reduction of radiation and lighter weight.

The Global Positioning System (GPS) is a navigation system it is used for detecting current position of the system. It sends and receives radio signals. One advantage of using GPS technology is that, one can determine the exact location, time, velocity, 24 hours a day, in any weather conditions & anywhere in the world. GPS receivers can be used for locating; positioning, surveying, navigating and determining the time. GPS are employed by both private individuals and companies.

Figure (4.1) shows various components connected to the Raspberry Pi.

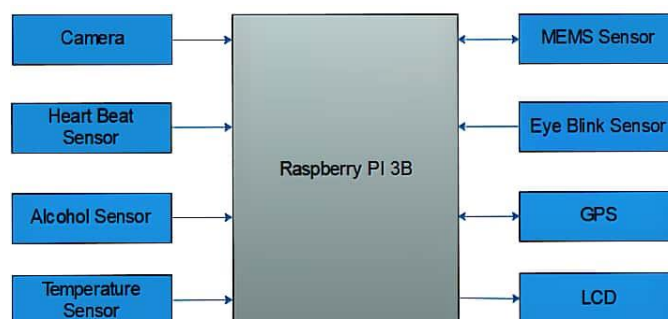


Figure 4.1. Block diagram

The figure 4.1 represents the block diagram of our proposed system. Here MEMS, Eye Blink, Alcohol

sensors, Temperature sensors, Heart beat sensor, GPS and camera module incorporated with in a microcontroller raspberry pi. The system operates by analyzing sensor signals the pi initiates camera if any abnormal condition is exhibited by the driver. Alert messages are passed and displayed on then LCD monitor.

V. SOFTWARE IMPLEMENTATION

Several softwares are used for the development of our prototype.

Raspbian OS: Raspberry pi works with Raspbian OS which is derived from the original Debian operating system. Raspbian is a Debian-based computer operating system used by Raspberry Pi. There are several versions of Raspbian are available including Raspbian Stretch and Raspbian Jessie. It has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers since 2015. Raspbian was created as an independent project by Mike Thompson and Peter Green. The operating system is still under active development. Raspbian is designed in such a way that it is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.

OpenCV-Python is a library designed to deal with computer vision problems. It is an open source cross-platform computer vision library which began as a research project at Intel in 1999 by Gary Bradsky, and the first release came out in 2000. It can be programmed using different programming languages like C, C++, Python, Java, etc. Using these we could create image processing functions and high-level algorithms. With the development of computer vision technology, Open CV has a number of algorithms for image processing. Open CV is a good image processing tool. We use open CV for image processing for face recognition.

Visual Studio Code (VS Code) is one of the sours code editor developed by Microsoft for Windows, Linux, and macOS. In addition to work as a code editor it includes support for debugging, embedded Git control, syntax highlighting, intelligent code completion, snippets, and code refactoring. It is also customizable, so that the users can change the editor's theme, keyboard shortcuts, and preferences. The source code is open source and released under the permissive MIT License. The compiled binary data are freeware and free for private or commercial use. We use visual studio code Editor for the development of Graphical User Interface (GUI) required for machine learning and several important developments of the proposed system using the python-PyQt5.

Spyder is used in Raspberry Pi for scientific programming in python. It is a powerful IDE used run programs written in Python. It contains many built-in popular scientific packages such as NumPy, SciPy, Pandas, IPython, QtConsole, Matplotlib, SymPy, etc. It has numerous built-in features and its functions could be extended further via first- and third-party plugins. In our system it is used as a PyQt5 extension library for the advanced editing processes.

Android Studio is the integrated development environment (IDE) for Google's Android operating system. It is built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on different OS such as Windows, macOS and Linux based operating systems. It can be used as a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development. We use Android studio for developing an application for the driver relatives to know status of the ride/ physical state of the driver.

PyQt5 is a combination of Python bindings for Qt v5. It comprises of more than 35 extension modules and allows Python to be used as an alternative application development language on iOS and Android.

The given flow chart (fig 5.1) refers to the flow of execution of the proposed system. The explanation for this flowchart is as follows.

The figure 5.1 shows the working of the system. Firstly, initialize GPIO, serial, sysBus, Spi, and camera in the Raspberry pi. Then attach an interrupt for getting the pulse rate of the driver. The microcontroller is programmed to receive an interrupt for every pulse detected and it can also count the number of interrupts or pulses in a minute. The count value of pulses per minute will be the Heart rate in bpm (beats per Minute). Then check the gyroscope values, According to the previous values of coordinates(x,y,z) the system automatically detect the present condition of the vehicle. If the accident occurs by vibration of rotating machinery of the vehicle, immediately the exact location of the accident is identified by an authority person through Global positioning system (GPS) and message is sent via Global system for mobile Communications (GSM). Eye blink sensor continually monitoring drivers eye movements, if the driver close his/her eyes more than 3 seconds camera module capture the image and send it to the control room. Similarly heartbeat, Alcohol and temperature sensors continuously monitors the driver, if any kind of irregularities occurs the machine learning based control system alert the driver. An extraction process is performed to extract meaningful features from the received data; these features then serve as input models to an inference network to analyze the driver's vigilance level. The network predicts the driver's alertness state through a series of computations, and displays the computed results on the LCD screen. An alert system is triggered if the statistical results indicate that the driver's alertness is predicted to be low.

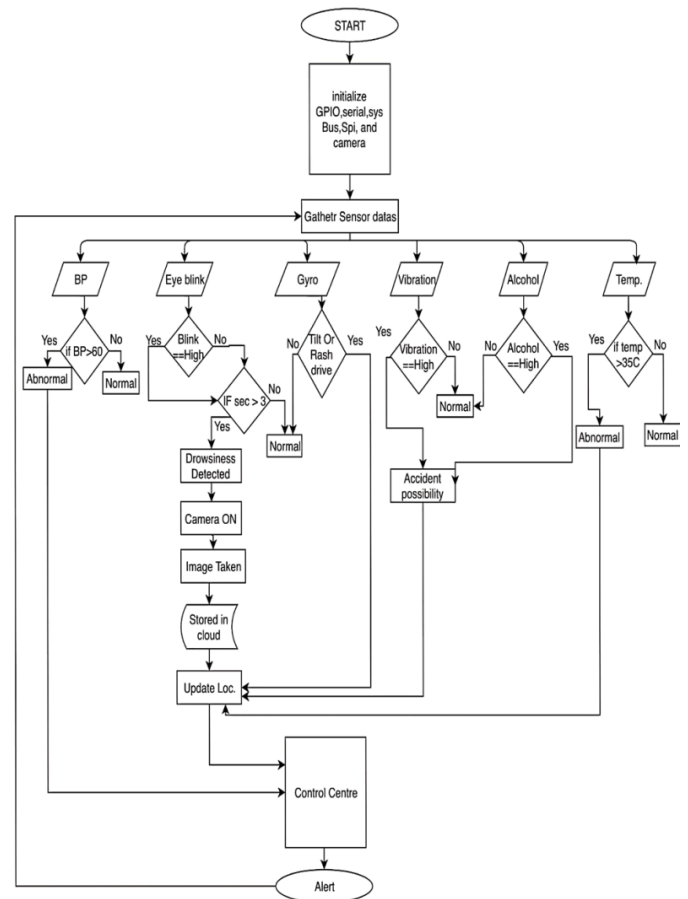


Figure 5.1. Flow chart

VI. OUTPUT

Hermes provides an embedded system that records aspects like accident detection, drowsiness detection, alcohol detection along with health care details of the driver, together with cloud services, android application and a php admin page; the system contains a separate machine learning analysis system. The embedded system is placed near to dash board near to the drive, containing camera, heartbeat, alcohol, temperature, MEMS, eye blink sensors, GPS and LCD Screen. The information from the embedded device is passed to an IOT cloud and viewed on an android application for external user, who wants to know about the whereabouts of the driver including details of normal conditions of vehicle and driver along with abnormal conditions if any. There is also an admin who monitors the state of driver and vehicle in a php domain containing all information's as that of android

app. The admin have special privileges of monitoring the profile of the driver, informing security numbers on abnormal conditions. An extra machine learning module is present which also take information from the cloud and predict whether the vehicle and driver states are in normal or abnormal mode. The result report module of project if found in drowsiness state help driver to stay alert and inform authority if any accidents occurs. It gives the current location of the driver along with his photo both in android app for viewers; also for admin in php domain. The system as a whole provides a best way to reduce accidents through drowsiness and alcohol detection and health monitoring.

VII. FUTURE ENHANCEMENT

In future, we can use for emergency speed control of vehicles, for rash driving by obstructing spark plug. In case of any violation of traffic rules, corresponding punishments can be given to the drivers when any connections are implemented to the traffic police system. It can be used for monitoring system for online taxi services like OLA, Uber etc. Voice based real time advice can be given for drivers by their loved ones when they are over drunken or rash driven.

VIII. CONCLUSION

Drowsiness and drunken driver are the leading cause of road accidents. In this paper, our proposed system helps to reduce the number of accidents due to the above mentioned causes. It also helps to monitor the health conditions of the driver. Interfacing simple sensors to various microcontroller platforms enables the ease of regulating the embedded system at a sophisticated level of automation and mediating the sensor information over a smart grid. This development fascinates the overall process of communication between human and machine rather than machine to machine communication.

IOT can revolutionize the way embedded systems interact and respond for variety of applications especially in case of vulnerable night drivers by monitoring them. It also enables large amount of data acquisition for taking accurate decisions over the emergency conditions. With the use of supervised learning process such as machine learning the output can be securely confirmed.

IX. ACKNOWLEDGEMENT

Firstly, we would like to thank respected Dr. P Mohamed Shameem, Principal TKM Institute of Technology and Mrs. Leena Y, HOD Dept. of CSE for giving us such a wonderful opportunity to expand our knowledge and for their huge support. Secondly, we would like to thank our parents who patiently helped us. I went through my work and my friends who helped me to make my work more organized and well-stacked till the end.

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Digital Camera Authorization

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ABSTRACT

In the modern world there are many situation where photography and videography are to be banned at certain places for various reasons. In places such as museums, court rooms, shopping malls, industries, defense areas, jeweler's stores, theater etc. where maintaining secrecy is big issue, a new technique is required that could differentiate authorized and unauthorized camera and deactivate the fraud one. This paper proposes a technique for authorization of digital camera. Here a system that can be used to detect multiple unauthorized camera and deactivate them is used. This system can be used to authorize camera by assigning special symbol on device using glyph marks and use them at places. The system learns to differentiate unauthorized device by deep learning technology and detect them from real-time video feed using computer vision to locate its position and deactivate the camera by directing laser or IR light to the lens which will distort the image due to overexposure. The light does not interfere with camera's operation and is harmless to camera user.

Keywords : Image Processing, Deep Learning, Neural Network.

I. INTRODUCTION

The no-photography policy is not limited just to India. But it is a worldwide phenomenon. Photography is banned at places such as museums, court rooms, shopping malls, industries, defense areas, etc. Eliminating use of cameras in such places improves visitor experience. Preventing photography ensures the gift shop maintains a monopoly on selling images. Banning photography is believes to boost security by preventing thieves or terrorists from visually capturing and pinpointing weakness in alarm systems and surveillance. Also, taking photographs in restricted areas violates copyright protection. Film industry also suffers loss due to movie piracy. Hence, there arises a need to prevent this undesired photography, to avoid this heavy loss. This projects presents solution for this undesired photography to prevent security and privacy of the site. Our solution is based on detecting the camera's which are unauthorized and are capturing pictures of the site.

After detection of unauthorized camera's a strong light is focused onto detected camera, which degrades the quality of the captured image, thus rendering the captured photograph useless. By implementing this project only desired cameras could be authorized into the place for capturing.

II. LITERATURE REVIEW

The detection of digital cameras or other optical device in the background could help military forces to detect possible attacks. By scanning the surroundings with a laser beam, a relatively strong retro reflection signal is created by an optical sight that is pointed the direction of the laser source. In 2005, a group of four people Khai N. Truong, Shwetak N. Patel, Jay W. Summet, Gregory D. Abowd published their results in Springer-Verlag Berlin, Heidelberg of 7th International Conference on Ubiquitous Computing [1]. System implementation includes use of Sony digital handycam video camera. This camera was held in night shot

mode. The lens of this handy-cam was surrounded by IR-transmitter and narrow band pass IR filter. This arrangement projects IR radiations in field of view, due to retro-reflection lens appears as a bright white circular sparkle through the handy (capturing device). The detected reflection is located by tracking the bright regions in handy cam above some luminance threshold. For neutralizing camera, 1500 lumens projector which emits localized light beam at each detected camera. In 2014, Virendra Kumar Yadav, Saumya Batham, Anuja Kumar Acharya published their results in Electronics and Communication Systems [2]. They used Circular Hough Transform and Local Maxima concept for detecting multiple circles. These results can be used to track circular lens of a camera. In 2014, Panth Shah, Tithi Vyas published their results in International Journal of Engineering Research & Technology (IJERT)[3], which are based on interfacing between Arduino for Object Detection Algorithm. These results can be used to locate the axis value of camera's lens and passing those values by serial communication to Arduino. In 2016 PA dhulekar[4] published a paper with new technique to deactivate all camera in the area by directing IR rays to the lens detecting it by image processing.

III. MODULE DESCRIPTION

The procedure is based on Image Processing and Deep Learning Algorithm [5]. Here, web camera is used as an image acquisition tool. The web camera can be inbuilt camera or any other USB camera. The whole procedure can be divided into several parts:

A. Image acquisition

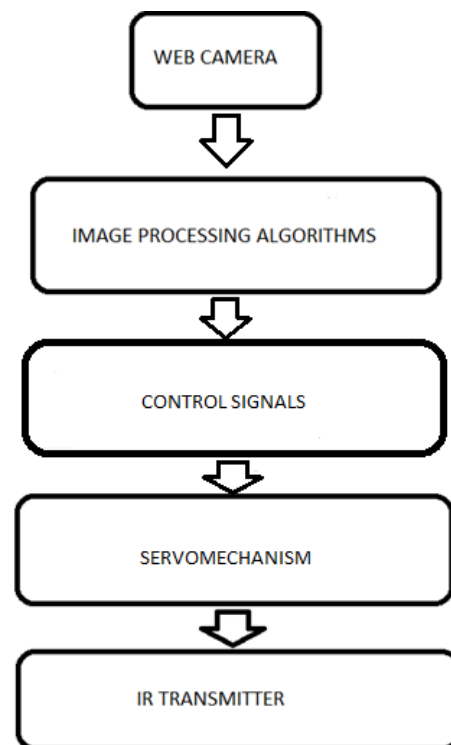
The initial step is to feed the video from the web camera. The video is captured by the web camera having resolution 1280*720 pixels continuously. The video is then converted into sequence of frames. The converted sequence of frames will undergo further image processing algorithm. Here, web camera

performs role of image acquisition toolbox. The video streaming from web cam is used for detection.

Figure 1 shows data flow diagram of the project.

B. Detection of camera

The acquired video is used to compare with the trained weight using deep learning and image processing algorithm using computer vision to compare the input data and locate the unauthorized camera in the frame.



Data flow diagram

Figure 1. Data flow diagram

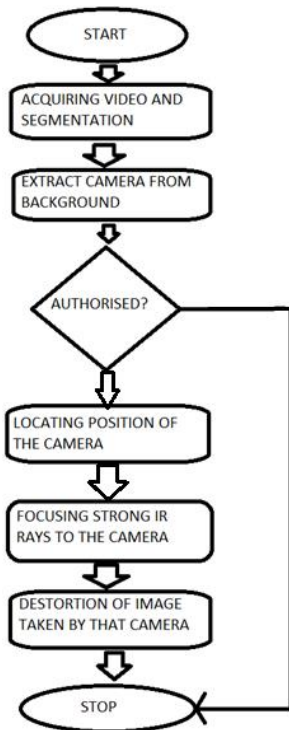
C. Locating camera

After detecting the camera's lens from the background the exact position of the lens can be detected by calculating the centroid of the lens. The X-Y axis values are calculated for locating the centroid of the detected camera lens then according to the axis value the control signal is given to the Arduino to operate the servomechanism.

D. Authorizing camera

Authorization of detected camera is done by analysing the details from image processing algorithm. Cameras

are authorized by sticking glyph sticker close to lens of camera. If this mark is not present in near the lens the camera is marked as unauthorized and reserved for neutralizing.



Flow-chart

Figure 2. flow chart

E. Neutralizing camera

Servomechanism plays vital role in neutralizing the detected camera. Servomechanism is interfaced with the controller board. On the servomechanism a strong point laser is mounted to operate as per the control signal sent from controller. The laser have alternatives such as IR transmitters or any other strong light source. The only duty of laser is to degrade the quality or fine details of the image by using over- exposure property of light. And the requirement of the strong laser of any other strong light source is that the intensity of strong light source must be greater than background light.

The camera is deactivated by exposing it to IR rays. When camera lens will be located it has to be neutralized by using infrared transmitters or strong

light source. Since this beam is of high intensity as compared to the other light incident on the lens from the image, the camera tends to be overexposed. After this effect the photograph will be distorted. This will contribute in loss of fine details of image rendering it useless.

IV. IMPLEMENTATION

This paper aims at designing a technique for authorization, detecting and deactivating digital cameras in photography prohibited areas based on image processing .The system will consist of two parts: Camera detection & authorization unit and camera deactivating unit.

Hardware requirement for implementing this project are web camera, controller, glyph sticker, servomechanism and light source. Webcam connected to pc for feeding the surveillance video to algorithm. Controller is any board like arduino or raspberry pi for controlling servo mechanism. Glyph sticker is Sticker with any special symbol. Servomechanism is Servomotor to direct light source to the desired location. Light source may be IR or laser led Software requirement are OpenCV and python. OpenCV is a Library of programing functions for real time computer vision. Python programming language is used to implemented algorithm.

Camera detection & authorization unit includes web cam interfaced with PC .Web cam will be used for surveillance of the prohibited area. This video is then converted into sequence of frames. These converted frames will undergo further image processing. First step is to get video feed from web cam which is connected to the laptop. An algorithm named YOLO(you only look once)[6] which is used for the detection of camera device and lens will be written in using python and any image processing software like OpenCV[7]. Yolo processes each frame of the surveillance video and divides each frame into $S \times S$ grid. If the centre of an object falls into a grid cell that

grid cell is responsible for detecting that object. This algorithm comes with customized deep learning model built using neural network which is responsible for object detection [8]. The model is trained using dataset of images that has glyph sticker with symbol. This sticker symbolizes that device is an authorized camera. Else the device without this symbol are marked unauthorized by the algorithm. The position of the unauthorized camera lens will be monitored by identifying and tracking distinct features of the lens [9]. Position of the lens of camera will be tracked by referring its axis value as defined in image processing software.

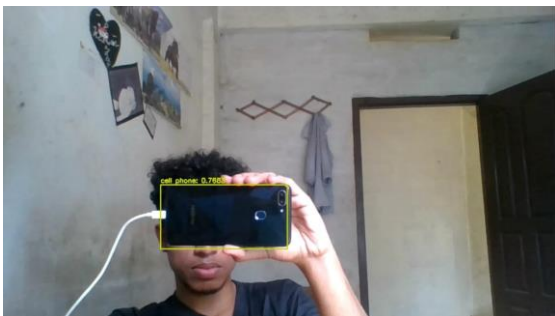


Figure 3. Screenshot of camera device detected by detection algorithm

Camera deactivating unit consists of IR- Transmitter or Strong Light Source, servomechanism and a controller. Control signal from camera detection unit will be generated and sent through serial communication to controller. IR transmitter will be fitted on to the servomechanism. Servomechanism will be interfaced with controller. After detection of camera lens and its position a signal will be sent to controller board and board will operate servomechanism such that IR transmitter will point in the direction of detected lens and emit strong IR rays which will reduce the quality of captured image[10]. The number of lenses can be counted by algorithm on real time basis.

V. CONCLUSION

The main objective of project is to detect and disable unauthorized digital cameras in photography

prohibited area using image processing algorithms and servomechanism. The image processing techniques are used to locate the position of multiple unauthorized cameras in prohibited area. It locates the lens of multiple cameras but it neutralizes the only one camera lens. The axis values of camera lens received by controller. The servomechanism rotates according to control signal which are received from controller. Because of the strong light source or LASER focused on centroid of camera, the user gets the distorted image. This work will be beneficial in the areas such as theatres for prevention of piracy. It has many applications which include maintaining secrecy at defence areas, courts, industries, government offices, research and development sectors, museums, historical monuments, religious places etc.

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Movie Review Using Emotion Detection

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ABSTRACT

Movie review is a general process taking place whenever a movie is released. The nature of movie is always a question for movie viewers. The release of movie makes viewers enthusiastic and they won't be able to know the absolute nature of movie. Nowadays after the release of a movie a third person will be standing outside the theatre to know about people feelings. They will be holding a recording mic and another person will be taking video of the process. After the questioning is over, they release the video to internet or there private channels to show the nature of movie. Hence a live review of movie is not possible at the moment. This project presents a solution such that a live review is done at the time when movie is running in the screen. Emotion detection is the process of identifying human emotion. With the help of machine learning model we can have trained classifier and the nature of human emotion can be identified. A high definition camera inside the hall can detect faces of people and detect the emotions they are showing at each second. This system updates the review during each second and review about the movie will be updated at the present time thus getting a live review. By implementing this project the review about the movie can be seen at the present time through a web application. Facial expression recognition enables computers to understand human emotions and is the basis and prerequisite for quantitative analysis of human emotions. First, we look at different representations for faces in images and videos. The objective is to learn compact yet effective representations for describing faces. We first investigate the use of descriptors (of algorithm) for this task. Generally three important steps involving in the face recognition system are: (1) detection and rough normalization of faces, (2) feature extraction and accurate normalization of faces, (3) identification and/or verification. Having developed these representation, we propose a method for labeling faces in the challenging environment. The face feature tells clearly what is their opinion about the visual experience thus we can rate the movie according to their opinion. Through machine learning, sentiment analysis can be achieved with greater accuracy. There are many ways for facial emotion detection like Viola-Jones algorithm, convolution neural network method from deep learning. The efficient algorithmic method from above can be used to obtain a better output to know about an individuals facial emotion. In this project we deals with sentiment analysis through facial features and gives rating about the movies.

Keywords : Sentimental Analysis, Machine Learning, Convolution Neural Network (CNN).

I. INTRODUCTION

Movie review is a general process taking place whenever a movie is released. The nature of movie is always a question for movie viewers. The release of movie makes viewers enthusiastic and they won't be

able to know the absolute nature of movie. Nowadays after the release of a movie a third person will be standing outside the theatre to know about people feelings. They will be holding a recording mic and another person will be taking video of the process. After the questioning is over, they release the video to

internet or their private channels to show the nature of movie. Hence a live review of movie is not possible at the moment. This project presents a solution such that a live review is done at the time when movie is running in the screen. Emotion detection is the process of identifying human emotion. With the help of machine learning model we can have trained classifier and the nature of human emotion can be identified. A high definition camera inside the hall can detect faces of people and detect the emotions they are showing at each second. This system updates the review during each second and review about the movie will be updated at the present time thus getting a live review. By implementing this project the review about the movie can be seen at the present time through a web application.

II. METHODS AND MATERIAL

This paper aims at designing a technique for live movie review using machine learning and emotion detection. The system consists of four modules: extraction module, normalization module, training and prediction module, display output.

In extraction module, we detect all the human faces inside the hall. For this we use opencv platform with python face detection coding. High definition cameras can be used for multiple face detection. The facial landmarks are obtained and it is extracted. After extraction, normalization of facial landmarks are done. Since one person may have different head poses in camera, for enhancing the performance of the proposed system, we apply a normalization step before selecting features. Normalisation is one of the techniques used in data science to bring features in a dataset to the same scale. When we normalize a feature, all features value will be in the range of 0 to 1. We use viola jones algorithm for sentimental analysis. The basic principle of the Viola -Jones algorithm is to scan a sub-window capable of detecting faces across a given input image. After normalization comes training and prediction method. The computed

features are used as input of a trained classifier to predict emotion for each person. At training stage, the algorithm estimates model parameters based on a training dataset.

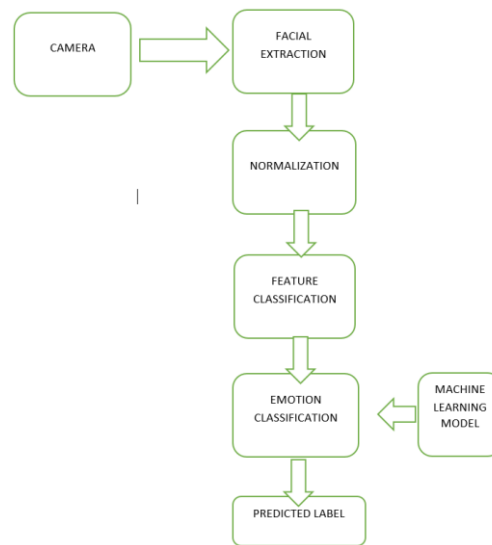


Figure 1. module representation

At prediction stage, the algorithm uses trained model to predict the outcome based on new data. Convolution neural network is also used as image recognition algorithm. It can also be used for other classification and other user problems. After this comes display unit where the data are displayed to application/webpage.

Movie review using emotion detection consists of camera that captures the faces of people inside the hall. A gpu powered computer is needed for image recognition and processing. Opencv platform is used and python coding language is used. A database management system is used for storing training images. A webpage displays the data that is received.

III. IMPLEMENTATION

The implementation details of four modules are described in this section. We develop this method for solving movie review problem that is faced today. We firstly detect all human faces and extract facial landmarks from each observed face. We normalize facial landmarks and calculate the corresponding

feature. The computed features are used as a inputs to a trained classifier to predict emotion for each person. Then gather this data to the display application or webpage.

A. Extraction

Face detection is an important step for image classification since only the principal component of face such as nose, eyes, mouth are needed for classification. Face detection is done by extracting the feature points of face. This is the initial step.

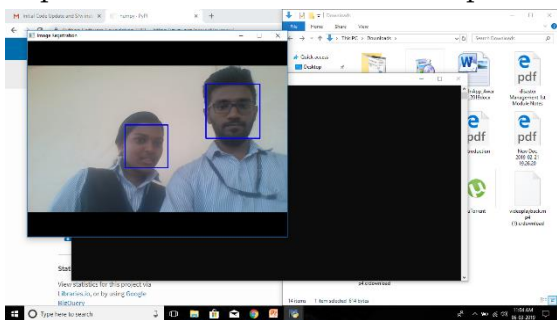


Figure 2

The faces are captured by high definition camera continuously.

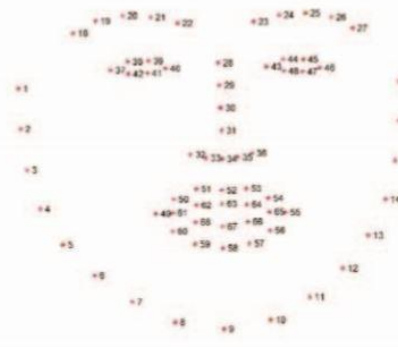


Figure 3. example for landmarks

The facial landmarks are identified. For emotion detection this is the primary stage. Examples of some emotions are shown in figure.

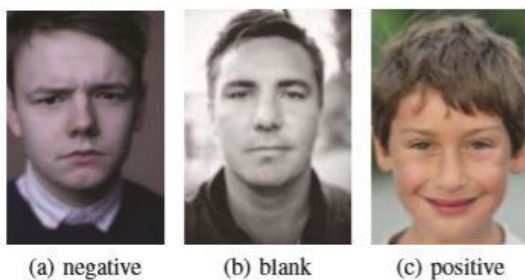


Figure 4. Emotions

B. Normalization

Normalisation is one of the techniques used in data science to bring features in a dataset to the same scale. Face component displacements are not the same for different subjects and perhaps even each person does not have a unique expression for the same emotion. For example, all people express the Sadness, but the way of displaying this emotion is not the same for all subjects. Other emotion expressions also have a similar situation. Facial expression variability is a basic problem in facial expression recognition systems. Variability in facial expression more occurs in geometry of facial components (such as mouth and eyes); however, creases, wrinkles, and furrows caused by expression, have less variability than facial geometric situation. Hence face geometry is normalized into a fixed geometric model, and then facial expression is recognized using appearance features representation. Due to the importance of mouth and eyes regions in emotion expression, to extract sufficient information, these regions are defined in their maximum size in geometric model. For normalization, first localized landmark points of each image are mapped onto fixed model coordinate. To do this, we use convolution neural network algorithm. Figure 1 illustrates an example of geometric normalization for a face image.

C. Training and prediction

In training stage, the algorithm estimates model parameters based on a training data set. We basically try to create a model to predict on the test data. So, we use the training data to fit the model and testing data to test it. The models generated are to predict the results unknown which is named as the test set. As you pointed out, the dataset is divided into train and test set in order to check accuracies, precision by training and testing it on it.

The proportion to be divided is completely up to you and the task you face. It is not essential that 70% of the data has to be for training and rest for testing. It completely depends on the dataset being used and the

task to be accomplished. So, assume that we trained it on 50% data and tested it on rest 50%, the precision will be different from training it on 90% or so. This is mostly because in Machine Learning, the bigger the dataset to train is better.

Prediction” refers to the output of an algorithm after it has been trained on a historical dataset and applied to new data when you’re trying to forecast the likelihood of a particular outcome, such as whether or not a customer will churn in 30 days. The algorithm will generate probable values for an unknown variable for each record in the new data, allowing the model builder to identify what that value will most likely be.

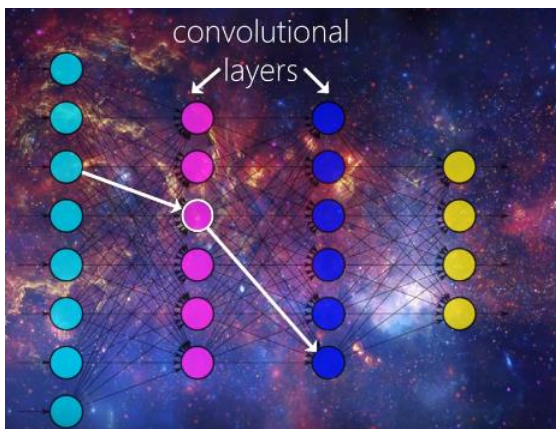


Figure 5. example of CNN

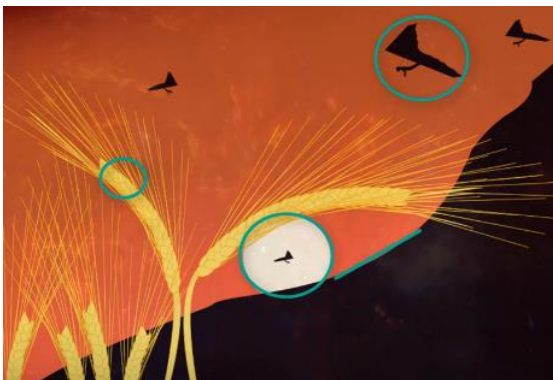


Figure 6. figure showing marks

The algorithm used for our project is convolution neural network algorithm and viola jones algorithm. Voila Jones is the oldest and most recognized face algorithm available for the face detection from the image. The Viola Jones face detector analyzes a given sub-window using features consisting of two or more

rectangles. In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep neural networks, most commonly applied to analyzing visual imagery.

D. Display

The final is the display unit where we can find the corresponding emotion shown as a database and with this data we will rate the movie according to the emotions.

IV. RESULTS AND DISCUSSION

There are many feature extraction techniques and some of them are geometry based, template based, appearance based and color based techniques. Supervised and unsupervised classifier are the existing methods for emotion classification. Bakshi, Urvashi, and Rohit Singhal concludes that feature detection techniques are divided as: Feature based technique and Image based technique . In feature based technique facial features are used for detection process and in image based technique multiple faces with clutter intensive backgrounds are detected. To extract feature or facial points from the image different approaches are existing. They are geometric based technique, template based technique and appearance based technique. In geometric based techniques facial points are obtained using the size and positions of principal elements of images. Using appropriate energy function template based methods extract features . Appearance based approach process the image as two dimensional patterns. For face recognition different approaches of such as holistic, feature-based and hybrid approach are existing. Geometric shapes of principal component of faces are identified in geometry based method. In the holistic approach whole face region is taken into account as input . Hybrid approach is the combination of both methods.

In the work of Serban, Ovidiu, features from video inputs as well as transcription on audio as text are combined together. This system uses a method called segmented detection instead of using individual classifiers. The emerging idea of multimodal fusion are studied in this research . NGrams, Smile Presence or Valence are the features used for fusion. SVM classifier is used for classification process. Youtube Opinion corpus containing 48 videos are selected for training and testing. Hua Gu,Guangda Su and Cheng Du proposes a method in which feature extraction are automatically performed. The operator SUSAN (Smallest Univalued Segment Assimilating Nucleus) is used to obtain the edge and ridge position of feature. The experiments are conducted on face database that has been created in their own lab itself with 270 people each provided 7 face images. Experimental end result shows that locating of feature points is correct and faster. Kwok-Wai Wong, Kin-Man Lam, Wan-Chi Siu proposes a more reliable approach for face detection and extraction using genetic algorithm and Eigen face technique. Firstly possible eye contender are detected and based on this possible face regions are detected with the help of genetic algorithm. Every face contender are then normalized by adjusting the shirring angle during head movement. An histogram equalization is done reduce the lighting effects. After that the fitness value of the face is calculated by projecting onto the eigen faces. Selected facial points are then verified by calculating the similarity and existing facial features. This work shows a great result even though when the image undergoes a shadow or shirred. Michael J. Lyons, Julien Budynek, and Shigeru Akamatsu proposes a technique which will automatically recognize images of faces. This system uses a two dimensional Gabor wavelet representation for classification process. Three image sets are tested with sex, race and expression as class labels. Dataset contains 193 images of emotions done by nine female Japanese models. Another dataset used is a facial expression image set with 51 male expressors and 59 female expressors.

1.Filter for simple image(according to CNN)

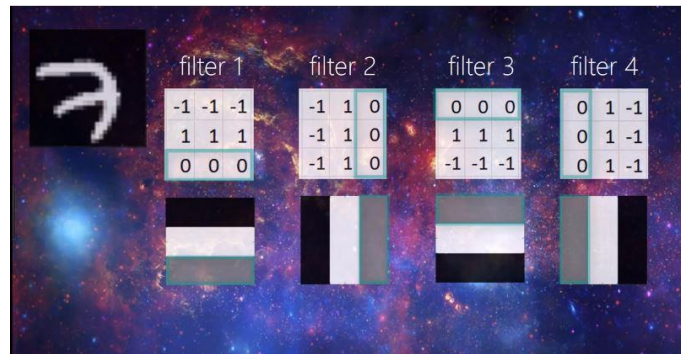


Figure 7

This is an example figure showing the working of CNN.

2.Filter for harder image(according to CNN)

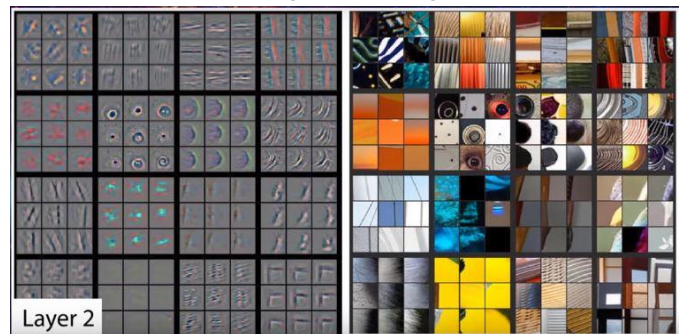


Figure 8

This is an example figure showing the working of CNN.

After working on cnn algorithm and viola jones algorithm we get an improvised result for our project. The emotion analysis can be easily done. The layer of filters help in greater analysis of face and the emotions present in the viewers face. The machine learning algorithm makes this project more efficient in working. This project helps in attaining emotions in a better way.

V. CONCLUSION

The main objective of the project is to detect the facial emotion and find the review of the movie. For detecting the emotions from the image we use the well-known Viola Jones algorithm. By using classifier the face and emotion recognition of the person is done. We get a live review using this method. This method is faster than the current method that people are

doing. Through our webpage or web application we can know about the movie review at the present time during the movie is played. Live stream is the speciality of our project. The use of machine learning makes this more advanced because the system can be updated with new features. The scope of this project is very high.

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IoT Static Wireless Mesh Network Routing

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ABSTRACT

Due to the emerging popularity of IoT devices, mesh networks became an inevitable network topology to consider. However, many technical issues still exist in this field. Most of the Embedded devices categorised as IoT devices are inherently constrained by low memory, processing power and throughput. This paper attempts to introduce a new routing scheme for static wireless mesh networks for IoT devices.

Keywords : Internet of Things, Wireless mesh networks, Routing, Routing algorithms.

I. INTRODUCTION

Wireless Mesh Networks (WMNs) are dynamically self-organized and self-configured, with the nodes in the network automatically establishing an ad hoc network and maintaining the mesh connectivity[1]. Wireless mesh networks offer advantages over other wireless networks; these include easy deployment, greater reliability, self-configuration, self-healing and scalability[2].

Some of the optimal assumptions considered during its design cycle are- any failure in this network is infrequent, the amount of data exchanged is very much minimal (less than 10MB per hour per Node), timeliness of the packet is negotiable, the physical position of the IoT devices are static and any two nodes considered as connected should be able to do bidirectional data exchange.

Every Static WMN cluster must have at least one node that acts as the gateway node and all other nodes acting as a slave to the gateway.

II. STATIC MESH NETWORK TOPOLOGY

S-WMN clusters can function without gateways, however, they are very much critical for handling network failures and data exchange between other WMN clusters.

A. Addressing

By default, S-WMN cluster assigns distinct whole numbers as the logical address for every node in the network. No two nodes can have the same logical address but a single node can have multiple logical addresses which is very much relevant in cases of gateways. Gateways can use reserved address spaces mapped to global or local IPv4/IPv6 addresses that can be used to establish communication outside of its scope. For any node in the network with multiple addresses ranging from x to $x+n$ where n is the number of addresses allocated to that node, then x will act as its native address and all other addresses ranging from $x+1$ to $x+n$ will act as a foreign address. Any device that seeks access to the cluster through a node will be assigned the foreign address of that node which will act as a DHCP server. This, in turn, can be used to integrate dynamic nodes or gateways into the

cluster on the fly without sacrificing the performance of the network. This also opens to the fact that insertion or deletion of new dynamic nodes to the network via a static node doesn't disrupt the routing tables of the mesh topology.

B. Gateways

Gateway nodes are special nodes in the network with a bit more of memory, processing power and throughput. They are very much critical in recalculating routing tables when a new node joins or disconnect from the cluster. By default, any data exchange outside of the cluster happens through the gateway nodes. Gateways are categorised into two-

- Primary Gateway - A Single standalone node in the network that handles the routing tables. By default, the primary gateway will have the first starting address in the succession of logical addressing. Primary gateway will be in charge of network administration, control and configuration of the network. Primary gateways can route packets in and out of the cluster and also between other clusters.
- Secondary Gateways - Any node in the system that can act as a primary gateway by connecting to the cluster as a dynamic node.

III. ROUTING TABLE

Primary gateway is responsible for maintaining routing tables. Routing tables are updated whenever a new node is added or disconnected from the network. Routing table also assigns a logical address to the nodes that help in the routing. The logical address of the nodes will tend to change when there is a change in the network topology hence, insertion and deletion of new nodes to the network are handled in a sequential manner.

A. Graphing Network

Primary gateway will fetch all the information about the nodes and forms a weighted undirected graph of the network (G). G can be either acyclic or cyclic for a network but must be connected. Disconnected graph components tend to form different clusters and hence wireless proximity between the nodes are essential to form a connected graph. Vertex (V) in the graph will represent a node and the weighted edge (E) will provide a real value that resembles the Quality of Service that comprises of several related aspects of the network service often considered, such as packet loss, bit rate, throughput, transmission delay, availability, jitter, etc[3].

Figure 1 shows an example of a static wireless mesh network cluster. The same depicts a cluster with 8 nodes with physical addresses A, B, C, D, E, F, G, and H. In this particular cluster, the Node A is assumed to be the primary gateway. Node A is connected to a router which is in turn connected to the internet. By this way, routers can effectively route packets in and out of the cluster using the port forwarding feature which is common in all of the routers available today.

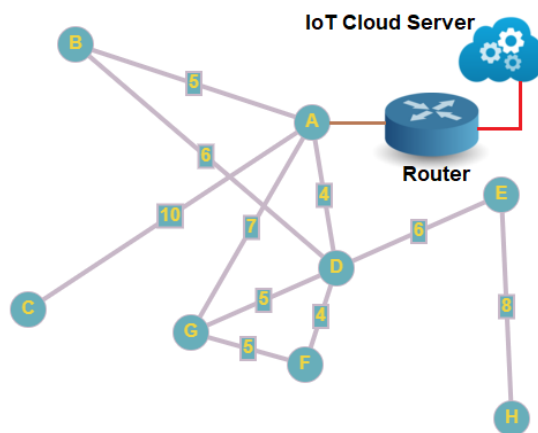


Figure 1. An undirected weighted graph (G) of the cluster

B. Minimum Spanning Tree

Using optimal, parallel or distributed algorithms we can obtain MST for the graph G from Figure 1. Research has also considered parallel algorithms for the minimum spanning tree problem. With a linear

number of processors, it is possible to solve the problem in $O(\log n)$ time[4][5]. Bader & Cong (2006) demonstrated an algorithm that can compute MSTs 5 times faster on 8 processors than an optimized sequential algorithm[6].

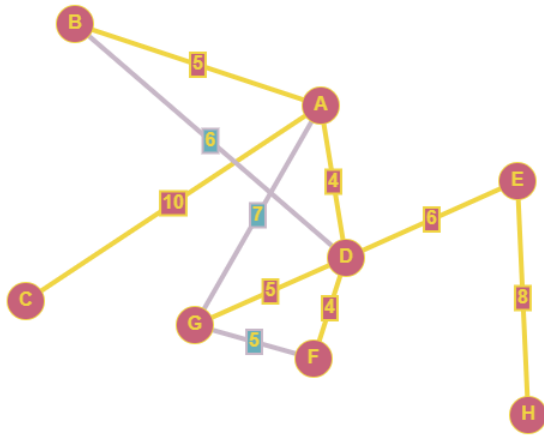


Figure 2. MST of the graph G

Figure 2 shows the MST of graph G from Figure 1. The weighted edges from B to D, A to G and G to F are eliminated to create a fully connected acyclic graph. Figure 2 hence resembles a tree which is an undirected graph in which any two vertices are connected by exactly one path. Every acyclic connected graph is a tree and vice versa[7].

C. Assigning Logical Address to Nodes

Discretion is advised for nodes that need multiple logical addresses. Any node that is expected to connect with a dynamic node can allocate foreign addresses for later use.

MST gives a tree which is connected and is devoid of any loops, now a depth-first search is done on the tree starting from the primary gateway. All the nodes are appropriately numbered as like in Figure 3 during the DFS.

If you closely observe the numbering (logical address) on Figure 3 you can make some interesting observations which are the basis for this particular routing scheme.

Observation 1: Every subtree in the graph with more than one node has a subnode with a minimum value N_{min} and maximum value N_{max} . If any other node exists except the above mentioned two, then it must be within the range N_{min} and N_{max} .

Observation 2: If a parent node exists for any child node then it must have a value less than that of the child node. This implies any data destined to a logical address which is lesser than its own logical address is to be routed to its parent node.

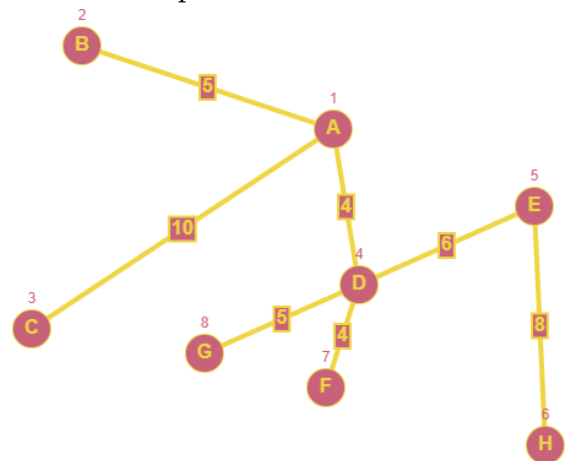


Figure 3. DFS numbering on the MST

D. Forming the Routing Table

From Figure 3 the routing table for a parent node can be inferred by observing the N_{max} and N_{min} for each of its individual subtrees.

Table 1. Routing Table

| | Next Node to Hop | | | | | | | |
|----|------------------|---|---|-------|-------|---|---|---|
| | A* | B | C | D | E | F | G | H |
| A* | | 2 | 3 | 4 - 8 | | | | |
| B | | | | | | | | |
| C | | | | | | | | |
| D | | | | | 5 - 6 | 7 | 8 | |
| E | | | | | | | | 6 |
| F | | | | | | | | |
| G | | | | | | | | |
| H | | | | | | | | |

From Table 1 we can infer that nodes B, C, F, G and H don't need a routing table as all traffic is routed to its parent node. For node E, any traffic to logical address 6 is routed to H and everything else is routed back to its parent node. This is the same in case of D, however node A is the primary gateway and hence it acts as the root node for all the communication. Primary gateways can be specifically programmed to route allocated foreign addresses to external IP's which make them an ideal solution for IoT devices that needs cloud support to function properly. This also means that dynamic nodes can also do the same without any change in the network topology.

IV. CONCLUSION

This work introduces a routing scheme that can be used to route data in static wireless mesh networks. Compared to the existing routing methodologies, while preserving the properties of the mesh network this routing scheme reduces the space complexity of the routing table which is a key factor for embedded devices with low memory, processing power and throughput. Hence this routing scheme can be effectively extrapolated to contain static mesh networks with thousands of nodes in a single cluster.

V. ACKNOWLEDGEMENT

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VII. BIOGRAPHIES

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Automatic Human Identification Via CCTV Using Gait Analysis

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ABSTRACT

Human identification using gait has received an increasing attention from the research community due to a rapid deployment of CCTV cameras. Even a small shop to large corporate office have this surveillance system. Human identification can serve many purposes. It can be used for access control, allows prosecution when a crime was committed or can even serve as an early warning system to enable the prevention of crimes. In this project we suggest a cost effective way to make the existing system to automatically identify a person using face and motion detection. However face recognition require both high resolution images and a relatively short distance but gait recognition can be used at long distances and does not require high resolution images and hence could be used in public with CCTV cameras. Here we create a processing module using raspberry pi 3 for this purpose and connect all existing surveillance systems to a single network. This module is connected to cloud server and it processes the CCTV video to detect the person. A single surveillance system requires only one module. If we provide information of a person in the server, whenever the person appear on any of CCTV connected to the network an automatic detection of corresponding person is done.

Keywords: Human Identification, Gait Analysis, Surveillance System, Face Recognition

I. INTRODUCTION

Today CCTV has become the eyes of the world. From a small shop to large enterprise has their own CCTV network and continuously monitoring the activities happening around. This create a huge database of video information. Whenever an exceptional situation occurs, this CCTV backup system is monitored and provide a clear idea of the situation. We have a huge data even in a small location. What if data allover can be connected? Then we get an extremely huge data. And if we could utilize this data we can make a big revolution. We could create a third eye that see all.

In simple words, we make the CCTV to talk to each other. For instance, assume a crime happened in your neighborhood. We talk about the incident to the people in our close network. Then if one of them

knew the suspect he tells that to others and all the other knows who the suspect is. Whenever if anyone one among you see the suspect again, then you alert all. This is how actually the system works.

We connect CCTV to a server. All CCTV are connected to a network and communicate to each other. They recognize the person from a scene using their learning capability. We can also upload the image of the suspect to the server. If the suspect happens to come over any CCTV connected to the sever, it identifies the suspect and provides an alert.

II. HUMAN IDENTIFICATION BASED ON GAIT

Gait recognition is a new technique of identification by computer vision. Gait is the "coordinated, cyclic

combination of movements that result in human locomotion" as defined by Boyd and Little in [1]. Gait recognition therefore is the recognition of features based on the walking patterns of people. Gait therefore appears to be the most suitable biometric for surveillance use cases. That is because gait recognition can be used at long distances and does not require high resolution images and hence could be used in public with CCTV cameras.

Gait is also a biometric which is very difficult to imitate or to disguise. In contrast, a facial recognition system by CCTV cameras can be circumvented by wearing a mask or even just a cap without looking in the direction of the camera. Gait is a behavioral biometric which contains two kinds of components. There are structural components such as the height, leg length and the crotch height and dynamic components like the joint trajectories. Gait is considered a unique characteristic of a person and it has been shown that humans can identify friends based on gait [2] however only to a degree that does not allow for it to be considered a reliable form of identification.

There are still many challenges to gait recognition such as different levels of background illumination, changes in the subject's appearance, changes in the subject's footwear, the nature of the ground, the camera angle and even the walking speed and many more. There are many different approaches to gait recognition and they all suffer from different subsets of these covariates.

a) Human Gait as a Biometric

Humans are able to recognize a walking pattern as human gait without any other context given. This has been shown in a study by Johansson using a pattern of moving lights that is called a moving light display.

When looking at an individual image, it is hard to recognize a human silhouette. However, when looking at these images in a rapid succession it is

immediately obvious that the illustration shows a walking human. Cutting and Kozlowski [4] further showed that humans are able to identify the gait of a friend even when no other contextual information is given. The humans tested achieved only a recognition rate of 38%, however, that result was significantly better than random which would mean a recognition rate of only 17%. This concludes that gait can be used to recognize and identify a person, albeit it is not yet known whether gait can be used to uniquely identify a person. Gait has the advantage of being able to be measured over a distance requiring no cooperation from the subject. It is also difficult to disguise although not impossible as has been shown by Hadid et al [5]. Even if the recognition rate of technical systems using gait cannot reach the high success rates of recognition techniques based on other biometrics, they can be useful in order to reduce the set of subjects to then allow further identification with other techniques. For example, in the case of a crime captured with a CCTV camera, the gait recognition technique could narrow the suspect from thousands down to 25 subjects. Further identification techniques like DNA testing or fingerprint analysis that require cooperation of the suspect which is not appropriate for mass usage could then be used to identify the offender. Gait is a cyclical motion that can be divided into a typical sequence of stances as is summarized by Boulgouris et al. [6]. The authors explained that a walking cycle is the movement where both feet are used to make a step forward. More precisely, a cycle consists of the double support stance - both feet are on the ground and one foot is in front of the other and the middle stance. This cyclic property and the phases created by it are heavily used in gait recognition approaches.

III. PRE-PROCESSING

Gait recognition is a process that is made up of several consecutive stages:

- First, the video of a walking subject has to be captured and the parts of the video that contain the walking sequences are isolated.
- These sequences then need to be pre-processed to extract the walking subject from the static background.
- Features are extracted from the image of the extracted subject and a gait signature is established. This gait signature can then be recognized using classification techniques to compare the established gait signature with the set of gait signatures from known subjects in the gait database.

a. Walking Sequence Extraction

The first step in gait recognition from image sequences is to identify and track the human(s) in a video. For each subject that contains the walking sequence of a single subject, an appropriate bounding box is calculated. The task of tracking humans in a video and being able to distinguish them from other moving objects like cars, animals or just background noise such as moving tree branches is a challenge on its own. This is further complicated in the case of occlusion where subjects are partially or fully occluded by other moving objects or static objects like street lamps. There are many approaches to this challenge which fall into many different categories that can be distinguished like model-based or featurebased tracking [7]. For some gait recognition approaches, the walking sequence is used as a basis from which the gait features are extracted. However, most approaches (especially the model-free approaches) use the silhouette as a basis which is discussed in the next step.

b) Silhouette Extraction

There are different approaches to extracting a silhouette from walking sequence. In the easiest case, where the subject is walking in front of a static scene, the silhouette can be determined by the simple background subtraction process. This technique creates a model of the background which is then

subtracted from each image yielding the silhouette. The model itself can vary in complexity. The simplest way to construct this model is to just calculate the average over all images of the sequence [7]. This process is however very susceptible to errors caused by changes in the illumination of the scene or changing weather conditions. A more sophisticated but still computationally efficient background subtraction model has been proposed by Elgammal et al. [8], which creates a probabilistic model that estimates intensity values. This allows to efficiently deal with small changes in the scene like trees moving in the wind.

Especially in outdoor scene shadows will pose a problem since the shadow will be moving just like the subject and will therefore be extracted as part of the silhouette. Bobick and Johnson propose a way of dealing with this in [9]. Assuming that the camera position relative to the Sun's position is known, the general position of the shadow can be predicted. The shadow can then efficiently be removed by using the fact that the shadow has in general a different intensity and colour distribution than the subject. There are other approaches to silhouette extraction for example using optical flow [8]. Many gait recognition approaches require a binarized silhouette which is created by simply changing the intensity of all foreground pixels to maximum.

c) Contour Extraction

Most approaches use silhouette directly. However, a not insignificant subset uses only the contour of the binarized silhouette. The contour can be calculated by first eroding the silhouette with an appropriate structuring element which effectively removes every foreground pixel that is next to a background pixel. Then the eroded silhouette is subtracted from the original silhouette leaving only the contour as shown in Fig.4.



Fig.4. Silhouette extraction [13].

IV. GAIT FEATURE EXTRACTION APPROACHES

Model-based Approaches

Lee and Grimson presented a model-based approach to gait recognition in [12] by using ellipses which are matched to the silhouette of a subject. The approach is in general not view invariant but they illustrate a way to lift this constraint by using a visual hull which is constructed using multiple cameras [13]. The gait features are extracted by first matching seven ellipses to the silhouette of a person. This is done by drawing a vertical line through the silhouette with exception of the top part yielding a front and back portion of the silhouette. Then a horizontal line is drawn through the centroid and both the upper and lower part are again equally divided by a horizontal line. This yields seven segments as is illustrated in the left part of Fig.5. An ellipse is fitted to each of these segments and from every ellipse four features are extracted:

- Both the x and y coordinates of the centroid.
- The aspect ratio defined by the major and minor axis of the ellipse.
- The orientation of the ellipses major axis.

These four features per ellipse result in a feature vector with 28 features for the whole silhouette which is calculated for every frame. Out of these feature vectors for each frame, two kinds of feature vectors for the whole walking sequence are constructed. The first considers the appearance of the silhouette and is constructed by the mean and standard deviation of

each of the 28 features. The second constructs a spectral component feature vector by calculating the Fourier Transform of each feature and the phase to the dominant walking frequency. The authors found that the appearance based feature vector yields better results if a sample of the subject with the same clothing style already exists in the database. However, for drastically different clothing styles the spectral components feature vector performs significantly better.

Model-Free State-Space Approaches

This section discusses the state-space approaches which are model-free. Kale et al. investigated the discriminative capabilities of the width of the contour of binarized silhouettes in [17]. They found that it contains both structural and dynamic information that could be used for gait recognition. Due to a high degree in redundancy caused by the fact that certain body parts are almost not moving during a walking cycle they found encouraging results even after smoothing the width vector using eigen decomposition. Based on these insights Kale et al developed a model-free state space approach which they presented in [18]. They use two different approaches to generate the gait signature. In the first approach, they use the width of the contour of the silhouette. The second approach uses the whole silhouette instead of just the contour. This is more computationally expensive however in low quality images the contour might suffer from information loss since it is very susceptible to noise. For both approaches a hidden Markov model is trained using stances of the individual with high discriminative capability. This process yields the gait signature which they find to be robust.

Model-Free Spatiotemporal Approaches

Harris and Nixon. They first extract spatial templates by performing background subtraction on the walking sequence of a subject and then normalizing the silhouette image in size. These spatial templates are then used to calculate temporal

templates using optical flow between consecutive frames. This means each walking sequence is turned into a set of temporal templates. Motion Energy Images (MEI) are the basis for the Gait Energy Image that was developed by Han and Bhanu and serves as the basic feature of the recognition technique presented in [23]. The MEI only illustrates where motion occurred while the GEI also contains the information how much motion occurred at each position. These GEIs are however high in dimension and are therefore projected into eigenspace. A similar approach uses optical flow between consecutive frames to construct their so called Gait Flow Image (GFI) [24] which can then project into canonical space for classification. GEIs are calculated for a whole walking sequence but GFIs are calculated for each gait cycle therefore an exemplar GFI is created for each walking sequence by averaging the GFIs of this sequence.

V. CONCLUSION

The gait recognition approaches reviewed in this paper all employed very different feature extraction methods, constructed different feature vectors and used yet again different methods to create a compact gait signature. Individual approaches to gait recognition do sometimes lend ideas and concepts from other existing approaches to no small degree. This leads to the problem that the comparison of gait recognition algorithms is very difficult. It is envisioned that the amount of data that would need to be sent from a large amount of CCTV cameras directly to a server would be huge. It would therefore be useful to have a local machine close to the cameras which does the pre-processing, gait feature extraction and gait signature creation step. This way the server would only receive data once actual walking sequences were captured that could be used for identification.

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Vehicle Record Storage and Tracking System with Easy Toll Pay

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ABSTRACT

The proposed system tries to eliminate the delay on toll roads by collecting tolls electronically. In Vehicle Record Storage and Tracking System with Easy Toll Pay, the entire citizens having a vehicle need to register. After the registration process they have to update their vehicle information. After the updating of vehicle information the user can printout their ID card. They have to keep the ID card during travel. This ID card is scanned by the Toll operator. There is no cash transaction is carried out in the toll booth. Using a virtual bank, the user account info is updated. The administrator of E-Toll with Easy Pay can monitor each tollbooth independently. He can monitor the vehicle that passed a particular toll booth at a particular time. Another important facility of our project is we can implement the system to check the vehicle by vehicle inspectors. If the inspector need to check the vehicle i.e., license, RC Book, Insurance Details, Pollution details etc., and then he can check the information using my project by entering the card id or simply scan the QR code by his mobile through our project. So a registered user need not take the hard copy of his vehicle record while driving. Using the constructs of MySQL server and all the user interfaces have been designed using the PHP technology.

Keywords: E toll, a Card Implementing QR Code, Smart City, License, RC Book

I. INTRODUCTION

The research work titled as “**Vehicle Record Storage and Tracking System with Easy Toll Pay**” is a web based application. Electronic Toll Collection (ETC) systems may be adopted by city managers to combat the problems of long vehicular queues, fuel wastage, high accident risks, and environmental pollution that come with the use of traditional/manual toll collection systems [1]. In short, the introduction of ETC in smart cities is aimed at achieving efficient toll operations with minimal constraints. Research advances reported in [2] revealed that toll collection can be performed without necessarily having the vehicles to stop over at a toll booth and analyze owner’s valid card. These new developments allow free flow of traffic on

highways and open up another form of use case in multi-lane highways. In this paper, an intelligent system is developed to eliminate long vehicular queues, fuel wastage, high accident risks, and environmental pollution in a smart city based on a card implementation. They were considered preferable because of the low power consumption, cost effectiveness, and network security. An enhanced user interface was developed on the Android platform for vehicle owners. The Android-based mobile application also has an administrative end for system regulations. User can easily carry this card and any vehicle inspector can analyze this card to ensure the details such as license, RC book, Insurance, Pollution paper etc. are valid or not in their own android based mobile phones only after we can register our system.

Why new system?

The system at any point of time can provide the details of the vehicle users by using a QR code implementing card.

The main purpose for preparing this research work is to give a general insight into the analysis and requirements of the existing system or situation and for determining the operating characteristics of the system.

The main objective of Vehicle Record Storage and Tracking System with Easy Toll Pay isto eliminate the delay on toll roads by collecting tolls electronically. Any number of employees can connect to the server. This web based multi-user system is divided into RTO Admin, Virtual Bank, Tollbooth Staff, Vehicle Inspector and User.

II. BACKGROUND

A. PHP

PHP is a widely used open source general purpose scripting language that is especially suited for web development and can be embedded into HTML. Instead of lots of commands to output HTML, PHP pages contain HTML with embedded code that does something. The PHP code is enclosed in special start and end processing instructions `<? php and ?>` that allow you to jump into and out of PHP mode. What distinguishes PHP from something like client-side javascript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. You can even configure your web server to process your entire HTML file with PHP, and then there is really no way that users can tell what you have up your sleeve.

The best things in using PHP are that it is extremely simple for a newcomer, but offers many advanced features for a professional programmer. PHP is mainly

focused on server-side scripting, so you can do anything any other CGI program can do, such as collect form data, generate dynamic page content, or send and receive cookies.

B. MySQL

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produce Web pages that include text, graphics and pointer to other Web pages (Hyperlinks). HTML is not a programming language but it is an application of ISO Standard 8879, SGML (Standard Generalized Markup Language), but specialized to hypertext and adapted to the Web[3].

The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed. Hyperlinks are underlined or emphasized works that load to other documents or some portions of the same document.

C. JAVASCRIPT

JavaScript is a client side language and it runs on a client browser. Netscape developed it and because of its simplicity it is one of the most known scripting languages. However JavaScript can also be used on the server side. JavaScript can be used on all most known browsers. It can be easily used to interact with HTML elements.

D. JQUERY

jQuery is a fast and concise JavaScript library created by John Resig in 2006. JQuery simplifies HTML document traversing, event handling, animating, and Ajax interactions for Rapid Web Development. JQuery is a JavaScript toolkit designed to simplify various tasks by writing less code.

III. PROPOSED METHOD

My proposed system changes the entire toll system which is done manually. Here I change the manual toll system by real time web portal. Administrator is the most powerful user in the website. Who can control all the activities of the website? He is able to create toll booths and police vehicle department. Administrator is responsible for assign toll amount and fine for road rule violations. He can check, monitor all activity of any toll booth any time.

Module Description:

The modules involved in this project are:

RTO Admin: Admin module has the following functions. Initially admin can login to the page. If the username and password is correct then only open the admin home menu. Otherwise it will not open the admin menu. This module handles the activities to add new tollbooth staff, vehicle inspector, fine, and also can view the analysis that can done based on the traffic rules violation survey and toll survey. Admin can ban the license those who violate traffic rules.

User: This module helps to user login. There will be a username and password to login into the system to use all the facilities. A new user should register with all his details and create an account before login. This registered user must contain a bank account also. This module handles the activities to add new vehicle details to prepare card for each vehicle.

Vehicle Inspector: This module helps to inspector login. There will be a username and password to login into the system to use all the facilities. This module handles the activity to accept the card that can travel in the vehicle. He/she have easy to check their documents like RC book, Insurance paper, license, Pollution paper etc., by using a card.

Tollbooth Staff: This module helps to staff login. There will be a username and password to login into the

system to use all the facilities. This module handles the activity to accept user's card and deduct money those who are passed by a tollbooth.

Virtual Bank: This module helps to bank user's login. There will be a username and password to login into the system to use all the facilities. This module handles the activity to accept the user's details and create a bank account and also deposit money to that personal account.

IV. RESULTS



Figure 1

This figure 1 shows the QR code implementing card that can get only after the user can register this website. It includes the user's vehicle documents like RC book, Insurance paper, license, Pollution paper etc. So a registered user need not take the hard copy of his vehicle record while driving.

V. CONCLUSION

The research work titled as "Vehicle Record Storage and Tracking System with Easy Toll Pay" is a web based application. E-Toll is an electronic toll system in which, I can add toll in an easy way. By developing this system, I can eliminate the man power in the toll system. It helps to avoid the time wastage and increase

the accuracy and reduces the manual influence. All the activities are performed in an efficient manner. Another advantage is in the area of fine due to disobeying the traffic rules. By developing this website, all the operations are done electronically, hence no need for carry money with us for toll and fine. It uses a virtual bank, in which all the transactions are automatically performed. This system of collecting tolls is ecofriendly and also results in increased toll lane capacity. Also an anti-theft solution system module which prevents passing of any defaulter vehicle is implemented, thus assuring security on the roadways.

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GPS and IoT Based E-Pump with Advanced Data Mining and Visualization

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ABSTRACT

GPS and IOT based E-Pump with advanced data mining and visualization is the new technology that has various advantages and it is an adoptable technology in this present scenario. Data Mining is the hot topic of the day. All organizations are moving towards implementation of IOT devices into their business for effective development. In this paper, we discuss about automating a Petrol pump by providing support to the customer outside the organization. A sensor based system detects the status of crowd in the pump. We believe GPS based E-Pump will surely improve the current system of petrol pump and improve quality at an affordable cost.

Keywords— Internet of Things (IOT), Data Mining, Cost effective, Global Positioning System (GPS)

I. INTRODUCTION

The 21st century is aptly known as the internet age because of the increasing use of internet in the day to day activities. Examples of these applications include online banking and brokerage, cash management, tax filling, computerized petrol pump, medical field. As far as GPS and IOT based E-Pump is concerned is to manage the booking and delivery of petrol and diesel to the customer in a particular location. [2][4].

The main advantage of the GPS and IOT based System is that it. manage the booking and delivery of petrol and diesel to the customer in a particular location. It mainly focuses on helping people who get stuck in a place when no petrol pumps are nearby. And also IOT sensors are implemented in the Pump for customer data acquisition and

analysis. The same data will be stored in MYSQL cloud server for future processing. The project is developed using php as front end and MySQL Server as backend. Here used data mining algorithm is Time series Analysis.

II. BACKGROUND

A.PHP

PHP (Hypertext Pre-processor) is a server-side scripting language designed for web development but also used as a general-purpose programming language.PHP is a widely used open source general purpose scripting language that is especially suited for web development and can be embedded into HTML.

Instead of lots of commands to output HTML, PHP pages contain HTML with embedded code that



does something.

The PHP code is enclosed in special start and end processing instructions `<? php and ?>` that allow you to jump into and out of PHP mode. What distinguishes PHP from something like client-side java script is that the code is executed on the server, generating HTML which is then sent to the client.[2][3].

There are three main areas where PHP scripts are used.

- Server-side scripting

This is the most traditional and main target field for PHP

- Command Line Scripting

PHP script to run it without any server or browser

- Writing Desktop Applications

PHP is probably not the very best language to create a desktop application with a graphical user interface.

B.MYSQL

MySQL is an open source, SQL Relational Database Management System (RDBMS) that is free for many uses (more detail on that later). Early in its history, MySQL occasionally faced opposition due to its lack of support for some core SQL constructs such as sub selects and foreign keys. Ultimately, however, MySQL found a broad, enthusiastic user base for its liberal licensing terms, perky performance, and ease of use. Its acceptance was aided in part by the wide variety of other technologies such as PHP, Java, Perl, Python, and the like that have encouraged its use through stable, well-documented modules and extensions[5].

- Speed
- Reliability
- Security
- Scalability and portability

C.HTML

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produces Web pages that include text, graphics and pointer to other Web pages (Hyperlinks).

HTML is not a programming language but it is an application of ISO Standard 8879, SGML (Standard Generalized Markup Language), but specialized to hypertext and adapted to the Web. The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed[5].

D. Apache Tomcat

Apache Tomcat is a web container which allows running servlet and Java Server Pages (JSP) based web applications. Most of the modern Java web frameworks are based on servlets, e.g. Java Server Faces, Struts, Spring.

Apache Tomcat also provides by default a HTTP connector on port 8080, i.e., Tomcat can also be used as HTTP server. But the performance of Tomcat is not as good as the performance of a designated web server, like the Apache HTTP server.

III. PROPOSED METHOD

In this scenario GPS and IOT based E-Pump used IOT sensors. Here used data mining algorithm is Time series Analysis.

A. Internet of Things (IoT)

Internet of Things (IoT) is an integrated part of Future Internet including existing and evolving Internet and network developments and could be conceptually defined as a dynamic global network infrastructure with self configuring capabilities based on standard and interoperable communication protocols where physical and virtual “things” have identities, physical attributes, and virtual personalities, use intelligent interfaces, and are seamlessly integrated into the information network[4].

Benefits of IoT

The internet of things offers a number of benefits to organizations, enabling them to:

- monitor their overall business processes;
- improve the customer experience;
- save time and money;
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- Generate more revenue



Figure A.1 IoT

B. Arduino Mega Board

Arduino is an open-source electronics platform

based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments[7].

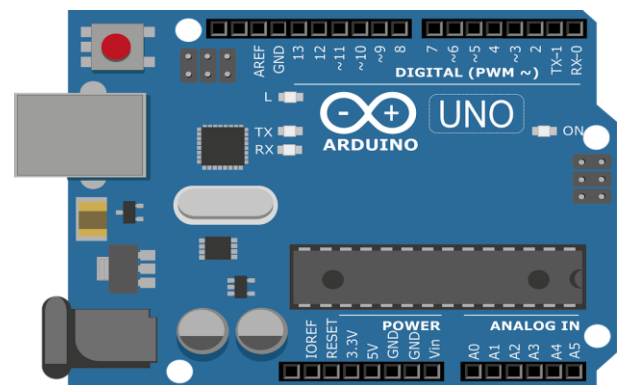


Figure B.1 Arduino Mega

Features of the Arduino UNO

- Microcontroller: ATmega328.
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Input Voltage (limits): 6-20V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)

- Analog Input Pins: 6.
- DC Current per I/O Pin: 40 mA.
- DC Current for 3.3V Pin: 50 mA.



Figure B.2 running the first arduino program

C. Time Series Analysis

A time series is a series of data points indexed (or listed or graphed) in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time. Thus it is a sequence of discrete-time data. Examples of time series are heights of ocean tides, counts of sunspots, and the daily closing value of the Dow Jones Industrial Average.

Time series are very frequently plotted via line charts.

Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science and engineering which involves temporal measurements.

Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on

previously observed values. While regression analysis is often employed in such a way as to test theories that the current values of one or more independent time series affect the current value of another time series, this type of analysis of time series is not called "time series analysis", which focuses on comparing values of a single time series or multiple dependent time series at different points in time [6].

Time series data have a natural temporal ordering. This makes time series analysis distinct from cross-sectional studies, in which there is no natural ordering of the observations (e.g. explaining people's wages by reference to their respective education levels, where the individuals' data could be entered in any order). Time series analysis is also distinct from spatial data analysis where the observations typically relate to geographical locations (e.g. accounting for house prices by the location as well as the intrinsic characteristics of the houses). A stochastic model for a time series will generally reflect the fact that observations close together in time will be more closely related than observations further apart.

Methods for time series analysis may be divided into two classes: frequency-domain methods and time-domain methods. The former include spectral analysis and wavelet analysis; the latter include auto-correlation and cross-correlation analysis. In the time domain, correlation and analysis can be made in a filter-like manner using scaled correlation, thereby mitigating the need to operate in the frequency domain.

Additionally, time series analysis techniques may be divided into parametric and non-

parametric methods. The parametric approaches assume that the underlying stationary stochastic process has a certain structure which can be described using a small number of parameters (for example, using an autoregressive or moving average model). In these approaches, the task is to estimate the parameters of the model that describes the stochastic process. By contrast, non-parametric approaches explicitly estimate the covariance or the spectrum of the process without assuming that the process has any particular structure.

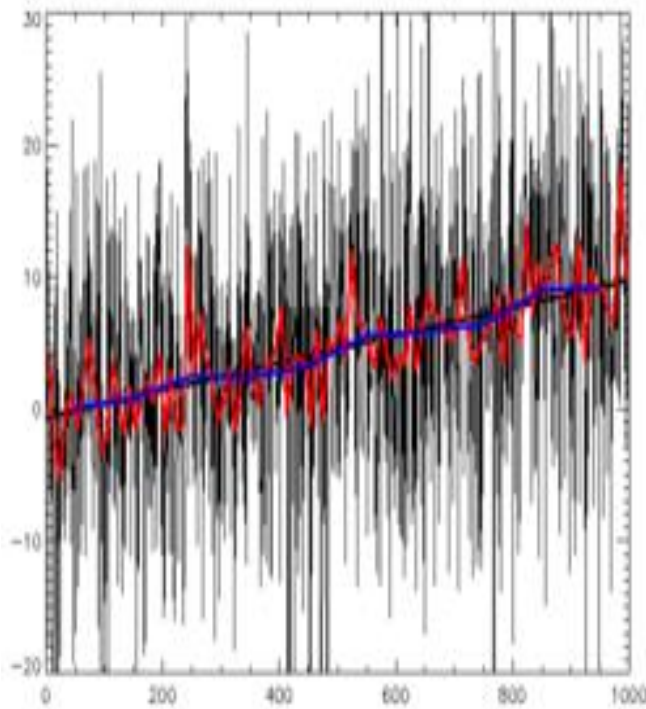
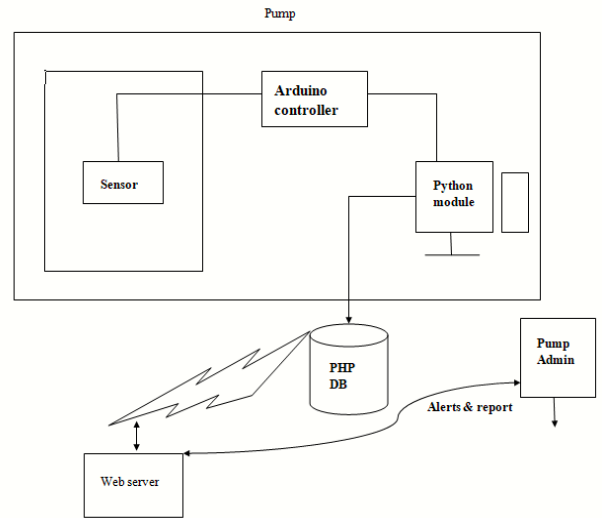


Fig C.1: Time series: random data plus trend, with best-fit line and, different, applied, filters

D. Architecture



E. Level of Users

➤ Operator

This module deals with the services that are offered to operator. In this module, duty of the admin to approving the petrol pump request and processing according to the user requirements, tracking the location of the user etc.

➤ Petrol Pump

The petrol pump handles the activities in a pump, Register the Owners of the petrol pumps,

Upload the details of the pumps, branches and facilities, Adding staffs and providing their services, Updates pump details, Add new stock details, View applications, View order details, Update status, IOT sensors are connected in the pump. And also get alerts to the admin.

➤ Customer

The user logs in to the site via email id and phone number, Upload the details, View order details, View pump details

V. CONCLUSION

The research work titled as “GPS and IOT based E-Pump ” is a web based work. This software is to manage the booking and delivery of petrol and diesel to the customer in a particular location. It mainly focuses on helping people who get stuck in a place when no petrol pumps are nearby. You can soon have the comfort of buying them on one click, without going to the fuel pump. And also IOT sensors are connected in the petrol pump for detecting the crowd and getting alerts to the operator. . Our system can provide solution for the existing system which is completely controlled and maintained by the pump operator.

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Set location for delivery, they can give the feedback about the petrol pump

➤ GPS based E-pump module

GPS tracking, Calculate the shortest distance between two points

➤ IOT based sensor data acquisition

Sensors are connected in the petrol pump. And the are stored in local pc, PIR sensor is used, Python module, Application server, Data Analysis module.

➤ Data mining functions

Time series analysis is used

➤ Visualization

Alerts and Graphical visualization

IV. RESULT

A. SCREEN SHOTS

The figure 1 shows the alert message by using Time series Analysis in data mining. This effectively reports the crowd status to the operator.

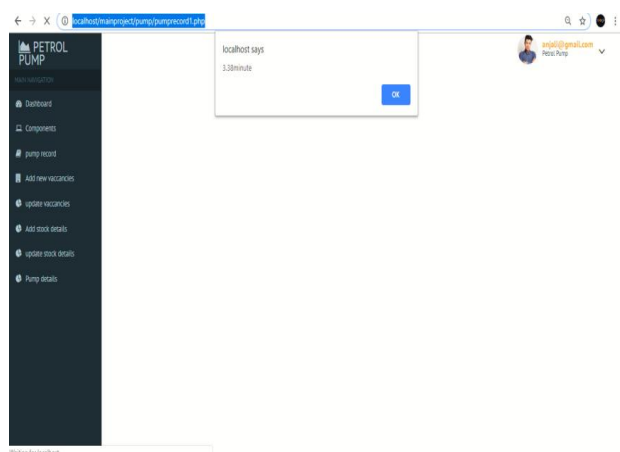


Fig 1: Time series analysis



Cloud-Based Multimedia Content Protection

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ABSTRACT

Web has millions of multimedia contents such as videos and images. It may happen that each and every multimedia content has duplicated copies. There is lots of mechanism available that provides easy way for editing, publishing or uploading multimedia contents so that it may leads to security problem and also reduplicating the identity of content owner and also loss of revenue to the content owner. So that this system can be used to protect the multimedia contents such as 3D videos or images from duplication. The main goal of this system is to provide cost efficiency, rapid development, scalability and elasticity to accommodate varying workloads and improve the accuracy as well as computational efficiency and also the reliability. This system can be deploying on cloud concept. Cloud is used to store and retrieve the multimedia contents which are uploaded on the web. This is considered as a small view for the whole system and this system show high accuracy for some videos and images.

Keywords : Multimedia Content security, Depth Signature Algorithm, Key generation

I. INTRODUCTION

Now a days, multimedia contents and availability of free online hosting sites have made it easy to duplicating copyrighted material, like images and videos for finding illegally made copies over internet is complex. In this system, there are three methods which are present first are Crawler to downloads the multimedia contents, Signature creation method for downloaded multimedia contents, Distributed matching engine to match the multimedia contents. This system can be deployed on cloud. It is helpful for all content owners and also cloud supports the different multimedia contents. This can be used to utilize the computing resource on their demand. The contributions of this paper are as follows Parallel crawler to download thousands of multimedia contents

from various online hosting sites. The 64-bit division algorithm can be used to create signature. This method create signature based on the downloaded multimedia contents. The signature is in the form of numbers that is

binary packet format .This created signature is stored in distributed index. Another method to match the match the signature which is stored in distributed index. The Depth first search algorithm is used to matching multimedia contents. If this signature is matched in distributed index then the system gives notifications that the contents are matched and if signature is not matched then through reference register it stored in distributed index. When we upload a new video or images then they get a key for providing security. For downloading any uploaded video or image then corresponding key is required that is get from SMS when we request to download it.

II. METHODS AND MATERIAL

In this system a user can upload videos and images then it is divided into binary packets. For that this system use a new concept called Depth Signature. And here it is used to check the similarities between the contents. That

means the contents are divided into frames and compared with the contents in cloud for security.

- 1) Compute Visual Descriptors for Left and Right Images
- 2) Divide Each Image Into Blocks
- 3) Match Visual Descriptors
- 4) Compute Block Disparity.
- 5) Compute Signature

Here also a key generation is implemented for giving extra security for the content. This means when a user uploads a video or image then they get a key as SMS generated by the system. And for downloading the corresponding content from the cloud the user need to enter the key and this is get from the SMS when the user request the content for search.

III. IMPLEMENTATION

The goal of the proposed system for multimedia content protection is to find illegally made copies of multimedia objects over the Internet. In general, systems for multimedia content protection are large-scale and complex with multiple involved parties. In this section, we start by identifying the design goals for such systems and our approaches to achieve them. Then, we present the high-level architecture and operation of our proposed system. Our proposed design supports creating composite signatures that consist of one or more of the following elements:

- Visual signature: Created based on the visual parts in multimedia objects and how they change with time;
- Audio signature: Created based on the audio signals in multimedia objects;
- Depth signature: If multimedia objects are 3-D videos, signatures from their depth signals are created;
- Meta data: Created from information associated with multimedia objects such as their names, tags, descriptions, format types, and IP addresses of their uploaders or downloaders;

The proposed method is composed of the following main steps.

- 1) Compute Visual Descriptors for Left and Right Images- Visual descriptors are local features that describe salient parts of an image. Different types of descriptors can be used, including Speeded-Up Robust Feature (SURF), Scale Invariant Feature Transform (SIFT), and HOG (Histogram of Oriented Gradients). The default

descriptor used in our method is SURF. Each descriptor has a fixed number of dimensions or features. For example, each SURF descriptor has 64 dimensions. Each descriptor is computed at a specific pixel in the image, which has a location of (x, y) . The result of this step is two sets of descriptors; one for the left image and one for the right image where N_L and N_R are the number of descriptors in the left and right images, respectively and D is the number of dimensions in each descriptor.

- 2) Divide Each Image Into Blocks- Both the left and right images are divided into the same number of blocks. In general, blocks can be of different sizes and each can be a square or other geometrical shape. In our implementation, we use equal-size square blocks. Thus, each image is divided into blocks.

- 3) Match Visual Descriptors- For each visual descriptor in the left image, we find the closest descriptor in the right image. We consider the block that the descriptor is located in and we find its corresponding block in the right image. We draw a larger window around this corresponding block. This is done to account for any slight changes in the visual objects between the left and right views. Different types of similarity measures can be used to compute the distance between feature vectors. In our implementation, we use the Euclidean distance to compute the distance between descriptors. We compute the distance between each visual descriptor in the left image and all descriptors in the corresponding block of the right image. The corresponding match is the descriptor with the smallest distance.

- 4) Compute Block Disparity- We compute the block disparity between each block in the left image and its corresponding block in the right image. The disparity of a single descriptor is given by $d = x_L - x_R$ where x_L is the position of descriptor in the left image, and x_R is the position of the corresponding descriptor in the right image. We normalize the disparity by the width and the height of each block in the image. The disparity of block is denoted by D and computed as the average disparity of all visual descriptors in that block. If a block or its corresponding block in the right image does not have any descriptor, the disparity is set to 0.

- 5) Compute Signature- We note that the signature is compact and fixed in size as the total number of blocks is fixed and small. In summary, our method constructs coarse-grained disparity maps using stereo correspondence for a sparse set of points in the image. Stereo correspondence tries to identify a part in an image that corresponds to a part in the other image. A finegrained disparity map of a pair of images describes

the displacement needed for each pixel to move from one image to the correct position in the other image. The disparity map is inversely proportional to the depth map, meaning that the disparity is larger for objects near the camera than objects far away from the camera. Since fine-grained disparity maps are expensive to compute, we create our signature from coarse-grained disparity maps, which are computed from blocks of pixels.

IV. RESULTS AND DISCUSSION

This is a novel system for multimedia content protection on cloud infrastructures. The system can be used to protect various multimedia content types. In proposed system we present complete multi-cloud system for multimedia content protection. The system supports different types of multimedia content and can effectively utilize varying computing resources. Here is a novel method for creating signatures for videos. This method creates signatures that capture the depth in stereo content without computing the depth signal itself, which is a computationally expensive process. This two-level design enables the proposed system to easily support different types of multimedia content. The focus of this paper is on the other approach for protecting multimedia content, which is content-based copy detection (CBCD). In this approach, signatures are extracted from original objects. Signatures are also created from query (suspected) objects downloaded from online sites. Then, the similarity is computed between original and suspected objects to find potential copies.

There are some screenshot of this work is given below:

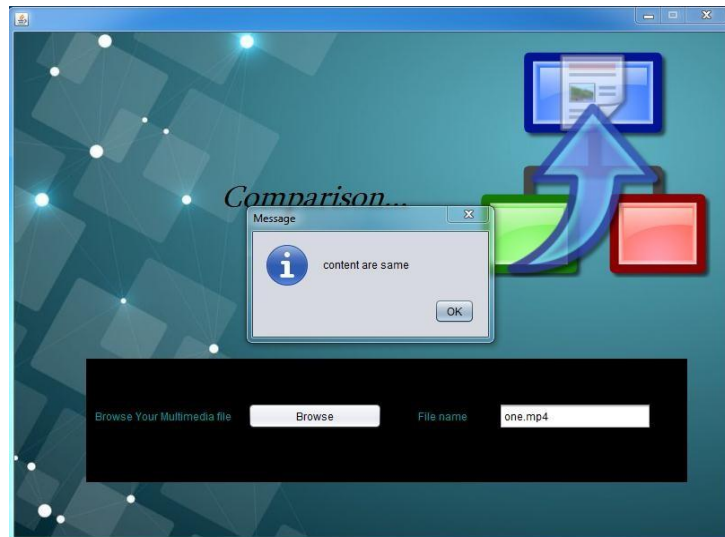


Figure 2: Content matching

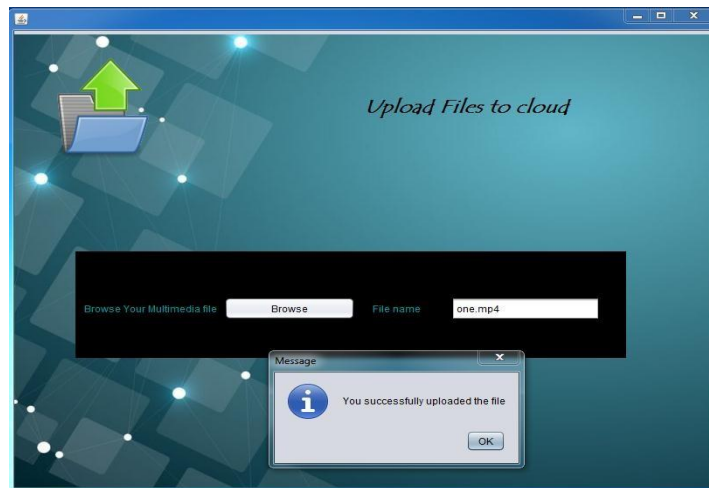


Figure 2: Successfully upload content

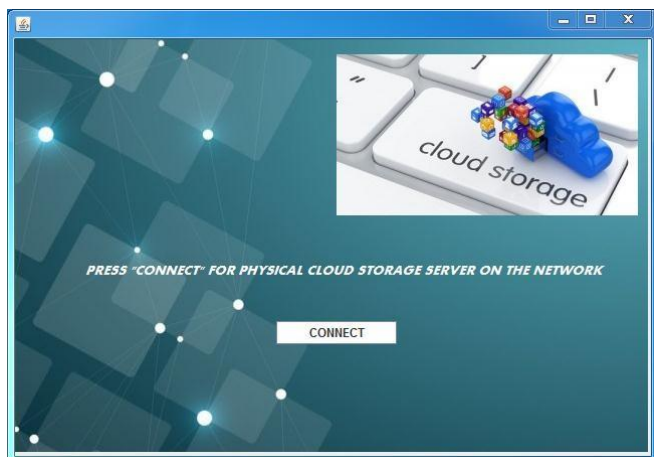


Figure1: Cloud connection

IV. CONCLUSION

Distributing copyrighted multimedia objects by uploading them to online hosting sites such as YouTube can result in significant loss of revenues for content creators. Systems needed to find illegal copies of multimedia objects are complex and large scale. In this paper, we presented a new design for multimedia content protection systems using multi-cloud infrastructures. The proposed system supports different multimedia content types and it can be deployed on clouds. Two key components of the proposed system are presented. There is a new method for creating signatures of 3-D videos. Our method is that create binary packets for the images or videos in the site. Thus, it captures the depth signal of the

3-D video, without explicitly computing the exact depth map, which is computationally expensive. Our experiments showed that the proposed system produces high accuracy in terms of both precision and recall and it is robust to many video transformations including new ones that are specific to 3-D videos such as synthesizing new views. Here also a key generation is implemented and is generates as SMS which is required for downloading the content from cloud. This adds extra security to the content.

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IOT Based Smart Trash Bin

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ABSTRACT

In the present day scenario, due to increase of waste every day the dustbins or trash cans that are placed at public areas overflow, creating unhygienic situation for the residents and also creating foul smell around its surroundings leading to harmful diseases and other sickness. To control such situation of overflowing garbage, the system implemented a design of an IOT Smart Trash Can. In this system, the trash cans are placed around the city or a locality, where each trash can is built with a low cost embedded device that can check the level of the waste in the bins. Provided, these trash can also have different ID that enables the garbage collector to identify the location of the trash can which is full. Once the garbage level crosses its threshold limit, the status of the trash can is sent to the municipal authority. He/she then alerts the corresponding garbage collector through an SMS specifying the location of the dustbin. When the trash bin is filled with garbage it is automatically closed. The administrator can also manage the streetlight. Here admin can monitor the current status of streetlights, the light automatically work based on the climate. Admin can find the complaint on streetlight and inform to the municipality. Public can post complaints when the filled trash bins are not cleaned or when the streetlight is not working. Peoples can check the status of the complaint.

Keywords: Arduino Mega, Wi-Fi, Ultrasonic Sensor, Internet of things (IoT), Waste Management.

I. INTRODUCTION

One of the major problems in developing countries is overflowing garbage bins. This is mainly due to the increase in population and improper waste management system. Untreated waste on open areas will lead to various diseases as insects breed on it. The generation and disposal of waste in large quantities has created a greater concern over time for the world which is adversely affecting the human lives and environmental conditions. [1]. Wastes are the one which grows with the growth of the country. People blame the municipal authorities for not taking proper action or their lack of interest in waste removal, but even after the removal of waste from an area, the next day it will still be a garbage dumping yard. The problem is that there is no proper systematic waste management. Uncollected garbage-pileup and stinking waste across both sides of national highways of various states in India is a normal scene today because of increase in population, lack of awareness and limited funding on waste management programs. Piling up of garbage leads to groundwater

contamination and facilitate breeding of flies, mosquitos, cockroaches, rats, and other pests. Possibility of frequent outbreaks of communicable diseases such as malaria, dengue fever, chickungunia etc. is enhanced. Also have negative impact on tourism industry. Generally, municipalities [5] pick up the trash on designated days on each and every trash cans of the locality whether or not the bins are full in order to keep the city clean. Thus wasting his time and number of trips he has to take for the garbage removal of all the dustbins. Since people have only limited time and attention, they are not very accurate when it is about capturing data about things in the real world. If computers were able to gather all these information without any human intervention, it would be easy to track everything and also reduce waste and cost. Internet has become an important part of today's lifestyle due to the tremendous demand and necessity leading to the beginning of Internet of Things (IOT). Internet of things is where the surrounding objects can be connected through a wired or wireless network without any human intervention. Few examples of an IOT based objects

are connected security system, electronic appliances, cars, alarm clocks, vending machines or any other objects that can be assigned with an IP address and also has the ability to send data over a network. Currently there is no system of segregation of dry, wet and metallic wastes at an industry. J.S. Bajaj [4] has suggested that a least cost, most appropriate technological option for safe management should be developed. The system prevents overflowing of garbage in the trash cans by alerting when the garbage level reaches its maximum. This reduces the time and effort of the garbage collectors and also the number of trips taken by the garbage collection vehicles. Therefore, Smart Trash Can makes waste management more efficient.

II. BACKGROUND

A. COMPONENTS

1) Liquid Crystal Display (LCD)

Most common LCDs connected to the microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (and communicates directly with the LCD).



Fig 1: LCD

2) Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers) work on a principle of a target by interpreting the echoes from radio or sound waves respectively. [2] Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor.



Fig 2: Ultrasonic Sensor

3) WI-FI Module

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The ESP8266 module is an extremely cost effective board.



Fig 3: Wi-fi Module

4) Arduino Mega board

The **Arduino Mega 2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.[3] It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Fig 4: Arduino Mega

B. SOFTWARE TECHNOLOGY REVIEW

1) PHP

The PHP Hypertext Preprocessor (PHP) is a programming language that allows web developers to create dynamic content that interacts with databases. It is faster than other scripting language e.g. asp and jsp. It is integrated with a number of popular databases, including MySQL, PostgreSQL, Oracle, Sybase, Informix, and Microsoft SQL Server. The PHP code is enclosed in special start and end processing instructions `<?php` and `?>` that allows to jump into and out of "PHP mode". PHP performs system functions, i.e. from files on a system it can create, open, read, write, and close them.

2) Arduino Software

A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde. A minimal Arduino C/C++ sketch, as seen by the Arduino IDE programmer,[3] consists of only two functions: one is setup: this function is called once when a sketch starts after power up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch. Second is loop: after setup has been called, function loop is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

3) JavaScript

JavaScript is a scripting language. A scripting language is easy and fast to learn. A scripting language is interpreted in run-time. It is not compiled like other languages as C++, C sharp, VB.net etc. JavaScript is a client side language and it runs on a client browser. JavaScript can be used on all most known browsers. JavaScript code can be inserted directly in the HTML or you can place it in a separate file with the .js extension and link the webpage with the .js file.

4) AJAX

AJAX is a web development technique for creating interactive web applications. AJAX stands for Asynchronous JavaScript and XML. AJAX is a new technique for creating better, faster, and more interactive web applications with the help of XML, HTML, CSS, and JavaScript. Ajax uses XHTML for content, CSS for presentation, along with Document Object Model and JavaScript for dynamic content display.

5) jQuery

jQuery is a fast and concise JavaScript library created by John Resig in 2006. jQuery simplifies HTML document traversing, event handling, animating, and Ajax interactions for Rapid Web Development. jQuery is a JavaScript toolkit designed to simplify various tasks by writing less code.

6) HTML

HTML 4.01 was a major version of HTML and it was published in late 1999. Though HTML 4.01 version is widely used but currently we are having HTML5 version which is an extension to HTML 4.01, and this version was published in 2012. Originally, HTML was developed with the intent of defining the structure of documents like headings, paragraphs, lists, and so forth to facilitate the sharing of scientific information between researchers.

7) CSS

CSS is used to control the style of a web document in a simple and easy way. CSS is the acronym for "Cascading Style Sheet". CSS handles the look and feel part of a web page. Bootstrap makes use of certain HTML elements and CSS properties that require the use of the HTML5 doc type. Bootstrap includes a responsive, mobile first uid grid system that appropriately scales up to 12 columns as the device or viewport size increases.

8) MySQL

MySQL is the most popular Open Source Relational SQL database management system. A database is a separate application that stores a collection of data. Each database has one or more distinct APIs for creating, accessing, managing, searching and replicating the data it holds. The MySQL database is owned, developed and supported by Sun Microsystems, one of the world's largest contributors to open source software.

III. PROPOSED SYSTEM

IOT Based Smart Trash consists of sensors, microcontroller and SMS module. The sensors detect the garbage level if the level reaches its average or maximum. The status of the trash can is then sending to the municipal authority. The municipal authority being the server can view all the trash cans that are controlled by this system. Municipal authority can also add new trash cans and view the status of all the trash cans. When the trash can is full, a SMS alert can be sent to the corresponding garbage collector. SMS alert will also contain the location of the dustbin that requires waste removal.

Module Description

a. Admin Module

1. Log in to the system by using his login ID and password
2. Manage the location
3. Add municipality
4. View the current status of the trash bins
5. View complaints and forward them to municipality
6. Add job vacancies
7. After performing all tasks admin can log out from the system

b. Municipality Module

1. Log in to the system by using his login ID and password
2. View the status of the trash bin
3. View the complaints post by public

4. After performing all tasks municipality can log out from the system

c. Public Module

1. Post the complaints on the official page
2. View job vacancies
3. Post comments

IV. RESULTS

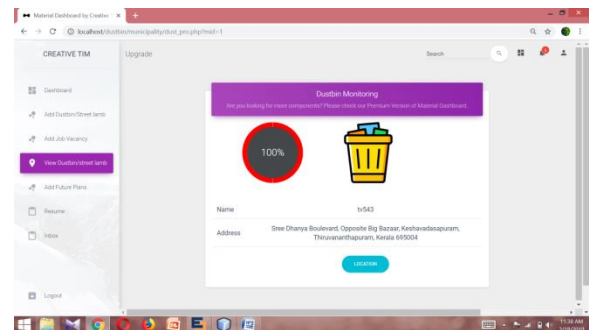


Fig 5: Dustbin status

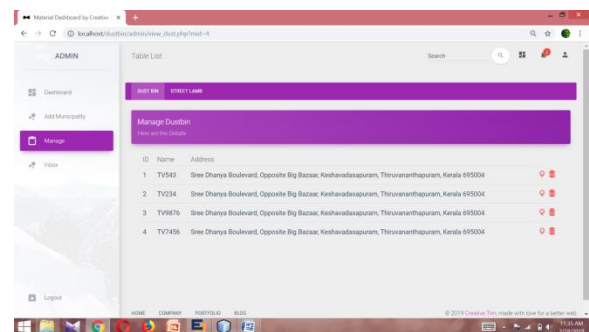


Fig 6: Manage dustbins

Status of dustbin is shown in the above figure i.e., the bin is full. The location of bins is shown in the next figure. The results are 100 percent accuracy.

V. CONCLUSION

The smart city concept is still new in India. The prime need of a smart life style begins with cleanliness and cleanliness begins with dustbin. A society will get its waste dispatched properly

only if the dustbins are placed well and collected well. The main problem in the current waste management system in most of the Indian cities is the unhealthy status of dustbins. Various features such as durability, affordability, prevention against damage and maintenance issues are addressed when these smart dustbins are designed. This Smart Dustbin can contribute a lot towards clean and hygienic environment in building a smart city. The main advantage is that it control overflowing of trash cans in public areas and various localities, as smart trash cans ensures real time waste management. The time for filling and removing the trash of smart bin will also be minimized thus a clean environment and empty dustbins available to common people. The number of trips required by the garbage collection truck to clean the bin and the amount of fuel consumed by trucks can be minimized and thereby saving fuel and money by optimizing routes. Creating green environment by reducing fuel consumption in turn reduces pollution in the atmosphere. By detecting the waste level in the dustbin and through wireless transmission of information's to the concerned people, this system can prove to be a revolution for the whole urban waste management system of upcoming smart cities.

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Reversible Secure Image Data Hiding over Encrypted Domain using Key Modulation

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ABSTRACT

This work proposes a secure reversible image data hiding (RIDH) scheme over encrypted domain. The embedding of data is achieved through a public key mechanism, in which secret encryption key is not needed. At the decoder side, a powerful two-class SVM classifier is designed to differentiate encrypted and non-encrypted image patches, allowing us to jointly decode the embedded message and the original image signal. Compared with the state-of-the-arts, the proposed approach provides higher embedding capacity, and is able to perfectly reconstruct the original image as well as the embedded message. Extensive experimental results are provided to validate the superior performance of our scheme.

Keywords: Reversible Image Data Hiding(RIDH), SVM

I. INTRODUCTION

Secure Reversible image data hiding (RIDH) is a special category of data hiding technique, which guarantee perfect reconstruction of the image upon the extraction of the embedded message. The reversibility makes such image data hiding approach particularly attractive in the special scenarios, e.g., military and remote sensing, medical images sharing, law forensics and copyright authentication, where high fidelity of the reconstructed image is required. The majority of the existing RIDH systems are designed over the plaintext domain, usually, the message bits are embedded into the original, un-encrypted images. The early works mainly used the lossless compression algorithm to compress certain image features, in order to arrange room for message embedding. However, the embedding capacity of this type of method is rather limited and the incurred distortion on the watermarked image is severe. Histogram shifting (HS)based technique, is another class of approach achieving better embedding performance through shifting the histogram of some image feature.

The Difference Expansion (DE)-based schemes and the improved Prediction Error Expansion (PEE)-based strategies were shown to be able to offer the state-of-the-art capacity distortion performance.

Recently, the research on signal processing over encrypted domain has gained increasing attention, primarily driven by the needs from Cloud computing platforms and various privacy preserving applications. This has triggered the investigation of embedding additional data in the encrypted images in a reversible fashion. In many practical scenarios, e.g., secure remote sensing and Cloud computing, the parties who process the image data are un-trusted. To protect the privacy and security, all images will be encrypted before being forwarded to a un-trusted third party for further processing. For instance, in secure remote sensing, the satellite images, upon being captured by on-board cameras, are encrypted and then sent to the base station(s). After receiving the encrypted images, the base station embeds a confidential message, e.g., base station

ID, location information, time of arrival (TOA), local temperature, wind speed, etc. into the encrypted images. Eventually, the encrypted image carrying the additional message is transmitted over a public network to a data center for further investigation and storage.

For security reasons, any base station has no privilege of accessing the secret encryption key K pre-negotiated between the satellite and the data center. This implies that the message embedding operations have to be conducted entirely over the encrypted domain. In addition, similar to the case of Cloud computing, it is practically very costly to implement a reliable key management system (KMS) in such multi-party environment over insecure public networks, due to the differences in ownership and control of underlying infrastructures on which the KMS and the protected resources are located. It is therefore much desired if secure data hiding could be achieved without an additional secret data hiding key shared between the base station and the data center. Also, we appreciate simple embedding algorithm as the base station usually is constrained by limited computing capabilities and/or power. Finally, the data center, which has abundant computing resources, extracts the embedded message and recovers the original image by using the encryption key K .

II. METHODS AND MATERIAL

Reversible data hiding Scheme based on histogram modification exploit a binary tree structure to solve the problem of communicating pairs of peak points. Distribution of pixel differences is used to achieve large hiding capacity while keeping the distortion low. We also adopt a histogram shifting technique to prevent overflow and underflow. Performance comparisons with other existing schemes are provided to demonstrate the superiority of the proposed scheme designed to solve the problem of lossless embedding of large messages in digital images using distribution of pixel differences.

Reversible data embedding has drawn lots of interest recently. Being reversible, the original digital content can be completely restored. In this paper, we present a novel reversible data embedding method for digital images. We explore the redundancy in digital images to achieve very high embedding capacity, and keep the distortion low. RDE hid information in a digital image

and authorized party can decode hidden data and restore image to its original state. RDE has a self-authenticating scheme for restore image and it is used as information carrier.

Reversible data hiding scheme for encrypted image, after encrypting the entire data of an uncompressed image by a stream cipher, the additional data can be embedded into the image by modifying a small proportion of encrypted data with an encrypted image containing additional data, one may firstly decrypt it using the encryption key, and the decrypted version is similar to the original image. According to the data-hiding key, with the aid of spatial correlation in natural image, the embedded data can be successfully extracted and the original image can be perfectly recovered the additional message is embedded by modifying a part of encrypted data. On the receiver side the embedded data are successfully extracted while the original image is perfectly reconstructed.

Modification to the system is a Blocker mechanism which blocks the user who attempts to use executable files.

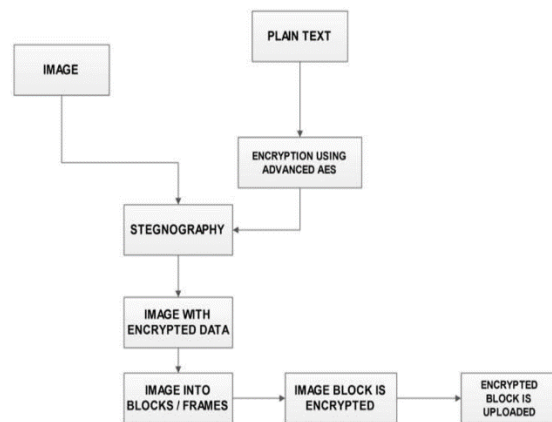


Figure 1: Architecture of the Proposed System

Following are the methods used for encryption, data embedding, data extraction and decryption.

A. Advanced AES Encryption

AES stands for Advanced Encryption Standard. Length of the input output block and the State is 128 for AES algorithm. This is represented by $N_b = 4$, which reflects the number of 32-bit words (number of columns) in the State. For the AES algorithm 128, 192, or 256 bits is the length of the Cipher Key, K . The key length of the block is denoted by N_k and its value is 4, 6, or 8. This value

reflects the number of 32-bit words (number of columns) in the Cipher Key. For the AES algorithm, during the execution of algorithm the numbers of rounds to be performed are dependent on the key size.

Nr is used to represent the number of round. AES algorithm uses a round function for both its Cipher and Inverse Cipher. This function is composed of four different byte-oriented transformations: 1. Using a substitution table (S-box) byte substitution, 2. By different offsets shifting rows of the State array, 3. Mixing the data within each column of the State array, and 4. adding a Round Key to the State. No. of round keys generated by key-expansion algorithm is always one more than the actual no. of round present in the algorithm.

In Advanced AES, the actual AES algorithm is executed twice to generate 256bit key by using two additional policies.

B. Steganography

Steganography is the practice of concealing a file, message, image, or video within another file, message, image, or video. The advantage of steganography over cryptography alone is that the intended secret message does not attract attention to itself as an object of scrutiny. Plainly visible encrypted messages, no matter how unbreakable they are, arouse interest and may in themselves be incriminating in countries in which encryption is illegal. Steganography includes the concealment of information within computer files. In digital steganography, electronic communications may include steganographic coding inside of a transport layer, such as a document file, image file, program or protocol. Media files are ideal for steganographic transmission because of their large size.

Here Steganography is used for mainly image data hiding.

C. SVM Classifier

A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane. In other words, given labeled training data (*supervised learning*), the algorithm outputs an optimal hyperplane which categorizes new examples.

SVM Classifier here it used as to obtain the original image while extracting the data. Here use a two class SVM to compare the encrypted and non-encrypted image patches.

III. IMPLEMENTATION

Reversible Secure Image Data Hiding is a system in which we use Advanced AES for encryption. It ensures high security for image encryption. Bitwise XOR enables reversible process for data extraction and image decryption. Here a SVM is used as a two class classifier used to obtain original image after decryption. Here SVM compares encrypted and non-encrypted image patches.

A. Advanced AES Encryption

It works same as normal AES but the difference is that we will introduce two libraries in JDK. They are US export policy and Local policy, which increases the actual key size in AES into its double value so that high security in encryption is provided.

B. Bitwise XOR operation (Steganography)

Step 1: Initialize block index $i = 1$.

Step 2: Extract n bits of message to be embedded, denoted by X_i .

Step 3: Find the public key $Q[X_i]_d$ associated with X_i , where the index $[X_i]_d$ is the decimal representation of X_i . For instance, when $n = 3$ and $X_i = 010$, the corresponding public key is Q_2 .

Step 4: Embed the length- n message bits X_i into the i th block via

$$[[f]]_{xi} = [[f]]_i \oplus Q[X_i]_d$$

Step 5: Increment $i = i + 1$ and repeat **Steps 2-4** until all the message bits are inserted.

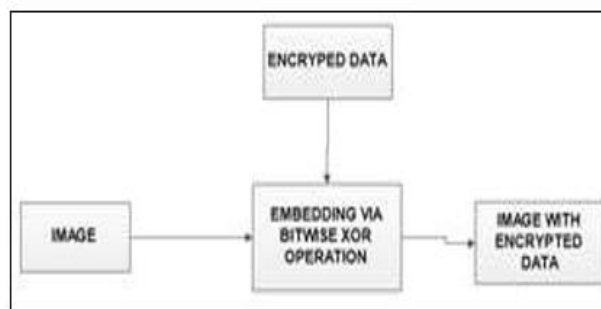


Figure 2: Bitwise XOR operation

C. Join Data Extraction and Image Decryption

The join data extraction and image decryption are signal separation problems. Here applies a two class SVM classifier, which differentiate encrypted and non-encrypted image patches, allowing us to jointly decode the embedded message and the original image signal

IV. RESULTS AND DISCUSSION

This work implement Advanced AES and steganography for encryption and message embedding at encoder side. A two class SVM classifier is used at decoder side for extracting the message and to obtain the original image. In this system the original image retrieval also have some particular importance. The results show that it is very secure for hiding confidential data. Here there is no need for private key modulation or no need to kept the key secret. This work also denies attempts to upload executable file. Because it may cause several virus attacks and it leads to the entire destruction of our system. So we here introduce a blocker mechanism to stop such attempts. When a user attempts to upload executable files the system blocks the user for a particular time. Thus it is secure Image data hiding system. Following are the few screenshots of the data embedding, extraction and image decryption.



Figure 3: User browse image to embed the data



Figure 4: User enters the public key for encryption



Figure 5: User enters the message to be embedded



Figure 6: User downloading the encrypted data embedded image



Figure 7: User applies SVM classifier and extracts message and decrypts original image

V. CONCLUSION

In this work, Secure reversible image data hiding (RIDH) scheme operated over a encrypted domain via a public key modulation. The public key modulation mechanism, which allows us to embed the data via simple XOR operations, without the need of accessing the secret encryption key such as private key. At the decoder side, there is a powerful two-class SVM classifier to differentiate encrypted and non-encrypted image patches, enabling us to jointly decode the embedded message and the original image signal perfectly.

In addition to this it improves security by implementing a blocker when an executable file is uploaded. Executable files may cause various kinds of virus attacks and it may destruct the entire system. So we have to take care of this. The blocker blocks such user attempts for a particular period of times. Thus it is a Secure Reversible Image Data Hiding system.

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A Naive Bayesian Mining Model for Ministry of Food Processing

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ABSTRACT

The proposed system tries to solve the problems of recording the data about the food schemes available. The main objective is to make the investors details more efficient and effective. The investor can provide different schemes to employees and the employees can decide whether to accept it or not. They can also provide feedback for employees about their work done as part of their scheme. Initially, the system will be implemented offline that means the data's are recorded manually and later on, be interlinked so that a employees and investors can access information across all food schemes in the state thus helping speedy and successful completion to work updated. The project has been planned to be having the view of distributed architecture, with centralized storage of the database. The application for the storage of the data has been planned. Using the constructs of SQL server and all the user interfaces have been designed using the Java Jsp technology.

Keywords : Dashboard, Food Processing, Schemes, Feedback.

I. INTRODUCTION

The research work titled as “A Naive Bayesian Mining Model for Ministry of Food Processing“ is a web based application. This software provides facility for reporting food schemes to investors and employees online by the administrator. The investors accept the schemes and make it available to the employees for further functioning by using add option. Then the newly accepted scheme will be available to the employees. If the employee is ready to accept the work provided by the investor, he/she can accept it by using update option so that the other employees can understand that the work was already taken. The investor can also delete the unwanted food schemes. Any number of employees and investors can connect to the server. Each employee or investor first make their login to server to show their availability. A Naive Bayesian Mining Model for ministry of food processing is a system used to report food schemes. This research work will be done using Java as front end, and MySQL Server as back end. Currently most of the works are done manually, by computerizing all the activities related to accepting different food schemes provided by the investor to employees can be managed easily and effectively. I am also introducing data mining in my research work by mining the feedback given by the investors

about the work done by the employees.

Why new system?

- The system at any point of time can provide the details of the investor and the employees.
- The system at any point of time can provide the details of schemes and its location.

The main purpose for preparing this research work is to give a general insight into the analysis and requirements of the existing system or situation and for determining the operating characteristics of the system.

The main objective of a naïve Bayesian mining model for ministry of food processing is to store and retrieve the details of different food scheme names, scheme types, location, feedback about the work done by employees etc. Any number of employees can connect to the server. This web based multi-user system is divided into Administrator, Investor and Employee.

The research work is aimed to develop a dashboard for maintain a computerized record of all the Food scheme. This system can be used as an application for naive bayesian mining model for ministry of food processing to manage the records of different schemes related to food.

II. BACKGROUND

A. JAVA

Java is a programming language originally developed by James Gosling at Sun Microsystems and released in 1995 as a core component of Sun Microsystems' Java platform[1]. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java applications are typically compiled to byte code that can run on any Java Virtual Machine (JVM) regardless of computer architecture. Java is general-purpose, concurrent, class-based, and object-oriented, and is specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere".

Java is considered by many as one of the most influential programming languages of the 20th century, and is widely used from application software to web applications. The java framework is a new platform independent that simplifies application development internet. Java technology's versatility, efficiency, platform portability, and security make it the ideal technology for network computing.

A list of most important features of Java language is given below.

- Simple.
- Object-oriented
- Platform Independent
- Runtime Environment
- Secured
- Robust
- Architecture-neutral
- Portable
- High-performance
- Distributed
- Multi-threaded
- Dynamic

B. MySQL

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produce Web pages that include text, graphics and pointer to other Web pages (Hyperlinks).

HTML is not a programming language but it is an application of ISO Standard 8879, SGML (Standard Generalized Markup Language), but specialized to hypertext and adapted to the Web[2].

The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed. Hyperlinks are underlined or emphasized works that load to other documents or some portions of the same document.

C. JAVA SERVER PAGES (JSP)

Java Server Pages technology is the Java platform technology for building applications containing dynamic Web content such as HTML, DHTML and XML. The Java Server Pages technology enables the authoring of Web pages that create dynamic content easily but with maximum power and flexibility.

The Java Server Pages technology offers a number of advantages:

- **Write Once, Run Anywhere properties:**
The Java Server Pages technology is platform independent, both in its dynamic Web pages, its Web servers, and its underlying server components. You can author JSP pages on any platform, run them on any Web server or Web enabled application server, and access them from any Web browser. You can also build the server components on any platform and run them on any server.
- **High quality tool support**
The Write Once, Run Anywhere properties of JSP allows the user to choose best-of-breed tools. Additionally, an explicit goal of the Java Server Pages design is to enable the creation of high quality portable tools.
- **Reuse of components and tag libraries**
The Java Server Pages technology emphasizes the use of reusable components such as: JavaBeans components, Enterprise JavaBeans components and tag libraries. These components can be used in interactive tools for component development and page composition. This saves considerable development time while giving the cross-platform power and flexibility of the Java programming language and other scripting languages.
- **Separation of dynamic and static content**
The Java Server Pages technology enables the separation of static content from dynamic content that

is inserted into the static template. This greatly simplifies the creation of content. This separation is supported by beans specifically designed for the interaction with server-side objects.

- **Support for scripting and actions**

The Java Server Pages technology supports scripting elements as well as actions. Actions permit the encapsulation of useful functionality in a convenient form that can also be manipulated by tools; scripts provide a mechanism to glue together this functionality in a per-page manner.

D. TOMCAT

Tomcat is a servlet container and Java Server Pages implementation it may be used stand alone, or in conjunction with several popular web servers.

- Apache version 1.3 or later
- MS Internet Information Server ,version or later
- MS personnel web server, version 4.0 or later
- NetScape enterprise server , version 3.0 or later

Tomcat is a security update release. This release closes a whole that potentially allowed access to resource protected by a <security constraint > in web.xml.

III. PROPOSED METHOD

Here used data mining algorithm is Naïve Bayesian Classifier.

A. Naive Bayes Classifier

The Bayesian Classification represents a supervised learning method as well as a statistical method for classification. Assumes an underlying probabilistic model and it allows us to capture uncertainty about the model in a principled way by determining probabilities of the outcomes. It can solve diagnostic and predictive problems. This Classification is named after Thomas Bayes(1702- 1761), who proposed the Bayes Theorem. Bayesian classification provides practical learning algorithms and prior knowledge and observed data can be combined. Bayesian Classification provides a useful perspective for understanding and evaluating many learning algorithms. It calculates explicit probabilities for hypothesis and it is robust to noise in input data.

Naive Bayes classifiers are a collection of classification algorithms based on **Bayes' Theorem**. It is not a single algorithm but a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other[4].

The fundamental Naive Bayes assumption is that each feature makes an:

- Independent
- equal contribution to the outcome.

With relation to our dataset, this concept can be understood as:

- We assume that no pair of features are dependent. For example, the temperature being 'Hot' has nothing to do with the humidity or the outlook being 'Rainy' has no effect on the winds. Hence, the features are assumed to be independent.
- Secondly, each feature is given the same weight (or importance). For example, knowing only temperature and humidity alone can't predict the outcome accurately. None of the attributes is irrelevant and assumed to be contributing equally to the outcome.

Baye's Theorem

Baye's Theorem finds the probability of an event occurring given the probability of another event that has already occurred. Baye's theorem is stated mathematically as the following equation:

$$P(A|B)= P(B|A)P(A) / P(B)$$

- Basically, we are trying to find probability of event A, given the event B is true. Event B is also termed as evidence.
- P(A) is the priori of A (the prior probability, i.e. Probability of event before evidence is seen). The evidence is an attribute value of an unknown instance(here, it is event B).
- P(A|B) is a posteriori probability of B, i.e. probability of event after evidence is seen.

B. Module Description:

The modules involved in this project are:

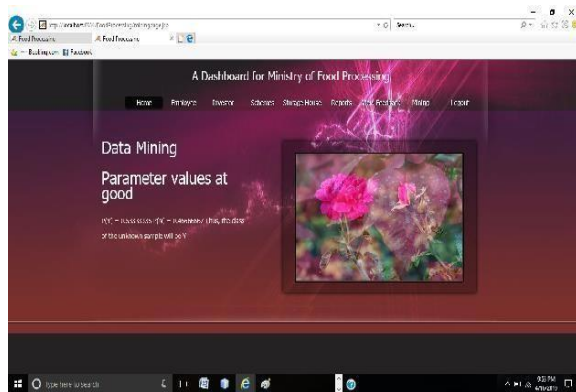
Administrator : Admin module has the following functions. Initially admin can login to the page. If the username and password is correct then only open the admin home menu. Otherwise it will not open the

admin menu This module handle the activities to add new employee, investor, scheme and also can view the feedbacks of the employees given by the investor. Here mining is also included.

Investor : This module helps to investor login. There will be a username and password to login into the system to use all the facilities. A new investor should register by admin with all his details and create an account before login. This module handle the activities to add new investor schemes for the employees and will give the feedback about the work done by the employees to mine the data.

Employee : This module helps to employee login. There will be a username and password to login into the system to use all the facilities. This module handle the activity to accept schemes from the investor.

IV. RESULTS



This figure 1 shows the probability value of the attributes by comparing the feedback stored in the database by using naive bayesian classifier algorithm. For example, here the parameter given is good. It compares with the data stored in the database. Here we get $P(Y)=0.53333336$ and $P(N)=0.46666667$.

V. CONCLUSION

The research work titled as “A Naïve Bayesian Mining Model for Ministry of Food Processing” is a

web based application. This software provides facility for reporting food schemes to investors and employees online by the administrator. The investors accept the schemes and make it available to the employees for further functioning. If the employee is ready to accept the work provided by the investor, he/she can accept it by using update option so that the other employees can understand that the work was already taken. This software is developed with scalability in mind. Additional modules can be easily added when necessary. The software is developed with modular approach. All modules in the system have been tested with valid data and invalid data and everything work successfully. Thus the system has fulfilled all the objectives identified and is able to replace the existing system.

The research work has been completed successfully with the maximum satisfaction of the organization. The constraints are met and overcome successfully. The system is designed as like it was decided in the design phase. The research work gives good idea on developing a full- fledged application satisfying the user requirements.

The system is very flexible and versatile. This software has a user-friendly screen that enables the user to use without any inconvenience. Validation checks induced have greatly reduced errors. Provisions have been made to upgrade the software. The application has been tested with live data and has provided a successful result. Hence the software has proved to work efficiently.

VI. REFERNCES

- [1] Michael Alen: “Java2 Complete Edition” pp-0-7945.
- [2] Bill Hamilton “ Programming MySQL” pp- 425-455
- [3] Charles Hampfed (2000) ‘Instant Java Server Pages’ University of Toronto.
- [4] <https://www.geeksforgeeks.org/naive-bayes-classifiers/>



Online Auction with Data Mining

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ABSTRACT

Online Auction with Data Mining is carrying out the traditional tendering process in an electronic form, using the internet. In this project, we present a design and implementation of a Tender Management System by using Web services for the automation of such tendering processes. This web application provides organizations to register with this system and upload tender details. Since this application is visible from all over the world clients can log into this site and apply for tenders and submit their quotations to the organizations on the project by filling a form through online. As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts. Bidders are advised to register their details, valid email address and mobile numbers as part of the registration process. These would be used for any communication from the organization. Bidder then logs in to the site through the secured log-in by entering their user ID / password. Based on the tender status such as cost, bid date and periods of using days it will buy the tender one to another customer. Otherwise it will not provide to the customer because does not meet the tender requirements. This project will be implemented using Java and MySQL

Keywords : Auction , Category, Bid , Selection

I. INTRODUCTION

Online Auction System which provides organizations/user to register with this system and upload tender details. Since this application is visible from all over the world clients can log into this site and apply for tenders and submit their quotations to the organizations on the project by filling a form through online. In tender noticed involves product status such as product type and rate level. There is no intermediate agent because it is directly notices information to user page. If they wanted, person can view the tender notice and directly apply for property. In this product rate has fixed amount. It does not provide any agent commission and any brokerage fees. It is directly delivering tender notice to web. Any User can make contracts to work then the tender is notified and selected then it is forward to the next stage. K-Means clustering algorithm, a data mining tool is introduced in this project. The algorithm is used for getting a suggestion about the bid amount and auction amount. Web based **Auction** system to source, award and manage the total procurement process. Tender administrators will supply and demand, through reverse auction, ensuring that goods are bought at the best possible price.

When a tender or bid is being called, a tender or bid number is usually issued as a reference number for the tender. The tender details would be open for interested parties to submit their proposals for the duration of the bid or tender. Once the duration is over, the tender bid is closed and sealed and can only be opened by either the tender or bid evaluation committee.

II. BACKGROUND

A. JAVA

Java is a programming language originally developed by James Gosling at Sun Microsystems and released in 1995 as a core component of Sun Microsystems' Java platform[1]. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java applications are typically compiled to byte code that can run on any Java Virtual Machine (JVM) regardless of computer architecture. Java is general- purpose, concurrent, class-based, and object-oriented, and is specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere".

Java is considered by many as one of the most influential programming languages of the 20th century, and is widely used from application software to web applications. The java framework is a new platform independent that simplifies application development internet. Java technology's versatility, efficiency,



platform portability, and security make it the ideal technology for network computing.

A list of most important features of Java language is given below.

- Simple.
- Object-oriented
- Platform Independent
- Runtime Environment
- Secured
- Robust
- Architecture-neutral
- Portable
- High-performance
- Distributed
- Multi-threaded
- Dynamic

B. MySQL

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produce Web pages that include text, graphics and pointer to other Web pages (Hyperlinks).

HTML is not a programming language but it is an application of ISO Standard 8879, SGML (Standard Generalized Markup Language), but specialized to hypertext and adapted to the Web[2].

The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed. Hyperlinks are underlined or emphasized words that load to other documents or some portions of the same document.

C. JAVA SERVER PAGES (JSP)

Java Server Pages technology is the Java platform technology for building applications containing dynamic Web content such as HTML, DHTML and XML.

The Java Server Pages technology enables the authoring of Web pages that create dynamic content easily but with maximum power and flexibility.

The Java Server Pages technology offers a number of advantages:

- **Write Once, Run Anywhere properties:**

The Java Server Pages technology is platform independent, both in its dynamic Web pages, its Web servers, and its underlying server components. You can author JSP pages on any platform, run them on any Web server or Web enabled application server, and access them from any Web browser. You can also build the server components on any platform and run them on any server.

- **High quality tool support**

The Write Once, Run Anywhere properties of JSP allows the user to choose *best-of-breed* tools. Additionally, an explicit goal of the Java Server Pages design is to enable the creation of high quality portable tools.

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The Java Server Pages technology emphasizes the use of reusable components such as: JavaBeans components, Enterprise JavaBeans components and tag libraries. These components can be used in interactive tools for component development and page composition. This saves considerable development time while giving the cross- platform power and flexibility of the Java programming language and other scripting languages.

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The Java Server Pages technology enables the separation of static content from dynamic content that is inserted into the static template. This greatly simplifies the creation of content. This separation is supported by beans specifically designed for the interaction with server-side objects.

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Tomcat is a servlet container and Java Server Pages implementation it may be used stand alone, or in conjunction with several popular web servers.

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- MS personnel web server, version 4.0 or later
- NetScape enterprise server , version 3.0 or later



Tomcat is a security update release. This release closes a whole that potentially allowed access to resource protected by a <security constraint > in web.xml.

III. PROPOSED METHOD

Here used data mining algorithm is K-Means Clustering.

A. K-Means Clustering

The k-means clustering algorithm is a data mining and machine learning tool used to cluster observations into groups of related observations without any prior knowledge of those relationships. By sampling, the algorithm attempts to show in which category, or cluster, the data belong to, with the number of clusters being defined by the value k.

The k-means algorithm is one of the simplest clustering techniques and it is commonly used in medical imaging, biometrics, and related fields. The advantage of k-means clustering is that it tells about your data (using its unsupervised form) rather than you having to instruct the algorithm about the data at the start (using the supervised form of the algorithm).

It is sometimes referred to as Lloyd's Algorithm, particularly in computer science circles because the standard algorithm was first proposed by Stuart Lloyd in 1957. The term "k-means" was coined in 1967 by James McQueen.

How the K-Means Algorithm Functions :

The k-means algorithm is an evolutionary algorithm that gains its name from its method of operation. The algorithm clusters observations into k groups, where k is provided as an input parameter. It then assigns each observation to clusters based upon the observation's proximity to the mean of the cluster. The cluster's mean is then recomputed and the process begins again. Here's how the algorithm works:

The algorithm arbitrarily selects k points as the initial cluster centers (the means).

Each point in the dataset is assigned to the closed cluster, based upon the Euclidean distance between each point and each cluster center.

Each cluster center is recomputed as the average of the points in that cluster.

Steps 2 and 3 repeat until the clusters converge. Convergence may be defined differently depending upon the implementation, but it normally means that either no observations change clusters when steps 2 and 3 are repeated, or that the changes do not make a material difference in the definition of the clusters.

Choosing the Number of Clusters :

One of the main disadvantages to k-means clustering is the fact that you must specify the number of clusters as an input to the algorithm. As designed, the algorithm is not capable of determining the appropriate number of clusters and depends upon the user to identify this in advance.

For example, if you had a group of people that are to be clustered based upon binary gender identity as male or female, calling the k-means algorithm using the input k=3 would force the people into three clusters when only two, or an input of k=2, would provide a more natural fit.

Similarly, if a group of individuals were easily clustered based upon home state and you called the k-means algorithm with the input k=20, the results might be too generalized to be effective.

For this reason, it's often a good idea to experiment with different values of k to identify the value that best suits your data. You also may wish to explore the use of other data mining algorithms in your quest for machine-learned knowledge.

B. Module Description:

The modules involved in this project are:

- ❖ Admin module
- ❖ User module

Admin module

Admin module has the following functions. Initially admin can login to the page. If the username and password is correct then only open the admin home menu. Otherwise it will not open the admin menu. New category is adding to the tender system. In this have Different categories of bid product such as laptop and computer.

User module

User module has information about the particular user details. Initially new user can register by giving details such as name, username, password, email id, mobile

number and address. If already registered, user can login to the home page. Otherwise it will not enter to the login home.

IV. RESULTS

SCREENSHOTS



Fig 1 : Mining

This figure 1 shows the probability value of the attributes by comparing the bid amount and auction amount stored in the database by using K-Means clustering algorithm.

V. CONCLUSION

Conclusion of tender management system was support both customer and directly to the administrator, towards achieving performance and acceptance criteria as stipulated in this document, if when required and that they would facilitate the bidder on a regular basis with technology or product updates and extend support for the warranty as well. The bidder must not be blacklisted by administrator or any other organizations. The user bid submission is before the closing date. If user requirements are satisfying the bid conditions then the product is delivered to the user.

During the making of the project I developed a vast knowledge on working of the Tender Management System, and Dynamically operation of web applications. I also studied and collected information on the various fields of implementation of the system such as the technology for security enhancements, and operating site dynamically.

Bids will only be accepted from principal manufacturers of servers having full-service support offices. The bidders should submit the required documents / financial instruments as stipulated. The bidder shall provide the Registration number of the firm along with the PAN Number, as applicable,

allotted by the concerned authorities. To Keep the transactions safe, we used stored procedure. Each User has different access directory for storing data, and keeping the data with respect of their region. Administrator has power to control other users and can stop or make new admin according to their workload.

VI. REFERENCES

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IOT Based Smart Driving System

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ABSTRACT

(IoT) Internet of Things is referred as the world-wide network system which connects all the smart objects together. It is the way in which all objects are enabled to be in touch with each other. Whenever those connected smart objects over internet are controlled to only vehicles, then it is referred as Internet of Vehicles (IoV). Vehicle ownership has been increased by continuously increasing population and rapidly increasing cities. Hence, traffic management has become a great problem in our daily life. This research paper provides IoV based traffic management solution to overcome the problems like accidents, over speed, pollution in our daily life. The user interface designs has been planned in Php, arduino technologies and the application data storage in sql server.

Keywords: Internet of things, Internet of vehicles.

1. INTRODUCTION

Today drunk driving is a big trouble in every part of the nation. Many accidents take place due to the negligence on the part of the driver. Many drivers drink and drive and it is a criminal offence. Every vehicle will have emission of pollution gas. But the problem is due to the improper vehicle maintenance. This pollution emission from the vehicle cannot be completely avoided but it can be restricted. Due to the high speeds of vehicles even in the sharp turnings and junctions most of these road accidents are occurred. Reduction of number of such accidents is the major step needed to be taken.

In the research work titled as "IoT based smart driving system" initially checks whether the person has drunk or not with the alcohol sensor. The system is designed in such a way that when the alcohol concentration is detected then the related information should send to the nearby motor vehicle department. Also, the amount of air pollution can be reduced through this IoT based smart driving system. Pollutants are detected using the

CO sensor. The presence of the pollutants is detected when a particular level is reached and the related information will send to the nearest motor vehicle department. This system also informs the violations to the motor vehicle department when the over speeded cars on highways are detected. In case of accidents the IoT device will send an alert message along with the corresponding location data from the GPS module to the rescue centers like hospital and the ambulances using network. This is an effective solution to the poor response in case of accidents. Therefore, Smart Driving system can make vehicle management more efficient. This system also provides the notification messages to the vehicle users regarding the traffic rule violations like over speed, alcohol detection etc and automatically deducts the penalty from them.

1.1. PROBLEM STATEMENT

The "IoT based smart driving system" provides traffic management solution to overcome the problem that is prevailing in our daily life like monitoring vehicle without using camera, over speed detection, accident detection, misuse of vehicles etc.

1.2 METHODOLOGY

1.2.1 Liquid Crystal Display (LCD)

The most common LCDs connected to the micro controllers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. This is used to display visuals. LCD consumes less amount of power.



Figure 1.2.1 LCD

1.2.2 Alcohol Sensor

This module is made using Alcohol Gas Sensor MQ3. It is a low cost semiconductor sensor which detects the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, and Raspberry Pi etc.



Figure 1.2.2 Alcohol Sensor

1.2.3 WI-FI Module

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The ESP8266 module is an extremely cost effective board[1].



Figure 1.2.3 Wi-Fi Module

1.2.4 Arduino Mega board

The **Arduino Mega 2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started [2].



Figure 1.2.4 Arduino Mega

1.2.5 Vibration sensor

The vibration sensor is used to detect the vibrations in a given area. This can help to provide alert to someone when trouble occurred, and today, you will even find these types of sensors in use with security systems.



Figure 1.2.5 Vibration Sensor

1.2.6 GPS Module

Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and computes its position on Earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites.



Figure 1.2.6 GPS Module

1.2.7 CO sensor

A carbon monoxide detector or CO detector is a device that detects the presence of the carbon monoxide (CO) gas in order to prevent carbon monoxide poisoning. CO is a colorless, tasteless and odorless compound and is referred as “silent killer” because it is virtually undetectable by humans without using the detection technologies.



Figure 1.2.7 CO sensor

1.2.8 Bluetooth Module

BluetoothHC-05 module is designed for transparent wireless serial connection setup. The HC-05 Bluetooth module can be used as a great solution for the wireless communication. It exchanges data between fixed and mobile devices over short distances.



Figure 1.2.8 Bluetooth Module

1.2.9 Motor Driver Module

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.[3]

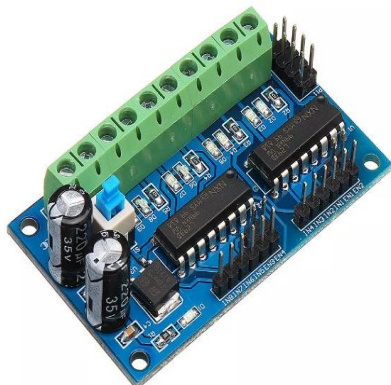


Figure 1.2.9 Motor Driver Module

2. BACKGROUND

2.1 TECHNOLOGIES USED

2.1.1 Php

The PHP Hypertext Preprocessor (PHP) is a programming language which allows the web developers to create dynamic contents that interacts with the databases. PHP is basically used to develop the web based software applications. RasmusLerdorf released the first version of PHP in 1994. PHP is a server side scripting language which is embedded in HTML. It is faster than the other scripting languages e.g. asp and jsp. It is integrated with a number of Popular databases like MySQL, Oracle etc.

2.1.2 Arduino

A program written in Arduino is known as sketch. Sketches are saved on the computer as text files with the file extension .ino. A minimal Arduino C/C++ sketch, has mainly two functions: one is setup: this setup function is called once when the sketch starts after reset. It is used for variable initialization, input - output pin modes, and other libraries required in the sketch. Second function is loop: after setup has been called, loop is executed repeatedly in main program. It controls the board until the board is reset or is powered off.

2.1.3 JavaScript

JavaScript is a scripting language. This is very easy and fast to learn. A scripting language is interpreted in run-time. JavaScript is a client side language which runs on a client browser. However JavaScript can also be used on the server side. JavaScript can be used on all most known browsers. It interacts with HTML elements easily. This validates text fields, disable buttons, validate forms, or background color changes of the page.

2.1.4 Html

HTML stands for Hyper Text Markup Language, which is used to develop the web pages. HTML was created by Berners-Lee. HTML was developed with the intent of defining the document structures like headings, paragraphs, lists etc.

2.1.5 CSS

CSS is referred as “Cascading Style Sheet”. It is used to control the style of a web document. CSS handles

the look and feel of a web page part. We can write the CSS once and then reuse the same in multiple html pages. CSS handles the text color, font styles, spacing between paragraphs, columns, background images etc.

2.1.6 MySQL

MySQL uses the standard form of the SQL data language. It works very quickly and works well with large data sets. It is very friendly to PHP, the most appreciated language for web development. Speed, reliability, security, scalability and portability are some of the most compelling features of MySQL.

3. PROPOSED METHOD

3.1 Method of Alcohol Detection

The MQ3 alcohol sensor will detect the alcohol concentration when the power supply is given to the Microcontroller VCC pin, and it provides analog resistive outputs based on the alcohol level concentration. The microcontroller will convert the analog resistive output to the digital output in the form of "ALCOHOL DETECTED" lcd message. Once the alcohol is detected the system will notify the users through SMS regarding this traffic rule violation and deduct the penalty automatically. Further using the GSM modem this system also alerts the nearest motor vehicle department regarding the violation.

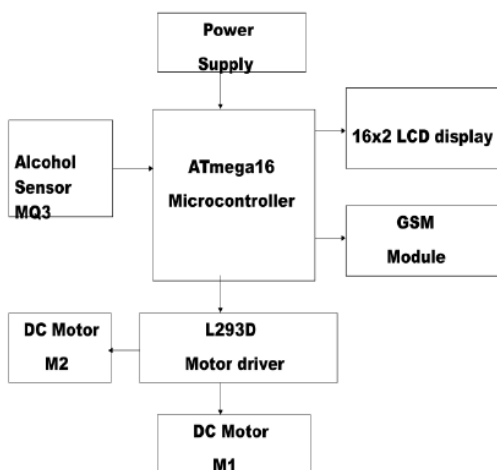


Figure 3.1 Block diagram of automatic drunken drive avoiding system

3.2 Method of Automatic Road Accident Detection

There are different methods for detecting the accidents automatically. These techniques include road accident detection using smart phones, mobile applications and GSM - GPS technologies. The exact incident location,

time and vehicle owner details can be identified using the GPS satellite. The abnormal behavior of vehicle detected using the vibration sensor. In case of an accident, the system finds the longitude and latitude of the position through the GPS module. Then it sends a message which contains the position of vehicle and the vehicle user details to the emergency departments like hospital and ambulance.

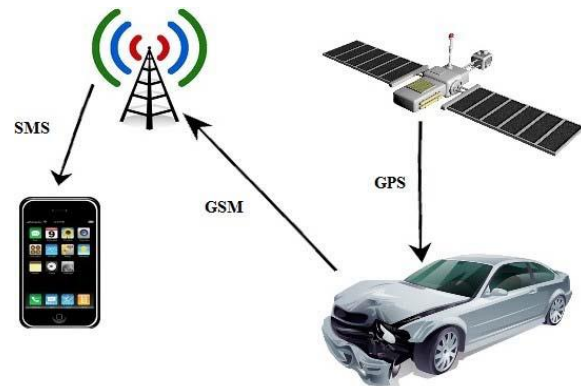


Figure 3.2 shows the procedure of accident detection through GPS technology

3.3 Method of Over Speed Detection

This system will be useful on the places where the rate of accidents due to over-speeding is comparatively high. The IOT based smart driving system has a speed sensing mechanism which automatically updates the database of motor vehicle department with the details of an over speeding vehicle using the GPS system. Once the details are updated, the driver is charged penalty for over speeding. Also the system notifies the user through SMS regarding the traffic violation and the fine will be deducted automatically from them. This makes use of the following units- Arduino MEGA, GPS unit, LCD display unit. The system has a device to detect rash driving and to alert the motor vehicle authorities in case of violations. Human concentration and lot of efforts required to detect the rash driving cases in early times and it is also difficult to implement. This paper is intended to design a system aimed at alerts related to rash driving.

3.4 Method of Pollution Detection

Every vehicle will have the pollution releases but the problem occurs due to the vehicle's improper maintenance. The pollution emission from the vehicles cannot be completely avoided but it can be restricted. When the pollution level shoots beyond the threshold level which has set, the message should be informed to the nearest motor vehicle departments. The method uses the CO sensor to detect the pollutants.

This sensor can be fitted at the mouth of the silencer in the vehicles. When the sensor gets the pollution input it informs the vehicle owner details to the nearest motor vehicle departments after verifying the pollution threshold level according to the frequency. To maintain the transport law, this system will be a great use for the government in order.

3.5 Hardware Architecture

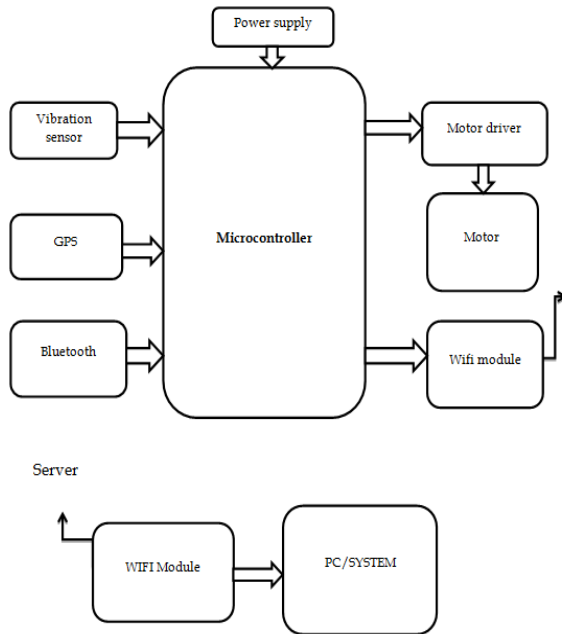


Figure 3.5 Block diagram of Hardware architecture Components

1. Power supply
2. Vibration sensor
3. GPS
4. Bluetooth
5. Motor Driver
6. Motor
7. Wi-Fi Module
8. Micro controller

Working Procedure:

1. Robotic car prototype contains 16*2 LCD Display, Arduino mega, Power Supply board, wifi module, Vibration sensor, GPS, Motor driver, motor, Co sensor and microcontroller.
2. Co sensors detect the vehicle pollutions, Alcohol sensors detect the alcoholic contents and the Vibration sensors detect the accidents.
3. When certain threshold level is reached, the level sensors will trigger the message to the concern authority.

4. ArduinoUno board provides a development environment for writing software for the board.
5. Here, when any of the mentioned traffic rules are violated then the nearest control rooms will get the details of the vehicles with the help of LCD display, GPS AND Wi-Fi module.
6. In case of accidents the information containing the location and vehicle owner details will send immediately to the nearest rescue centers like hospitals and ambulances.
7. In pc, there is a modem to receive the data coming from hardware and it directly gives to server.
8. The status of the vehicle violations are then sent to the concerned vehicle users as SMS and automatically deducts the penalty.
9. The motor vehicle department being the server can view all the vehicle details that are controlled by this system.

5. RESULTS

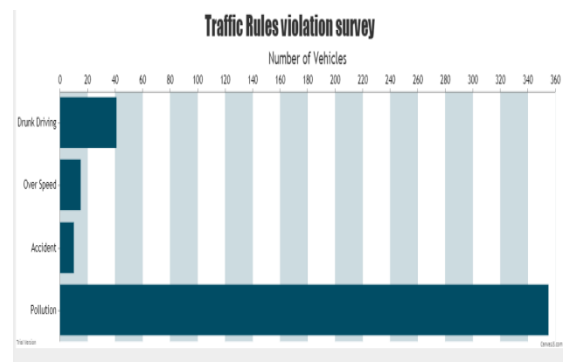


Figure 5.1- Analysis graph of traffic rule violations

The developed “robotic car prototype” and the portal “IOT based smart driving system” is working accurately. Motor vehicle departments are able to view the information regarding the traffic rule violations in their corresponding locations. Rescue teams are also able to view the accident related information in their corresponding locations. The vehicle users are also notified regarding their rule violations through sms and the penalty is deducted automatically from them.

6. CONCLUSION

Many accidents occur due to the lack of care of drivers. Many drivers drink and drive which is a criminal offence. Also we all know that one of the major causes for accidents is over speeding.



This project is for the solutions of vehicle management problems. This is developed to check the traffic rule violation efficiently. By implementing this project a safe car journey is possible by decreasing the accident rates due to traffic violations. Also through this project the air pollution amount can be reduced considerably. The system aims to timely inform the emergency services with the location of accidents and the vehicle owner details, to the nearest rescue centers in the process of saving precious lives. This is efficient advanced traffic rule violation detection and penalty deduction system which prevents the vehicle users from the traffic rule violations. This system will be useful to maintain the transport laws efficiently.

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Peer Cash A Blockchain Based Cryptocurrency

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ABSTRACT

PeerCash is an decentralized application built on Ethereum blockchain technology. Decentralization means that there is no concept of having admin. Blockchain is a decentralized, distributed ledger secured technology which is immutable and verifiable. Every events in blockchain is recorded on blocks and it is encrypted using cryptography hashing. The advantage of PeerCash is that we can completely avoid the middle man from the web shopping payment system. That is we can completely remove the bank from interfering with our payment system and the buyer and seller can directly proceed their transaction and make their purchase. PeerCash transactions is completely recorded on blocks and the transactions is secured. So we can call PeerCash as a cryptocurrency. This paper describes about this application.

Keywords : Blockchain, Ethereum, Cryptocurrency, Cryptography

I. INTRODUCTION

Today's world is at our finger tips. Everyone wants to fulfill their requirements at their door step whether it be food or commodities. Online web shopping is such an application. We can just pick the item that we want and simply just pay the bill for the items to reach your hands. For this we use secured payment systems such as credit cards, debit cards, net banking, paypal etc for this. These payment sytems are good enough, but they lack certain things because we are living in the era of best technology. But they are not properly utilized. The problems is that there is no decentralization in these payment systems. This is a crucial problem for our privacy and security. Here the centralized systems are a bank, a centralized server etc. Therefore, we propose a system known as PeerCash.

A PeerCash is a digital cashing system which is completely peer to peer (i.e, people to people) that works on payment system of web shopping. Hence the name PeerCash. It works on the Blockchain technology. Blockchain is the technology that is used behind every cryptocurrencies that exist today. [1]

Blockchain is a distributed ledger which records all transactions. Once it is written, it cannot be rewritten. It is immutable. Blockchain is a decentralized network, which is a distributed database that is hosted on millions of computers simultaneously. Every system in the network are called as nodes. Nodes work together in groups to make the network secure. Every record is said to be called as blocks and it is connected as a chain in a chronological order, hence named blockchain. Every transactions is encrypted using cryptography so that transactions will be generated and represented by a hash value.[3][4][5] PeerCash also works in the same way. Every transactions is secured using cryptography. The transactions should be final and no further changes can be done to it.

We use ethereum blockchain technology in PeerCash as it is one of the biggest public blockchain mainnet available in the whole world with maximum number of computers and maximum number of people acting as nodes.



Ethereum blockchain can be used for making decentralised applications. In Ethereum blockchain PeerCash is implemented as a smart contract.[2] A smart contract is digital value of the code. PeerCash allows to settle the main problem faced by the fiat currencies i.e, double spending. It is deployed on the blockchain as a smart contract and will be able to track the transactions by searching it on the Blockchain explorer. It will be displayed as hash value to provide security over the transactions. It won't be able to tamper the transactions

II. RELATED WORKS

Satoshi Nakamoto[1] A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending, propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcasted on a best effort basis, and nodes can leave and rejoin the network at its own will, by accepting the longest proof-of-work chain as proof of what happened while they were gone.

VitalikButerin, Gavin Wood, Joseph Lubin[2] Like Bitcoin, Ethereum is a public blockchain network. They both rely on blockchain to operate. Think about the Internet. You can build lots of different applications on top of it like email, online shopping sites and Facebook. Well, in a way, blockchain technology is a new type of Internet where you can build lots of different applications.

Bitcoin and Ethereum are just two examples. The major difference between Bitcoin and Ethereum, however, is their purpose. Whereas Bitcoin provides one specific function, peer to peer electronic Bitcoin payments, Ethereum offers a platform that enables developers to build and deploy other decentralized applications. You could, for example, build another Bitcoin type currency on Ethereum.

Ian Grigg[3] Current technologies for blockchain fall short of providing what developers and end-users need in order to contract together and to build large scale businesses. EOS, propose a performance-based and self-governing blockchain that provides an operating system for building large-scale consumer facing distributed applications. This paper outlines the context, vision and software architecture underlying EOS, which are building to serve a broad and diverse group of users with smart business.

David Schwartz, Noah Youngs, Arthur Britto[4] While several consensus algorithms exist for the Byzantine Generals Problem, specifically as it pertains to distributed payment systems, many suffer from high latency induced by the requirement that all nodes within the network communicate synchronously. In this work, present a novel consensus algorithm that circumvents this requirement by utilizing collectively-trusted subnetworks within the larger network, show that the "trust" required of these subnetworks is in fact minimal and can be further reduced with principled choice of the member nodes. In addition, it show that minimal connectivity is required to maintain agreement throughout the whole network. The result is a low-latency consensus algorithm which still maintains robustness in the face of Byzantine failures. It present this algorithm in its embodiment in the Ripple Protocol.

III. METHODS AND MATERIAL

PeerCash is developed on ethereum blockchain using a standard protocol known as ERC-20 standard. ERC-20 is a

token smart contracting, it has an interface. In smart contract an interface is added. In interface Peercash is actually what is doing, are Total supply, Account transfer (buyer to seller), balance to be displayed in account(deduction, addition). These are to be verified. The Total supply is fixed.

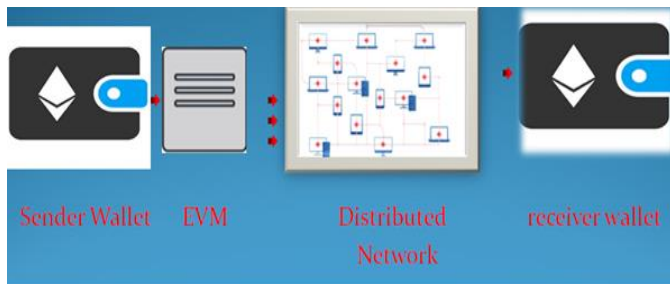


fig1.Design Of PeerCash

The above figure shows the design of PeerCash consist of sender wallet, a receiver wallet, an EVM and a distributed network. An EVM is an Ethereum Virtual machine. When a sender sends an amount of PeerCash to the receiver, it get passed through the EVM. Amount of coins sending is a smart contract. EVM will convert this smart contract to byte code and then pass to the distributed network. The distributed network consist of millions of computers, nodes. These nodes will check whether the transfer is correct to the actual reciever. If it is correct then they will write to the blockchain and the amount will be in receiver account.

PeerCash is using evolutionary prototyping model. It is tested in two testnet blockchains, that is Ganache Blockchain and Rinkeby Testnet. Ganache Blockchain is the private blockchain, which is given by ethereum for free use. Ethereum is using Solidity programming language. So first we write the code in solidity, that is the interface should be written. Then it is migrated to Ganache as a smart contract. Then we can test the smart contract using Node js. Rinkeby testnet is also working in the same way. These two testing needs to be complete only then we can completely deploy it into main blockchain.

How we can use PeerCash in web shopping. This is our next question? Ordinary payment gateways like debit card, credit, paypal etc... is using a centralized system. PeerCash is completely different from them. When going through the checkout page, after selecting a payment method they will direct us to their centralised server. In this case there is a financial institution. But in PeerCash we have wallet which can be used as extension. After clicking checkout and selecting PeerCash as payment method, the browser will securely ask to connect with the wallet. Here the browser connecting means , the seller account is requesting to pay the amount for purchasing. If the buyer accept this then it should be visible as a popup notification, and thus there is no need to direcyed int banks website.

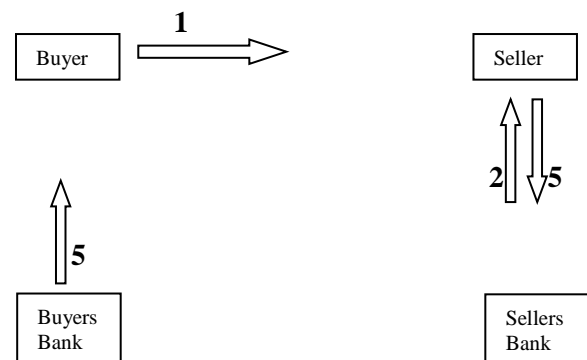


fig2. EXISTING SYSTEM

From the above figure,

- 1.The buyer makes a debit card purchase at checkout.
- 2.The debit card purchase to transmission of payment data from the seller to sellers bank
3. Transmission of payment data from buyers bank to the receiver bank
- 4.After receipt of payment of payment data, transfer of funds
- 5.Information is updated.

IV. RESULTS AND DISCUSSION

PeerCash is purely an extension based payment system for web shopping. PeerCash does not need any bank confirmations to make the payment done. It is directly peer to peer transaction system. It only needs the confirmation of the person who is using it. Buyer and Seller has equal rights and they acts as the banker for the transaction to be done. This also removes the third party to avoid the additional charges. Banks are levying high charges on the transaction basis. PeerCash removes the third party from this. PeerCash payment system allows to securely connect the browser with wallet by popup notification. Its only needs the confirmation of the user to connect the wallet with the browser. After connection we can securely pay for the order. It will take less time taken than the other payment system currently in use. It also implements the security, because there is no need to enter any information on the shopping site, it gets directly connected with the wallet. Every transactions is highly secured than other current payment system.

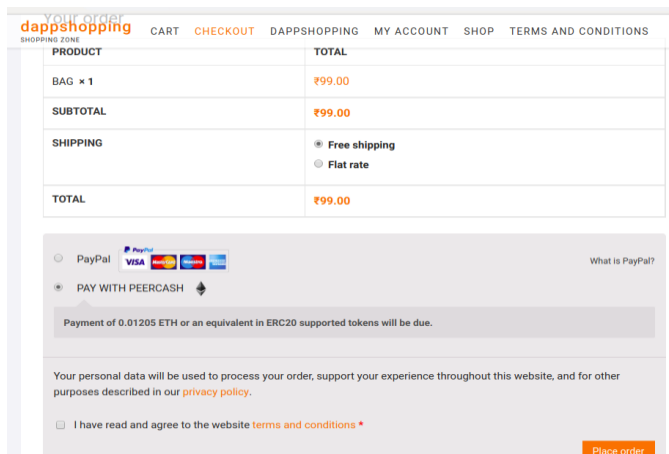


fig3. Selecting PeerCash as payment option

The above figure shows that when we buy a product from web shopping, then we add it to the cart and chosen to checkout. Then we need to select Peercash as payment option and place the order.

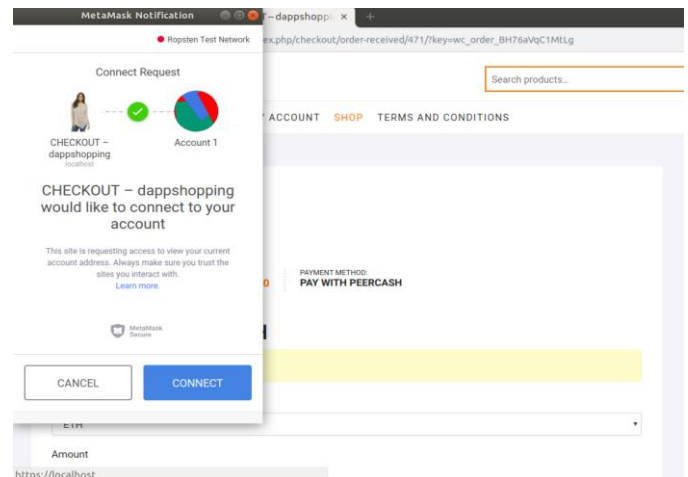


fig4. Browser asking to connect the wallet

The above figure shows that, after clicking the place order, the browser will ask us to connect with our wallet. That is the seller is asking to connect with our wallet. And then a popup window will open up.

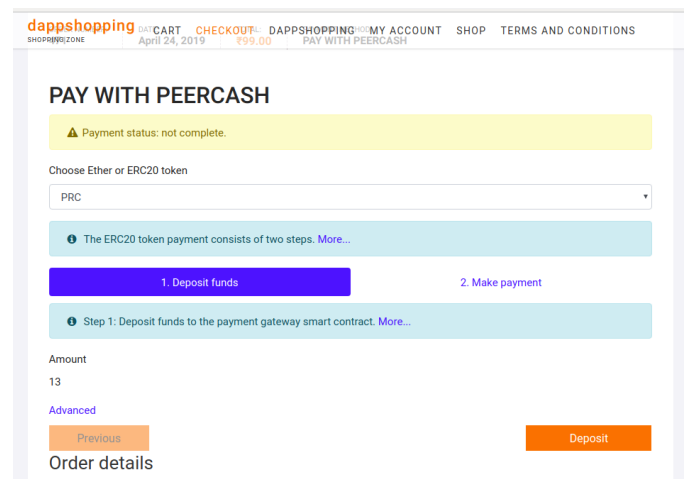


fig5. Pay with peercash

From the above figure it shows that, after clicking connect, the buyer has to go through two steps to pay the amount. First they need to deposit the fund and then pay blockchain fee. Depositing the fund means verifying whether the actual amount is getting correctly received by the seller. Only after paying the required blockchain write fees the amount will be credited. Otherwise Peercash will be back to the account and order will be cancelled.

The below figure shows that it is needed to confirm the deposit.

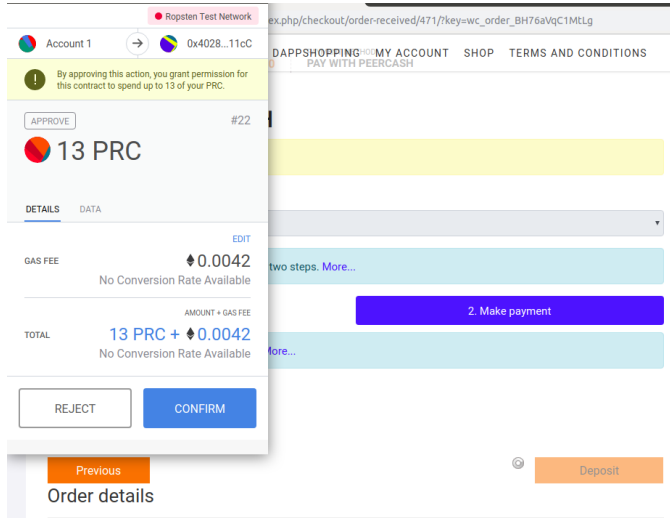


fig6. Deposit Confirmation

Below fig shows that after confirm it is needed to pay the blockchain fee to place the order successfully.

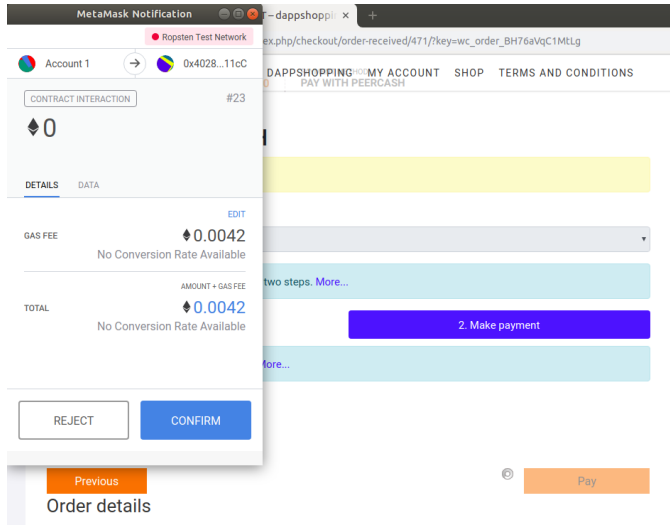


fig 7. Paying the fees.

Below figure shows that the order is successful after successful payment.

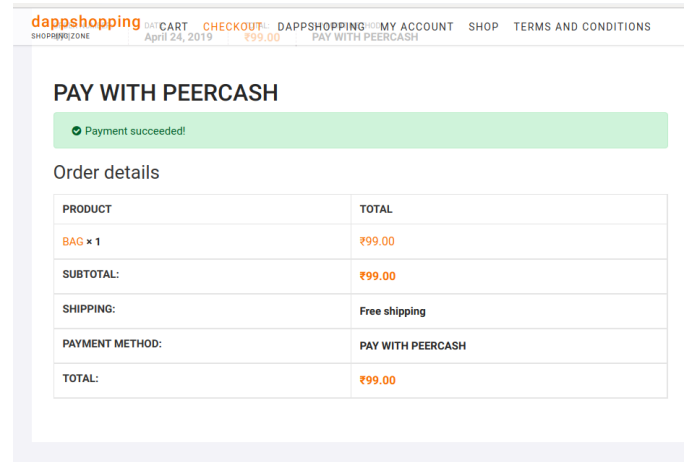


fig 8. Order is Done

V. CONCLUSION

This paper has discussed a way of electronic payment system for online based shopping systems. One of the most significant outcome of this project is that we could remove the third parties behind the shopping payment systems and thereby created an fully extension based payment system , which takes trust over the account and shopping websites by providing security in the payment system without moving from the shopping website to external payment gateways.

VI. ACKNOWLEDGMENT

We sincerely thankful to our Principal Dr. P Sreeraj, for providing us the facilities in order to go ahead in the development of our research. We express our deep and sincere to Dr. Nijil Raj N, Head of Computer Science and Engineering Department, Prof. Yasir A, Project Coordinator and guide Prof. Bindu Sivasankar, for valuable advice and timely instructions.



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Drowsy Driver Detection Using Haar and PAC

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ABSTRACT

Drowsy driver detection system is one of the potential applications of intelligent vehicle systems. Previous approaches to drowsiness detection primarily make pre-assumptions about the relevant behavior, focusing on blink rate, eye closure, and yawning. Driver drowsiness contributes to many car crashes and fatalities in our country. Machine learning algorithms have shown to help in detecting driver drowsiness. In our proposed method Haar classifier and Probably Approximately Correct(PAC) are used for detecting driver drowsiness. It is one of the few object detection methods with the ability to detect faces. Haar classifier used for face recognition most probably eye detection and can optimize frequently used face measures by using PAC. The main idea behind this method is to develop a system which can detect fatigue of the driver and issue a timely warning. Existing method reveals that 78%, 68% and 68% accuracy by using SVM, Naive Bayes and PERCLOS algorithm. Our proposed method reveals that 89% and 84.6% accuracy respectively by using Haar and PAC algorithm. It seems to be that our proposed methods are better than the existing method.

Keywords: Drowsiness Detection; facial expression; Machine learning; PAC; Haar classifier.

I. INTRODUCTION

Our proposed method discussing about prediction of driver drowsiness using machine learning algorithm. National Highway Safety Administration reports that almost 36,061 fatal vehicle crashes happen in each year. Alcohol intoxication, distraction and drowsiness have a considerable proportion in these crashes (by respectively 31%, 29%, and 2.5%). However, lack of physical traceability of distraction and drowsiness cause their roles to be underestimated. Each year more than 80,000 crashes occur in Nation's highways because of drowsy driving and result at least 850 fatalities and many injuries. Using data from the 100-car naturalistic study, researchers have found that drowsy driving is the reason of 22% to 24% of crashes and near-crashes observed. National Sleep Foundation's 2012 annual Sleep in survey shows that 20 percent of workers had driven drowsy at least once per month in the past year. Approximately 40 percent of train operators said they have driven drowsy at

least once in the past month. More than 25 percent of those who had driven drowsy had fallen asleep. Studies show that sleepiness can impair driving performance as much as or more than alcohol.

Prior research in alcohol impairment detection shows that the machine learning algorithms can help to prevent and reduce these crashes and their consequences. The difference between an impaired driver from an unimpaired driver can be recognized reliably by these algorithms with use of driving performance metrics based on signature pattern of lane position and steering. In this method, given a set of driving runs by drowsy and non-drowsy drivers our try to detect the drowsy drivers and thus are more amenable to use by the general public.

II. RELATED WORKS

Mkhuseli Ngxande, Jules-Raymond Tapamo, Michael Burke[1] proposed driver drowsiness detection based on

behavioral measures using machine learning techniques. There are many facial features that can be extracted from the face to infer the level of drowsiness. These include eye blinks, head movements and yawning. As a result, this paper reviews machine learning techniques which include support vector machines, convolutional neural networks and hidden Markov models in the context of drowsiness detection.

Mohammad Amin Assari, Mohammad Rahmati[2] proposed a hardware system which is based on infrared light and can be used in resolving these problems. In the proposed method, determine the face region using the background subtraction technique, the facial components are obtained by horizontal projection and template matching.

A.R. Beukman, G.P. Hancke and B.J. Silva[3] proposed a multi-sensor system for driver fatigue detection. The system achieves this by monitoring eye closure and wheel steering movements, and is able to alert the driver of any detected anomalies. Various techniques are suggested for registering the location coordinates. If it is detected that the driver is falling asleep, the system alerts the driver through audible and visual cues and sends an SMS to a third party reporting the occurrence.

Bagus G. Pratama, Igi Ardiyanto, Teguh B. Adji[4] proposed the ratio of accidents caused by drowsiness, so they propose various features such as visual, non-visual, and vehicular. Visual features are extracted from driver's face and recorded by camera. Non-visual features are signals emerged from driver's body and to acquire those signals, they use special sensor attached to driver's body. Vehicular features are obtained by observing the behaviour of driver during driving. From those features they discussed 3 ideas that can be considered as guidance to lead researcher in developing drowsiness detection. The first idea is creating the dataset of drowsiness facial expression because it can predict drowsiness and fatigue. Second idea is to combine visual, non-visual, and vehicular features into one for better detection. And last one is developing wearable hardware's such as smart watch for drowsiness detection which are easy to use and user friendly.

Ashish Kumar, Rusha Patra[5] proposed a real time driver's drowsiness detection system developed with acceptable accuracy. In the developed system, a webcam records the video and driver's face is detected in each frame employing image processing techniques. Facial landmarks on the detected face are pointed and subsequently the eye aspect ratio, mouth opening ratio

and nose length ratio are computed and depending on their values, drowsiness is detected based on developed adaptive thresholding.

Taro Nakamura, Akinobu Maejima, Shigeo Morishim[6] proposed a method for the estimation of the degree of a driver's drowsiness on basis of changes in facial expressions captured by an IR camera. Typically, drowsiness is accompanied by falling of eyelids. In this paper, they propose a more precise drowsiness-degree estimation method considering wrinkles change by calculating local edge intensity on faces that expresses drowsiness more directly in the initial stage.

Javed Ahmed, Jian-ping li, Saeed ahmed kran, Riaz ahmed shaikr[7] proposed to locate the eyes of driver, and to decide whether the eyes of driver are open or close. The system manages utilizing data gained for the image which is in binary form to locate the face edges, which gets the location where the eyes of a person may exist. If the eyes of driver are found close for five successive frames, the system assures that the driver is nodding off and a signal of warning has been issued. The result demonstrates that eye-tracking drowsiness functions admirably for a few drivers the length of the squint acknowledgment works appropriately. The camera based drowsiness measures give an appreciated contribution.

III. METHODOLOGY

In the project of driver drowsiness detection our use Haar cascade classifier for detecting driver drowsiness very accurately and with less false positive rate. In the algorithm has to express the face detection method on it is described.

Haar cascade classifier algorithm:

Step1: Load the required XML classifiers.

Step2: Load our input video in grayscale mode.

Step3: Find the faces in the image. If faces are found, it returns the positions of detected faces as Rect (x,y,w,h).

Step 4: Get the locations and create a ROI (Region of interest) for the face and apply eye detection on this ROI.

Step 5: End

It is a machine learning based approach where a cascade function is trained using XML files. Driver Drowsiness Detection is to capture a driver's face from a camera and

be able to accurately calculate the level of drowsiness. For video manipulation, choose OpenCV library. Then video load in grayscale mode. Driver Drowsiness Detection requires a video sensor to detect the faces of drivers. To detect a driver's face is the Haar Cascade Classifier. It is one of the few object detection methods with the ability to detect faces. Region of interest (ROI) can detect a driver's face with increased accuracy. The way to create an ROI area is to first obtain the rectangle area from the Haar Cascade Classifier, which includes height, width, and the points of x and y. The rectangle is scaled up to create region of interest. If the eye is detected, then check whether the eye is opened or closed. Then checking the criteria for judging drowsiness. That is thus the eyes is closed for more than 20sec it means that driver is in drowsy state. So the alarm starts to beep.

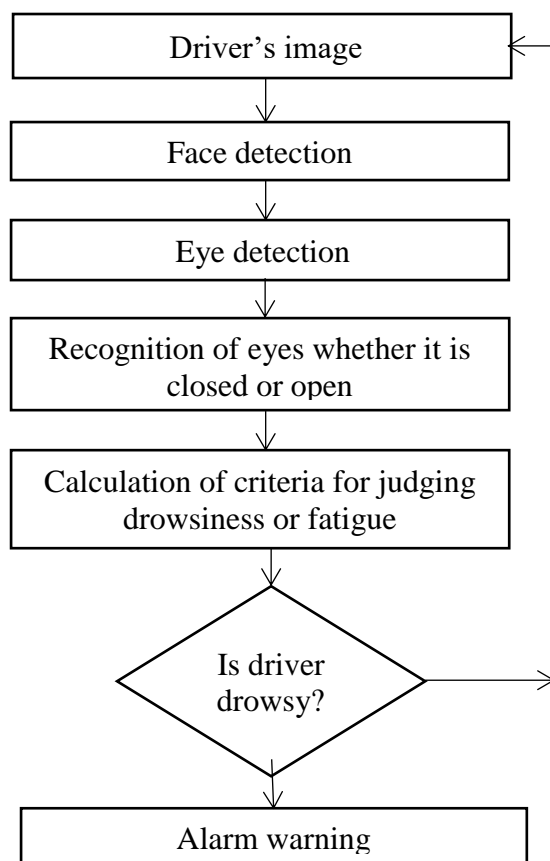


Fig 1: Work flow of driver drowsiness detection

IV.RESULTS AND DISCUSSION

This section describes the results of both proposed and existing system. Various machine learning techniques are used to detect driver drowsiness. SVM, Naive Bayes, PERCLOS are used in the existing system and Haar classifier algorithm and

PAC are used in proposed system to detect drowsiness. By comparing these two systems (Existing and proposed systems), proposed system depicts accurate results than existing system.

| | Algorithm | Accuracy |
|-----------------|-------------|----------|
| Existing system | SVM | 78% |
| | Naive Bayes | 68% |
| | PERCLOS | 68% |
| Proposed system | HAAR | 89% |
| | PAC | 84.6% |

Table 1: Existing Vs proposed system

The device needs a very accurate eye detector that could be integrated into their system. On their dataset, the Haar-based eye detector, that is bundled with OpenCV had an accuracy of about 89%. In other words, 11% of the time the eye detector failed either the location of the detected eyes were wrong, or there were more than or fewer than two eyes detected.

V.CONCLUSION

From this method, it has been proven that Haar classifier algorithm provides perfect results as compared to other algorithms. This paper presented a system for automatic detection of driver drowsiness and has a new method to detect the eyes and judge the eyes state for fatigue detection. In current methods, when eyes were opened, the eyes position can be detected. At the same time judge the state of the eyes, if eyes were closed for 20 sec then the alarm starts to beep until the driver open the eyes. Distance between driver and camera is in the range 30cm to 80cm. Experimental result shows that the proposed method has 85% accuracy.

VI. ACKNOWLEDGEMENT

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department and younus college management, supporting for this work.

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Ai Based Shopping System for Price Negotiation Using Chatbot System and Artificial Intelligence

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ABSTRACT

Today life of humans are fully engaged in their busy schedule. With their busy days, people are in need of a system that brings the product at their door step in order to simple their purchase. Thus e-commerce websites has been developed and act as an emerging technique in this current world. People make their purchasing after the introduction of e commerce websites in an efficient manner. But while making an online purchase the quality and price of the product is very important. Even though things we want are getting easier, all people are very conscious in quality and rate of the particular product. Having a best price which is not a fixed one will increase the payoff among sellers and buyers. Thus an automated agent for negotiation has been designed in order to maintain a flexible and considerable price instead of fixed price. This Automated agent will help the organization or shops to have their selling in online fully automated. It also helps the customers to negotiate with the AI Bot based on price of every product. Once after the negotiation of price, the link for payment will be sent to mail in order to make online credit card payments. Finally successful payment can be intimated through mail.

Keywords : Online Shopping, Artificial Intelligence, Chatbot

I. INTRODUCTION

Shopping has long been considered as a refreshment by many. Shopping online became a recreational activity of life. The reason of developing web based online shopping system are many everyone walking down the street for shopping has some difficulties. Also some people are so much busy and not able to go out for shopping, Some don't like to shop in crowd. There is another reason that it is not possible to see all the product of a store, also its hazardous for both the customer and the seller. Online shopping system is a virtual store on Internet where customer can browse

the product and select the product of interest. The selected product may be collected in shopping cart. At checkout time the items in the shopping cart will be presented as an order. At that time shipping information and payment method have to selected by the customer. Finally by confirming the order we complete the shopping and the product will be delivered to customer via courier, post or by direct agent of company.

In this paper a chatterbot or chatbot aims to make a conversation between both human and machine and design and development of an intelligent voice

recognition chat bot. The machine has embedded knowledge to identify the sentences and making a decision itself as response to answer a question. By introducing an artificial brain, the web-based bot generates customized user responses, aligned to the desired character. Questions asked to the bot, which is not understood is further processed using a third-party expert system (an online intelligent research assistant), and the response is archived, improving the artificial brain capabilities for future generation of responses. We point out that the automated negotiation is still in its infant stage, because there are still some difficulties in this field. The first is the ontology issue, the second is agents' strategies and third is Communication protocol. Electronic negotiations are becoming an important research subject in the area of electronic commerce. Decision analysis and especially multi attributive utility theory play an important role for the support of electronic negotiations. The preferences are usually represented as a utility function on the set of alternatives such that the user prefers an alternative exactly when it has higher utility. With the rapid expansion of the Internet, the implementation of agent technology in electronic commerce (e-commerce) becomes very popular, which provides a promising field for the approach of agent and Artificial Intelligence technology.

Artificial Intelligence (AI) is a commonly employed appellation to refer to the field of science aimed at providing machines with the capacity of performing functions such as logic, reasoning, planning, learning, and perception. Despite the reference to "machines" in this definition, the latter could be applied to "any type of living intelligence". Likewise, the meaning of intelligence, as it is found in primates and other exceptional animals for example, it can be extended to include an interleaved set of capacities, including creativity, emotional knowledge, and self-awareness. Nowadays, the term AI encompasses the whole conceptualization of a machine that is intelligent in terms of both operational and social consequences. A practical definition used is one proposed by Russell and

Norvig: "Artificial Intelligence is the study of human intelligence and actions replicated artificially, such that the resultant bears to its design a reasonable level of rationality".

In this article, we have discussed about scheduling in cloud computing environment. The introduction is summarized into Section 1. Literature survey is shown in Section 2. Methods and materials are formulated in Section 3. Methodology is shown in Section 4. The results and discussion are explained in Section 5 and section 5 and 6 sums up the paper.

II. LITERATURE SURVEY

Solomon, 1998 in his study "Consumer behavior is the study of the processes involved when an individual selects, purchases, uses or disposes of products, services, ideas, or experiences to satisfy needs and desires". In view for the Internet to spread out as a retail channel, it is imperative to realize the consumer's mind-set, intention and conduct in light of the online buying practice: i.e., why they employ or falter to use it for purchasing? Consumer attitudes seem to have a significant influence on this decision.

Schiffman, Scherman, & Long, 2003 in his study researched that "yet individual attitudes do not, by themselves, influence one's intention and/or behavior. Instead that intention or behavior is a result of a variety of attitudes that the consumer has about a variety of issues relevant to the situation at hand, in this case online buying. Over time the Internet buyer, once considered the innovator or early adopter, has changed. While once young, professional males with higher educational levels, incomes, tolerance for risk, social status and a lower dependence on the mass media or the need to patronize established retail channels

Vijay, Sai. T. & Balaji, M. S. (May 2009), revealed that Consumers, all over the world, are increasingly shifting from the crowded stores to the one-click online shopping format. However, in spite of the convenience

offered, online shopping is far from being the most preferred form of shopping in India. A survey among 150 internet users, including both users and non-users of online shopping, was carried out to understand why some purchase online while others do not. The results suggested that convenience and saving of time drive Indian consumers to shop online; while security and privacy concerns dissuade them from doing so.

The work of Kim and Park (2005) using U.S. samples suggests that their positive attitudes as well as willingness to search for pre-purchase information leads to a strong likelihood that they will buy online. Online shoppers, are required to have computer skills in order to use the Internet for shopping. Hence, those who are not comfortable with using the computer, will likely do their shopping at the traditional store, modern shop, or discount store because it will be faster shopping there than in the Internet shop.

Goldsmith and Flynn (2004) state that the home catalog is another traditional selling channel where people can shop at home because of the varieties of products offered in the catalog. They can order through the phone or by mail. It is convenient except that they are not able to touch and feel products before purchasing.

According to Zhou et al. (2007) it is the customer's probability that shopping online would increase his/her efficiency and this positively affect the entire purchase process. Bhattacharjee, (2001) says that customer prefer to acquire a product when such usage is perceived to be useful.

According to Dr. Wallace, perhaps, the biggest market of chatbot is Enter- tainment Markets, in which, we can imagine that chatbots can act as a talking book for children and provide foreign language instruction or can be a tutor in Intelligent Tutoring system. One such study used an ALICE system to help Chinese university students practice their conversational English skills. The study was qualitative in nature and used pre-existing conversational English skills . The study

focused more on user attitudes rather than on chatterbot efficiency. It was discovered that 62% of users chatted for 10 lines or less, and that 8.5% of the time ALICEbot has no specific pattern to match the given input and had to rely on root-level generic responses.

III. METHODS AND MATERIALS

Our proposed method is the artificial intelligence based online shopping system. With over 80% of global consumers trying online shopping at least once, the greatest opportunity for e-commerce companies is to build a long lasting and profitable relationship with this already existing audience. Such a strong relationship requires utmost focus on the customer as a whole and making sense of a flood of real time information that goes well beyond demographics or shopping behaviour. There are two entities who will access the system. One is the admin and another one will be the registered user. User can select the desired product and view its details and add to cart if he/she wishes to buy the product . User can also ask queries to AI Bot for bargaining related to price and regarding any product details and bot will return the query result in form of text to speech.

- The goal of the agent system is to expand the range of the online business module.
- This agent system differs from common ones. Since the current e-commerce systems often have strict requirements on the price, the number of buyers and the number of transactions, they are lack of real time interactivity between the users and the system.
- The agent-based model for intelligent shopping assistant, solves the problem. There are three different contents: multi-agent model system, system semantic protocol and natural language process base text.

a. Chatbot

Before entering design process, it needs to know global architecture of the chatbot. The scheme of the chatbot design shown in Figure:1

The chatbot consists of core and interface accessing that core. The core is in RDBMS being database. The database consists of tables to store knowledge, while the interpreter is a stored program of function and procedure sets for requiring of pattern matching.

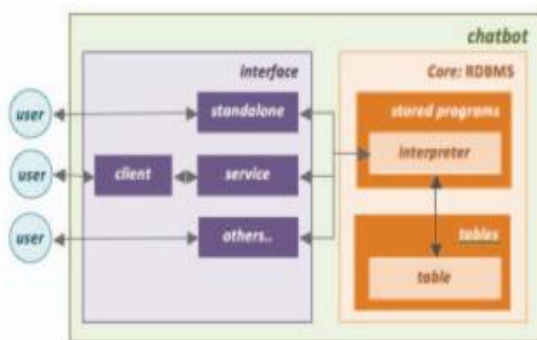


Figure1: Global Design of Chatbot

The interface could be a standalone application that can be employed by user for chatting or conversation. It can also be employed by service that needs additional client application to converse with the user. This application in the interface side can be expanded more over as user needs it and can also be written using other programming languages.

The boundaries of chatbot in this method have some requirements:

1. Chatbot should be able to differ each conversation session that is running, so it has to store data due to the conversation session such as session of identity (sessionid), user name on the session. The sessionid must always be sent together with user input by application in the interface side along conversation process.
2. Chatbot must store knowledge in the pattern-template form.
3. All user inputs must be free of misspellings, punctuation, and must be in lower case, so to anticipate

these cases the chatbot should be able to do normalization of the input that doesn't fit.

4. For the purposes of misspellings correction, the chatbot should have a list of misspelled words and the correction stored in the tables of database.

5. The chatbot should be able to pick up the keywords from the user input, so the chatbot should have a list of keywords which is stored in the tables of database.

6. The chatbot should be able to do a search template using a sentence-similarity measurement scores between both pattern and input. The searching of pattern is narrowed based on the result identification as described at point 4.

7. The chatbot should keep a conversation log containing sessionid, time, input, and response.

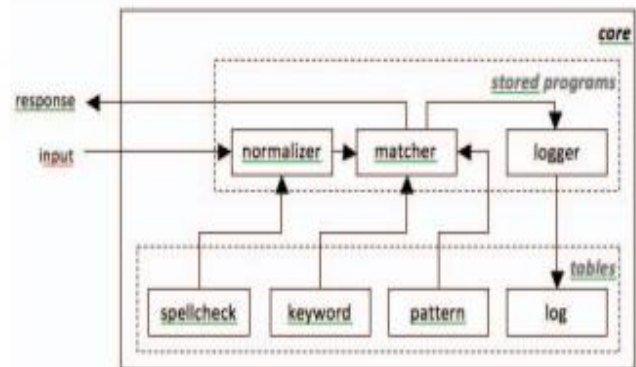


Figure 2: Chatbot Core Scheme

b. Natural language processing (NLP)

A natural language processing (NLP) gives capability of computer allows communication to happen between user-to-computer or human-to-machine and computer-to-computer or machine-to-machine using human natural languages. There are three analyses to understand natural language i.e. parsing, semantic interpretation, and knowledge-based structures. The parsing is an analysis of sentence syntax structures. In this step, identification of main linguistic relations is done to parse into subject, predicate, and object of the sentences. The semantic interpretation step yields meaning representation of the texts. The semantic interpretation uses knowledge of word meaning and linguistic structure such as noun or verb transitivity.

Actually, processing focus in NLP is a sentence. A sentence could be meant as biggest syntaxes consist of two or more words. A structural relationship between inter-word and inter-sentence is a different. Between both sentence and word, there are two media syntax units i.e. clause and phrase. The clause is a syntax unit that consists of two or more predicate elements. The predicate elements are a subject, predicate, object, complement, and adverb. The phrase is a syntax that consists of two or more words which does not include predicate elements.

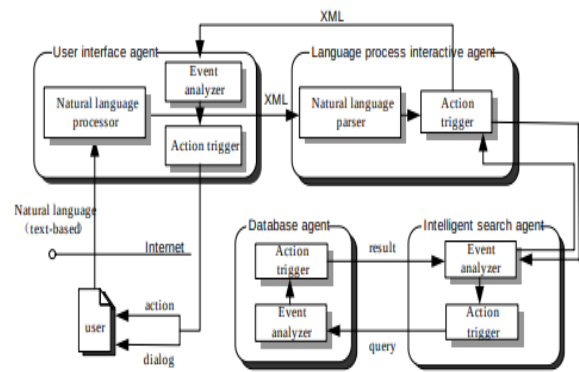


Figure 3 : design of the system

c. Decision Tree Classification (DT)

Decision Tree (DT) is a simple and easy way to implement classifier. Decision tree builds classification or regression models in the structure of a tree making. It is simple to debug and handle. Decision trees can handle both categorical and numerical data. The algorithm works by finding the information gain of the attributes and taking out the attributes for splitting the branches in trees. A DT is a flowchart like structure having internal node that represents a test on an attribute, branch that represents the outcome of the test and leaf node that represents a class label (decision taken after computing all attributes). The paths from root to leaf represents classification rules. The extracted features are provided as input to DT classifier.

IV.METHODOLOGY

System Design develops the architectural details required to build system or product. The system design process encompasses the following activities:

- ▶ Partition the analysis model into subsystems.
- ▶ Identify concurrency that is dictated by the problem.
- ▶ Develop design for the user interface.
- ▶ Choose a basic strategy or implementing data management.
- ▶ Identify global resources and the control mechanisms required to access them.

V. RESULTS AND DISCUSSION

The combination of chatbot and voice output allows for a simpler experience which makes a client more user friendly. By introducing an artificial brain, the web-based bot generates customized user responses, aligned to the desired character. Here admin will add the product with its details such as product name, product description, features, warranty, add on product and delivery date. User need to register with basic registration details to generate a valid username and password. After login, user can view all the recommended products on the homepage compiled by system based on users information. User can also ask queries to AI bot regarding any product details and AI bot will return the query result in form of text to speech.

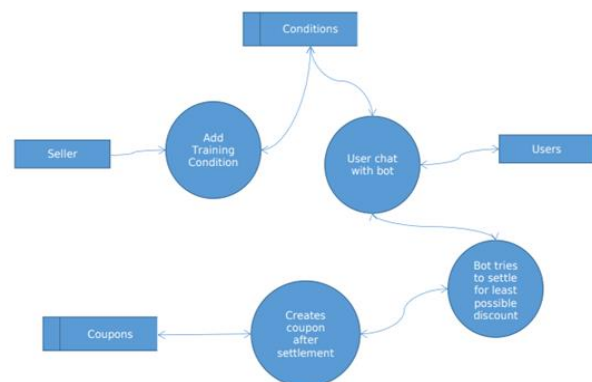


Figure 4: Bot training

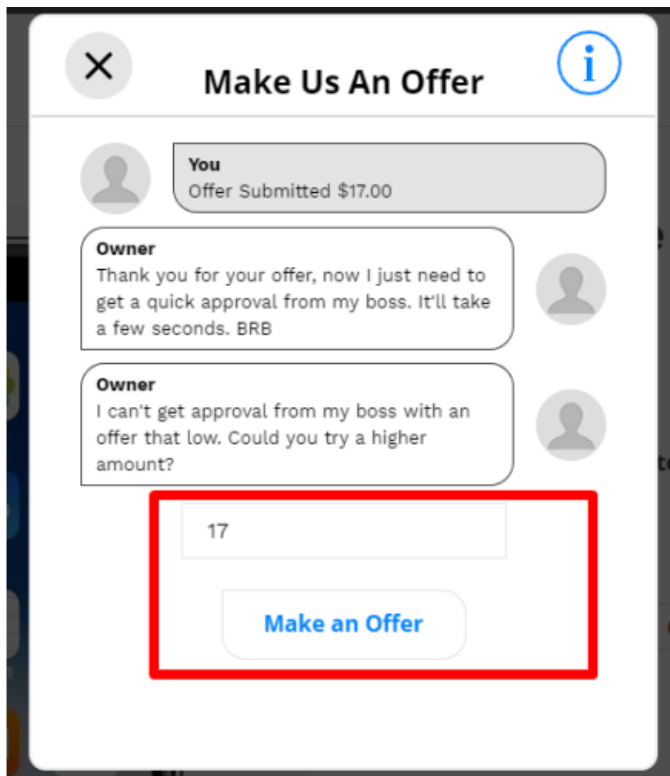


Figure 5: chatbot GUI

As this negotiation may happen back and forth, the store admin can propose a final offer himself at any stage if he feels that the customer is nowhere close to the least price after repeated attempts. At this moment, the customer has to accept or decline the deal to break the loop.

- What if we tell you that the site owner was not even online when the negotiation took place.
- What if we tell you that the entire conversation with the customer was being handled by a chatbot.

VI. CONCLUSION

The overall results prove that the respondents have perceived online shopping in a positive manner. This clearly justifies the project growth of online shopping. The frequency of online shopping is relatively less in the country. Online shopping organizations can apply the relevant variables and factors, identified from the research, to create their strategies and tactics. The organizations can prioritize the consumer inherent and unequivocal requirements in online shopping

environment. The results can also be used by various organizations to identify their target customer segments.

Conventionally web-bots exist; web-bots were created as text based web-friends, an entertainer for a user. Furthermore, and separately there already exists enhanced rich site summary (RSS) feeds and expert content processing systems that are accessible to web users. Text-based web-bots can be linked to function beyond an entertainer as an informer, if linked with, amongst others, RSS feeds and or expert systems. Such a friendly bot could, hence, also function as a trainer providing realistic and up-to-date responses. The convenience could be improved if the system is not only text based but also voice-based & voice trained.

VII. ACKNOWLEDGMENT

We are sincerely thankful to our Principal Dr. P Sreeraj, for providing us the facilities in order to go ahead in the development of our research. We express our deep and sincere gratitude to Dr. Nijil Raj N, Head of Computer Science and Engineering department, Prof. Yasir .A, Project coordinator and our guide Prof. Thanuja A, for providing valuable advice and timely instructions. We would like to express our very great appreciation to Mr. Sreedarsh S for his valuable and constructive suggestions during the planning and development of this research work.

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An Automated System for Analysing the Financial News

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ABSTRACT

The 24-hour news cycle and barrage of online media is a constant drum beat. The flow of positive and negative financial news is always in flux, influencing our current perspective and reassessing our future outlook. Nowhere is this more true than in the capital markets where assets are priced and risk assessed based on future expectations. While many factors influence a trader's decision to buy or sell an asset it can be argued that the sentiment from the 24-hour news cycle greatly impacts their outlook on the future value of an asset. In this paper our method propose new methods to predict the positive or negative sentiment of financial news. Using Natural Language Processing methods, our method extract syntactic sentence patterns from financial news. From these patterns we conduct experiments using machine learning sentiment analysis approaches to predict sentiment. It find that our sentiment prediction methods are able to consistently out perform the methods. Our robust techniques give the financial practitioner a method to analyze the news sentiment factor and labeling them using a machine learning algorithm logistic regression.

Keywords: Web scraping, Sentiment Analysis, Labeling, Logistic Regression.

I. INTRODUCTION

One of the pillars of modern financial theory is the Efficient Market Hypothesis (EMH). EMH was first proposed by Professor Eugene Fama of the University of Chicago in the 1960's. According to EMH, market prices reflect a security's fundamental value over the long run. However in the short run a security's price may deviate significantly from its true fundamental value. EMH further postulates that the price of securities change as new information enters the market and rational actors adjust their price expectations in reaction to this new information.

The goal of this project is to implement some fairly advanced machine learning algorithms in order to detect the overall meaning of financial news without having to read them. The project is structured in different parts. The first part is the web scraping. Using different tools like Tor it is possible to download automatically thousands of articles from different websites like Bloomberg or CNN and to archive them in different folders corresponding to different companies. The next step is labelling. This operation is needed to calibrate the dataset in order to implement correctly the learning part. This is not a computed

operation, it must be done by humans so that the overall sense of each article is understood and the data set is divided into four categories, they are: positive, negative, neutral and irrelevant. Then articles are parsed so that all the useless words are deleted and only nouns, verbs, adjectives survive, making the dataset analysis easier. This is when the learning phase begins.

The algorithm analyses the articles and builds the dictionaries with the words it found in the training set. The test set compares the words contained in the new articles with the labelled ones and assigns a label to the new article. Another technique used is the logistic regression which is more accurate because it gives more importance to more frequent words. The environment used in this project is Python which is a versatile language and has a lot of libraries already available to perform natural language processing. The possibility of simply classifying articles regarding a specific company is useful especially for possible investment strategies which are based on sentiment analysis.

Sentiment analysis is the task of extracting a person's opinion or emotional response from an object or event. Our method, compare use machine learning technique, to which we contribute. Using tools from Natural Language Processing we decompose financial news headlines to extract and build features from syntactic sentence patterns. We identify recurring patterns which are used to train our models. Lastly we conduct experiments using both methods to predict financial news sentiment and discuss the results.

The possibility of simply classifying articles regarding a specific company is useful especially for possible investment strategies which are based on sentiment analysis. The machine learning approach to sentiment analysis is a supervised classification task which involves building classifiers from labeled instances of texts or sentences.

II. RELATED WORKS

Technical analysis depends on historical and time-series data. These strategists believe that market timing is critical and opportunities can be found through the careful averaging of historical price and volume movements and comparing them against current prices. Technicians also believe that there are certain high/low psychological price barriers such as support and resistance levels where opportunities may exist. They further reason that price movements are not totally random, however, technical analysis is considered to be more of an art form rather than a science and is subject to interpretation.

While many researchers use pre-defined sentiment dictionaries such as the Harvard Inquirer (HI) or SentiWordNet argues that general lexicons are not suited to domain specific applications. They find that 73.8% of the negative words in the HI are not considered negative when used in the context of finance. To address this shortcoming they propose a new sentiment lexicon tailored to the domain of finance. Using a financial lexicon they find a significant reduction in sentiment classification errors.

Attempts to predict positive or negative market volatility in the financial markets. Taking a machine learning approach they follow. Using the Federal Reserve meeting minutes as input they select lists of words which imply market volatility. The word list is then ranked and sorted. These words become the "seeds" to generate dependency trees used in the feature vectors for model learning and testing. They find that using a considerably smaller subset of text containing only financial domain words achieves comparable results to that of using the entire corpus, also experiments with a specific lexicon constructed with words related to financial risk, such as forbear, default, etc. Using this tailored lexicon they build financial risk models to predict company specific risk. They find a strong correlation between risk words and the risk of companies. Combines financial news articles with social media content. This data is binned into fourteen categories which evoke specific emotions such as fear, joy, greed, optimism, etc. Using the binned data

they perform linear regression and use neural networks to predict FX rates. They find that the neural networks achieve superior results over linear regression methods.

While a consensus appears to be forming on the need for domain specific lexicons and training texts, there appears to be a gap in viewing these domain specific words in the context in which they appear.

The lexicon approach to sentiment analysis requires a dictionary of words and the associated sentiment score for each word in the dictionary. Sentiment word scoring typically entails a binary score of +1 for positive sentiment and -1 for negative sentiment. Neutral sentiment that is words that do not convey positive or negative sentiment such as the word "the", commonly referred to as stop words are often discarded. Analysis however requires the decomposition and examination of sentence structure so we have chosen not to discard any text and will assign a sentiment score of 0 to neutral words.

To determine the sentiment score for a sentence a Bag-Of-Words (BOW) model is followed. A BOW model considers each word to be independent. Thus each word is independently scored by looking up the word in the lexicon and assigned the associated word sentiment score. This process is repeated for each word in the sentence. The sentiment scores are then summed and the sign of the result is the final sentiment score for the text. A sentence with a greater number of positive sentiment words than negative will be scored as positive and vice versa. Popular lexicons include the Harvard General Inquirer Lexicon (H4N) developed, the MPQA Subjectivity Lexicon and SentiWordNet.

The BOW model using the H4N lexicon to assign sentence sentiment will be used to determine our baseline score in the experiments section. The H4N lexicon consists of a total of 11,789 entries (words) of which 1,917 are positive words, 2,291 negative words and the remainder is considered neutral. Performance of all other models in the study will be reported relative

to the baseline score. Further details of lexicon based sentiment analysis approach may be found and relatively in more recent work.

While lexicon sentiment methods have proven useful there are several draw backs. These include the lack of domain specificity, the independence assumption, the laborious nature of building a lexicon, the absence of context and their non-robust nature due to missing words. Below the following text are the sentiment scores for each word as they are found in the Harvard General Inquirer lexicon using a BOW sentiment scoring model.

"Google beats earnings estimates by a large margin."
Not Find -1 0 0 0 0 0 Not Find
Summing the word sentiment scores yields a result of -1, taking the sign gives the sentence sentiment of negative though it is evident that the sentence emotes positive sentiment when viewed from the perspective of an investor. This highlights several of the draw backs previously noted such as lack of domain specificity, the independence assumption, lack of context and missing words. The entire sentiment score is predicated on the single word "beat" which the H4N lexicon labels as negative. The word "beat" is a homograph (it has multiple meanings), the context in which is used allows us to deduce the intended meaning. While one definition for the word "beat" is "to strike violently" it becomes obvious by the collocated word "earnings" combined with viewing through the domain of investments that "beat" in this context does not mean 'to strike violently'. The intended meaning in this context is "to surpass or exceed" which should emote positive sentiment from an investor. Had the sentiment model included investments domain knowledge and was contextually aware the word "beat" would have been labeled positive and the entire sentence sentiment would flip from negative to positive.

III. MATERIALS AND METHODOLOGY

Dataset

Our articles are taken from various financial news available websites like CNN, Bloomberg etc. Each news

is annotated with its category, subcategory, dates and set of tags that describing the contents of the news. For this method our method focuses on financially related news.

Methodology

In our proposed system our method have proposed some fairly advanced machine learning algorithms in order to detect financial news without having to read them. This automated system for the analysis of news is useful and accessible for any company. System consists of 3 steps - first part is the web scraping. Using different tools like Tor it is possible to download automatically thousands of articles from different websites like Bloomberg or CNN and to archive them in different folders corresponding to different companies. The next step is labelling.

This operation is needed to calibrate the dataset in order to implement correctly the learning part. This is not a computed operation, it must be done by humans so that the overall sense of each article is understood and the data set is divided in four categories: positive, negative, neutral and irrelevant. Then articles are parsed so that all the useless words are deleted and only nouns, verbs, adjectives survive, making the dataset analysis easier.

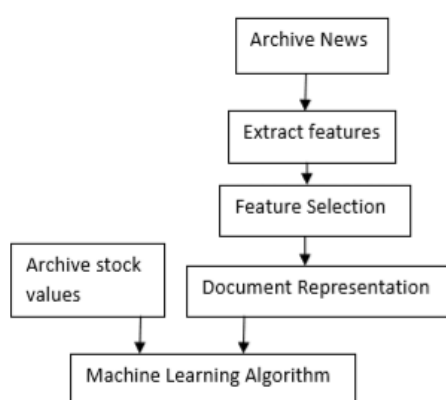


Figure 1: Work flow diagram for proposed system

Following convention positive sentiment news headlines were labeled as positive and negative sentiment headlines were labeled as negative. News

headlines which did not emote sentiment were evaluated as neutral.

A. Web Scraping

Web Scraping also termed Screen Scraping, Web Data Extraction, Web Harvesting etc, is a technique employed to extract large amounts of data from websites where by the data is extracted and saved to a local file in your computer or to a database in table (spreadsheet) format.

B. Sentiment Analysis

Sentiment Analysis is the process of `computationally' determining whether a piece of writing is positive, negative or neutral. It's also known as opinion mining, deriving the opinion or attitude of a speaker. Here we analyses whether the financial news is positive, negative, or neutral.

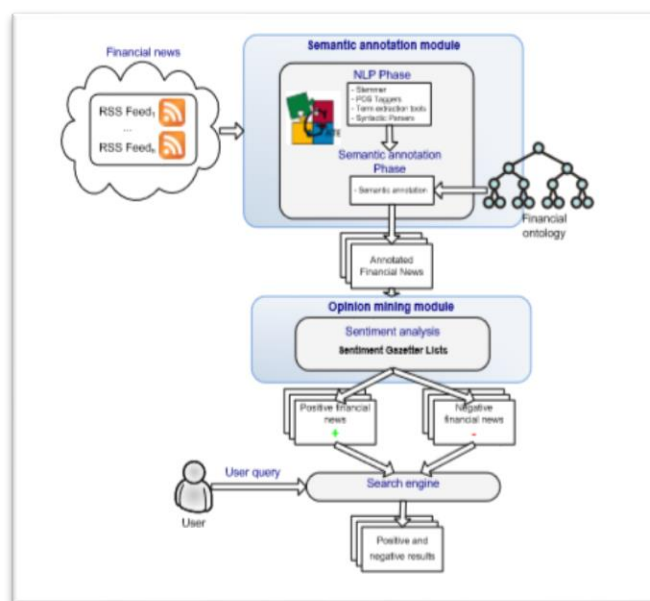


Figure 2: Architecture of the system

C. Labeling

Take a set of unlabeled data and augments each piece of that unlabeled data with meaningful tags that are informative. Using labeling we categorize the financial news as positive, negative, and neutral.

The implementation of machine learning algorithms requires labeled training data as input. One of the challenges of developing sentiment models for the financial domain is the lack of training data as input. For other domains such as discussion forums, blogs and product reviews there are a number of datasets available, but there is a lack of annotated data for financial sentiment analysis.

This study assumes that a financial news Sentiment accurately reflects the sentiment of the financial news article, thus our exercise it to label news headlines. The overall sentiment of the news article was considered, that is each word in the sentence is interpreted in the context of the entire sentence, words are not independent.

Feature Extraction

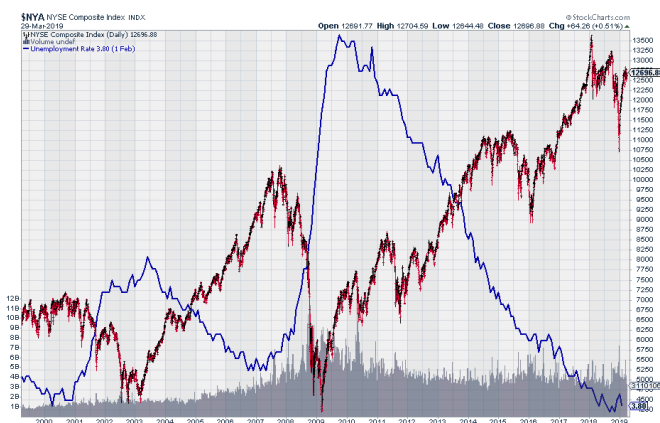
Reports the efficacy of syntactic patterns in sentiment aspect extraction. They find that the most productive pattern looks for noun sequences which follow an adjective. Generally, information about sentiment is conveyed by adjectives or more specifically by certain combinations of adjectives with other parts of speech. The adjective-noun pair method used in sentiment studies by online product review researchers has found its way into financial news analytics research in such works. While research has show the efficacy of the adjective - noun sentiment detection method for document level analysis it will not always suffice or may even break down at a more granular level. When analyzing a large document it would be highly improbable that a single adjective-noun pair would not exist, however once the analysis is narrowed to the sentence level the adjective-noun pair maybe absent, thereby proving ineffective.

IV. RESULT AND DISCUSSION

This method mainly consists of three steps. Web scraping consists in the extraction of articles from different websites, after processing scraping the first dataset is ready to be labeled and parsed. The labeling

step is necessary in order to calibrate the learning algorithm. For each article in the database a label is chosen: positive, negative, and neutral based on what is written about the society in the article. In parsing, a lexical analysis using NLTK (Natural Language Tool Kit) is performed looking for the more useful lexical categories. Useless words, special characters, and punctuations are also removed from the text. Learning consists in the extraction of list a from the training set of meaningful words with a predicted positive, negative, or neutral effect is done. At the end the words will be included into a dictionary that will be used in the testing phase. After the realization of these steps each article will be labeled following the percentage of positive or negative words that are contained in the article.

S



IV. CONCLUSION

It is a system that analyses news about a company and tells if it is positive or negative news. With machine learning, based on natural language processing algorithms. Nowadays the newspaper plays an important role regarding the image of a company. With this tool, keeping track of the news without reading the articles will be possible. This automated system for the analysis of news is useful and accessible for any company.

V. ACKNOWLEDGMENT

We are sincerely thankful to our Principal Dr. P Sreeraj, for providing us the facilities in order to go ahead in the

development of our research. We express our deep and sincere gratitude to Dr Nijil Raj N, Head of Computer Science and Engineering department, Prof. Yasir .A, Project coordinator and our guide Asst.Prof Thanuja A, for providing valuable advice and timely instructions. We would like to express our very great appreciation to Mr Sreedarsh S for his valuable and constructive suggestions during the planning and development of this research work.

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Implementation of Panic Button in Mobile Phones

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ABSTRACT

Our objective in this paper is to present a feasible solution to send a SoS message in a phase where the phone is switched off. SoS distress signal is an abbreviation for “save our souls” or “save our ship.” But in reality, “save our souls” and “save our ship” are backronyms, and the letters don’t actually stand for anything. Morse code string of three dots, three dashes, and three dots all run together with no spaces or full stops (... ---...). Since three dots form the letter “S” and three dashes form an “O” in International Morse code, though, the signal came to be called an “SOS” for the sake of convenience. In the existing System, it deals with send SoS message to the given emergency number when the phone in ON condition by using a SoS app, The major problem arise here is when the device is switched off the SoS message cannot be send, our system become the solution for this problem. In our proposing system there is a secondary battery storage, which only use for the emergency services. The GPS and GSM modules are works within it. Here uses a secondary power source and Adding an separate button to send SoS messages, When the SoS button is pressed the phone starts sending an alert message which contains the current location and the alert SMS to the contact that already registered for this service in our device. Raspberry Pi and Arduino (ATmega 328) are the major components.

Keywords: SOS distress signal, Morse code, Panic Button, Raspberry Pi, Arduino (ATmega 328).

I. INTRODUCTION

Implementation of panic button in mobile phone is a system that use to help people when they are in urgent situation. For example when a people kidnapped by a kidnapper, during the extreme situation, they can just press one button from the mobile phone even if mobile is switched off all the personal information will be send through SMS to 5 or more important person or even some government official that set by the user. The personal information of the user, the coordinate of the user current location and the emergency message set by the user will attach together in SMS and send. The best way to curtail your probability of becoming a dupe of violent crime (robbery, sexual assault, rape, domestic violence) is to recognize, defence and look up resources to help you out of hazardous situation. If you’re in dilemma or get split from friends during a night out and don’t know how to find back residence, this mobile with you will guard you and can reduce your risk and bring assistance when you need it. There are several app reduce the risk of sexual assault on women by informing control center and their

associates through SMS, but in lay of those this apparatus have much more efficient way to inform those this respected personals and also has a defending system which cannot be provided by existing app.

Our system that ensures the safety of women. It reduces the risk and helps us in need by identifying the location of person who is in danger. A chaotic world has become a ground for numerous natural disasters and man-made disasters. Natural disasters like Tsunamis, flood, earthquakes, hurricanes and storms or human caused events like large scale terrorist attacks or nuclear disasters, power sources may be totally destroyed and make the mobile batteries completely drained off. This situation makes the rescue operations extremely difficult to help the trapped survivors. Getting ‘Right data at a right time’ is a tough challenge in case of any pre and post crisis situation because “A minute delay in seconds may cost someone’s life” there. A remedy for this is the development of Smartphone technology. Here predefine the contacts in the SoS system that used for the emergency situation ,if such a situation occurs an

emergency message will send to the corresponding contacts .But the main problem is when the device is in poweroff condition (no battery charge) this technique is not works. Therefore this paper propose a system known as "Implementation of panic button in mobile phones". This SoS method also work in switch off conditions by using a backup power

II. RELATED WORKS

Sujit Rai et.al [1] An app is capable of sending the emergency messages via push notification and sms services to the selected contacts in one's smartphone informing them about the current happenings and telling the whereabouts of the user in the event anything goes wrong. A fully functional security app, It will be equipped with some of the most astounding features including reports, events, emergency contacts, gps integration, custom push notification, co-attendees of the events and capability to function efficiently in multiple event types. Pramod Sonawane et.al[2] Having a smartphone makes it much more convenient to check your email, social media or even your bank account while on the go. But there are also limitations of smartphone because we cannot connect directly to a USB or Ethernet cable with our phone and other multiple devices. So we provide the solution of that making pi phone using raspberry pi which is advancement in smartphone. Ravi Sekhar Yarrabothu et.al [3] This paper presents Abhaya, an Android Application for the Safety of Women and this app can be activated by a single click, whenever need arises. A single click on this app identifies the location of place through GPS and sends a message comprising this location URL to the registered contacts and also call on the first registered contact to help the one in dangerous situations. Priyanka Shinde et.al[4] This application collected speed and location information from the Global Positioning System (GPS) receiver, used the Google Maps Application Programming Interface (API) to determine the location of nearby hospitals, and gives message to hospitals and relatives, if a person need a help. Premkumar.P et.al[5] Introducing a device which ensures the protection of women. This helps to identify protect and call on resources to help the one out of dangerous situations. Anytime you senses danger, all you had to do, is hold on the button of the device. The system resembles a normal watch which when activated, tracks the place of the women using GPS (Global Positioning System) and sends emergency messages using GSM (Global System for Mobile communication), to sos contacts and the police control room. S.Mythili et.al[6] This paper provide a comprehensive overview of existing emergency applications by evaluating its operations, benefits and limitations. It provides an alternative direction to vanish the conventional problem having manual intercession and reporting emergencies R.Hari Sudhan et,al[8] This paper,

Arduino UNO ATMEGA-328 microcontroller is described in a detailed manner. Arduino software is installed in the computer and so that we can edit and upload the program according to the applications. Mainly these arduino software supports c and c++ programming languages.

Hugo Paredes et.al[9] This paper presents SOSPhone, a prototype of a mobile application that was developed to enable users to make emergency calls using an iconographic touch interface running in a touchscreen mobile device. The prototype implements the client-side of the application and was demonstrated and evaluated by a large number of users, including people without any disability, emergency services professionals and deaf people. This paper describes the SOSPhone prototype and presents the results of the interface evaluation process. Above papers only discuss about the sending distress signal when the device is ON condition. Our work overcome this Disadvantage.

III. METHODS AND METHODOLOGY

A. Hardware components:

- a) Raspberry pi 3 B+:



Figure 1: Raspberry Pi 3 B+

The entire single-board computer measures just 3.35 x 2.2 x 0.67 inches on its own about the size of a deck of cards and fits into a variety of cases and housings. The board weighs 1.8 ounces. On the board is everything you need to either use the Pi as a little desktop or build it into your next project. The standard ports are all there, with four full-size USB 2.0 ports, a Gigabit Ethernet jack (max speed 300 Mbps), a single HDMI output and a 3.5-millimeter, four-pole jack that doubles as a stereo audio and composite video port. A microSD card slot is used for installing storage, meaning you can add as little or as much storage space as you can get on a microSD card.

The Pi 3 B+ has a quad-core Broadcom BCM2837B0 and a Cortex-A53 processor clocked at 1.4 GHz. It gives you full 64-bit support and offers more power than previous iterations of the Pi, including the immediate predecessor, the Pi 3. There's 1GB of LPDDR2 SDRAM for memory and a microSD card slot that you'll use for storage and

loading, for whichever operating system you want to put on it.

b) ATmega 328:



Figure 2: ATmega 328

ATmega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. ATmega 328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. The further details about ATmega 328 will be given later in this section.

c) GSM module:



Figure 3: GSM module

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment

Identity) number similar to mobile phones for their identification.

The MODEM needs AT commands, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the GSM and GPRS cellular network.

d) GPS module:



Figure 4: GPS module

GPS receivers are generally used in smartphones, fleet management system, military etc. for tracking or finding location. Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites. This GPS receiver is used in many applications like smartphones, Cabs, Fleet management etc. GPS receiver uses a constellation of satellites and ground stations to calculate accurate location wherever it is located. These GPS satellites transmit information signal over radio frequency (1.1 to 1.5 GHz) to the receiver. With the help of this received information, a ground station or GPS module can compute its position and time.

B. Software Components:

a) Raspbian OS:

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.

Raspbian uses PIXEL, Pi Improved X-Window Environment, Lightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new

theme and few other changes. The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

b) Arduino IDE:

The Arduino integrated development environment (IDE) is a cross-platform application (for windows, macOS, LINUX) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiringproject, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

c) Embedded C:

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

The microcontroller programming is different for each type of operating system. Even though there are many operating system are exist such as Windows, Linux, RTOS, etc but RTOS has several advantage for embedded system development.

d) Python shell:

Python is a very useful programming language that has an easy to read syntax, and allows programmers to use fewer lines of code than would be possible in languages such as assembly, C, or Java. The Python programming language actually started as a scripting language for Linux. Python programs are similar to shell scripts in that the files

contain a series of commands that the computer executes from top to bottom. Unlike C programs, Python programs don't need to be compiled before running them. However, you will need to install the Python interpreter on your computer to run them. The Python interpreter is a program that reads Python files and executes the code. It is possible to run Python programs without the Python interpreter installed though. Programs like Py2exe or Pyinstaller will package your Python code into stand-alone executable programs. Python 2 and Python 3 come pre-installed on Raspbian operating systems, but to install Python on another Linux OS or to update it, simply run one of these commands at the command prompt:

```
sudo apt-get install python3
Installs or updates Python 3.
sudo apt-get install python
```

e) Tkinter Package:

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinter is most commonly used method. It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tkinter outputs the fastest and easiest way to create the GUI applications. Creating a GUI using tkinter is an easy task.

To create a tkinter:

1. Importing the module – tkinter
2. Create the main window (container)
3. Add any number of widgets to the main window
4. Apply the event Trigger on the widgets.

Importing tkinter is same as importing any other module in the python code. Note that the name of the module in Python 2.x is 'Tkinter' and in Python 3.x is 'tkinter'

```
import tkinter
```

METHODOLOGY

A. Architectural block diagram:

When panic button is pressed wake up controller is enabled, it send wake up signals to the Raspberry pi 3 B+, secondary relay and ATmega 328. This is for enabling all these components ,if primary power is ON in all these components they will enable ,else raspberry pi will not enable therefore this help to determine device is switch ON or OFF.

Secondary relay is part which the switching of power take place. This is used to switch the control of secondary power to the ATmega 328.

Raspberry pi is one of the core component of our proposed system. It consist of overall packages required

for a mobile device or a mini pc, it has built in processor, RAM and I/O ports. An exclusive kit from Cana Kit that includes the fastest model of the Raspberry Pi family - the Raspberry Pi 3 Model B+ The Raspberry Pi 3 Model B+ is the latest production Raspberry Pi 3 featuring a 64-bit quad core processor running at 1.4 GHz.

B. Flow Chart:

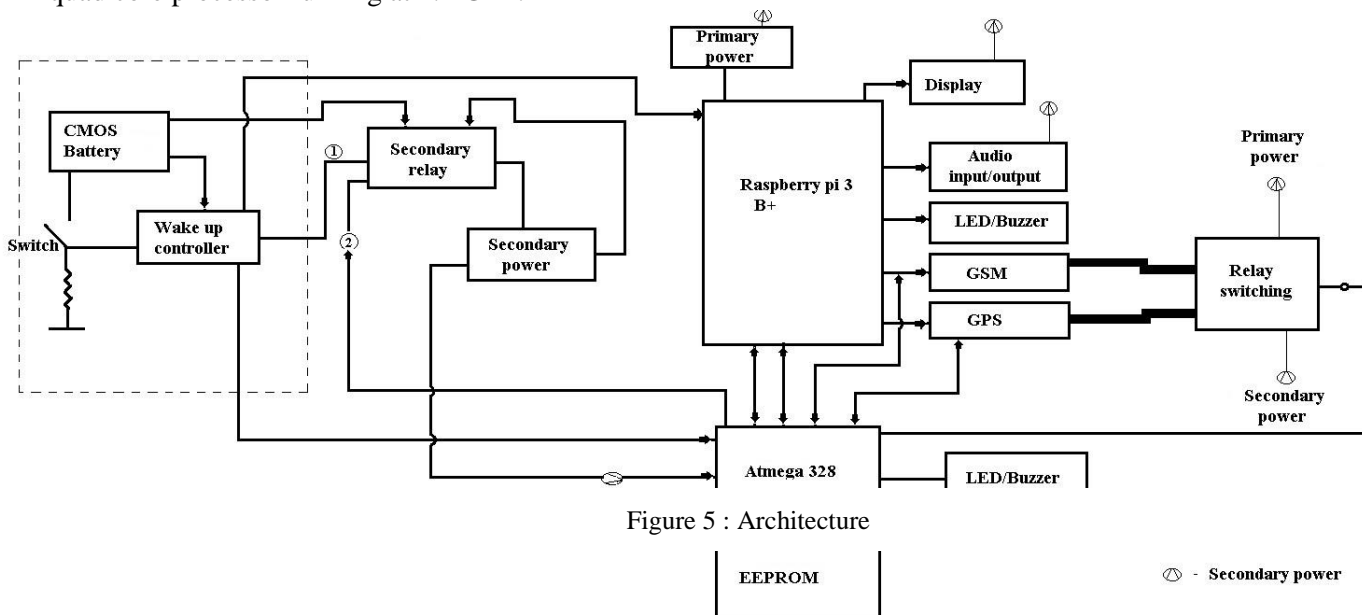


Figure 5 : Architecture

In our device Raspberry pi 3 B+ receive signal from the wake up controller and check if the device has availability of the primary power then all the components associated with the raspberry pi will work and the SoS message with GPS location will send with the help of this primary battery along with the help of ATmega. If primary power is not available then raspberry pi cannot send signal to ATmega ,the ATmega takes complete control.

ATmega 328 is the high-performance Microchip 8-bit AVR RISC-based microcontroller. Here is the message to be send and programs are written. The reverse switching is occur between ATmega and secondary relay, that is ATmega take the control of secondary relay. Therefore Secondary power also under the control of ATmega. ATmega check raspberry pi is ON or OFF ,if primary power is ON raspberry pi send signal to ATmega, so ATmega do not need to worry about the control of GSM or GPS module(work with primary power).Else when the primary power is OFF raspberry pi do not work so no signal is received in ATmega therefore it takes the control of GPS and GSM modules(switch to secondary power using relay switch based on the signal from ATmega 328).

GSM/GPRS module is used to establish communication between a computer and a GSMGPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication.

A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position.

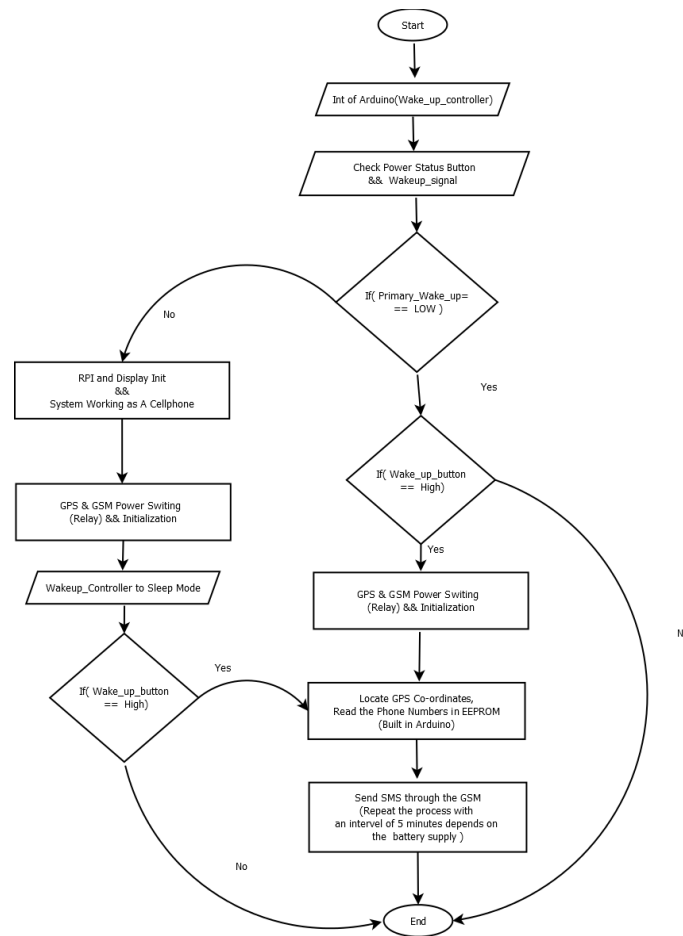


Figure 6 : Work flow diagram

IV. RESULTS AND DISCUSSION

In our proposed system we implementing a dedicated panic button in mobile phones it helps to overcome the disadvantage of normal SoS emergency messaging system ,that is this panic button can be work in both switch on and switch off conditions of mobile devices. Here in the implementing mobile, it has a secondary battery along with the primary battery .CMOS battery and secondary battery has low power than the primary battery because these batteries are used only for send SoS message and current GPS location in switched off condition of the mobile device .Primary battery is used for the normal working of the mobile.



Figure 7 : Interior of Device

V. CONCLUSION

In our proposed system Raspberry pi 3 B+ and ATmega 328 are the core part of our proposed system. We program the device with the help of python. Unlike other existing mobiles our proposed system has an additional secondary power supply or backup power for the emergency situation. we are mainly focus on the mobile phone in switched off or battery fully drained condition. In normal mobile phones if it is switched off GPS and GSM module cannot work so our system shows a remedy for that problem.

While the mobile phone has no power to switched on if any emergency situation occurs we do not have any way to contact others for help or simply we cannot send a emergency SoS message. If a disaster situation may occur no power is available for charge mobile phone so if anyone stuck any where we cannot inform other people for help. But our device shows a solution for this. It is also mainly helpful for the women who likes to travel.

VI.ACKNOWLEDGMENT

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Tesseract OCR Based Assistive for Visually Impaired Person

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ABSTRACT

This paper proposes the concept that helping or guiding a visually impaired person for their day by day activities. This paper proposes the concept based on voice based assistive for these kinds of peoples. It involves text extraction from a captured image and then converts it into speech by using the gTTS tool from google. The system is designed based on RASPBERRY PI and the portability has been achieved by using a rechargeable battery. This system consists of various modules such as ULTRASONIC sensor for detecting the obstacles in front of them and PERSONAL ASSISTANT based on machine learning helps in make the system more interactive to the user and an Android based chat bot helps in the communication with their relatives or friends also it consists of tracker based on IOT and GPS helps in storing the location history that they travelled. This system will helps lots of peoples who are suffering from this disability.

Keywords: Ultrasonic Sensor, OCR, gTTS tool, Personal Assistant, Machine Learning, Chat-Bot, IOT enabled Location tracker.

I. INTRODUCTION

Vision plays a major role in human for their daily activities. The visually impaired peoples are increasing every year due to health-related issues and many other reasons like accidents etc... The most difficulty faced by a visually challenged person is difficulty in reading the text and detecting the object in front of them. Various developments in the field of technology helps the blind person to developing camera-based and voice-based system along with computer vision tools with the existing useful products such as an ultrasonic sensor, Google Text to Speech tool, Optical Character Recognition System, etc.

This is a prototype for blind peoples to do their activities without the help of others. The device can be worn on the head of a blind user. The proposed system is developed by using Raspberry Pi and the portability is achieved by using a battery backup. Thus, the user could use this device anywhere and able to use anytime. The device has the first login using a username and password. After login, the various modules such as the ultrasonic sensor, GPS tracker, chat-bot begins to start their processing. The Ultrasonic sensor starts working when there are any obstacles in front of the blind user and alerts them using the voice with distance. Text extraction from an image is carried out by using Optical Character

Recognition (OCR). It is the tool for which the text from an image is then converted to digital format, from any scanned document or a photo of a document or a scene-photo. The digital image is converted to text using the Tesseract OCR engine it will helps in detecting the white spaces outline etc... It will check the standard of recognized text. In this system and the conversion of text to speech output is done by using an e-Speak algorithm. Here we use Google text to speech tool.

The personal assistant based on the latest technology machine learning in the system helps the blind person to know about the wanted information such as date, time, location etc. Machine learning is not only a single technique or a technology. It is the field of computational science which it incorporates numerous technologies to create systems that can learn based on the data's using their environment and can make predictions, actions when compares with the new situations. When we trigger for personal assistant then it will enable the microphone for getting inputs, then outputs the result through the attached headphone. The chat-bot is an android based application in the system which it will helps the person to communicate with their relatives or friends. The text message received is then converted into voice at the user side also the input will be given a voice, then it will be converted as text and then send to the relatives or friends of the blind user. The IOT

enabled GPS tracker in the system helps their relatives or friends to track the location using the chat-bot.

II. PROPOSED SYSTEM

This prototype helps in detecting the texts from the captured image and brings to them using a headphone or any audio output device. The system is designed to alert the blind user if any obstacle is in front of him. Thus, the user safety could be ensured. Also, an android based chat-Bot helps the person to communicate with their friends or relatives also they could track him using the same application. The proposed system has several modules such as Camera, Ultrasonic Sensor, Chat-Bot, GPS, Microphone, Personal Assistant, Headphone, LCD, and Touch Sensor. The text recognition from an image taken by using a camera and recognizes the text from the image using an Optical Character Recognition (OCR). Conversion of the recognized text file to voice output by using the gTTS tool. The captured image is first converted to grayscale and then filtered using a Gaussian filter to reduce the noise in the image. Here we use an adaptive Gaussian thresholding is used to reduce the noise found on that image. The filtered image is then converted to digital format. Then the digitized image is cropped so that the portions of the image with no characters are removed. The cropped frame is loaded to the Tesseract OCR so as to perform text recognition. The output of the Tesseract OCR will be a text file which will be the input of the gTTS tool. The Ultrasonic sensor emits sound waves at high frequency that the humans couldn't hear. Then the sound will get reply back to the origin, then it will calculate the distance based on the time required. Then the system will alert the blind user by voice with the distance. The Chat-Bot an android based application in the system helps the person to communicate with their relatives or friends. The text messages received is then converted into voice at the user side and the input will be given a voice, then it will be converted as text and then send to the relatives or friends of the blind user.

Fig 2.1 shows the system design of the proposed system.

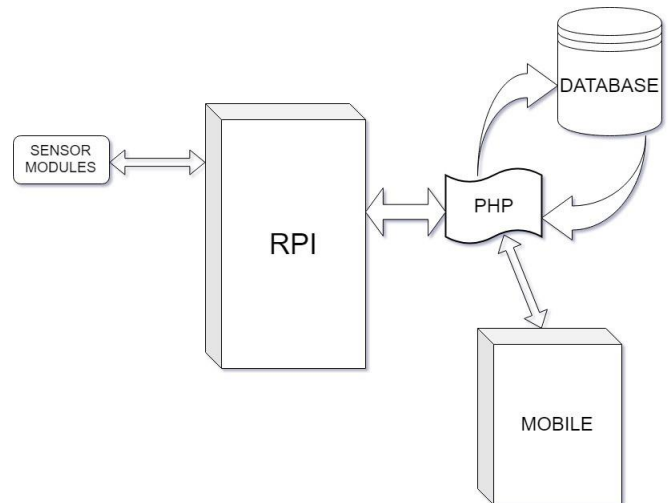


Figure 2.1

The IOT system is used for data retrieval and data view from various sensors and various scenarios. After that it will decide which actions to be performed such as, sends an alert to the user, automatically adjusts the sensors based on the user actions, etc. The GPS tracker in the system helps their relatives or friends to track the location using the Chat-Bot by using IOT server. This helps in saving the track history of the blind person for their safety. The microphone is a type of transducer which converts energy from one form to another form. Microphones convert sound waves into the audio signal. Here we use the microphone for taking input for Personal Assistant. The Personal Assistant based on the latest technology Machine Learning helps the user to communicate with the device and to know the attributes like time and date, text information, etc. Machine learning is not only a single technique or technology. It is the field of computational science which it incorporates numerous technologies to create systems that can learn based on the data's using their environment and can make predictions, actions when compares with the new situations. The Headphone converts the electrical signals to sound waves for the output to the user from the system. The LCD is used as another output of the system. It is not for the blind user, it is for the system diagnosis. The Touch sensor is similar to that of a simple switch. It is used for the function selections and for different purposes like a trigger for image capture, friend selection in chat-bot, to enable Personal Assistant and system diagnosis. The system is portable, which is achieved by providing a battery backup. Thus, the user could carry this device anywhere.

III. LITERATURE SURVEY

Most of the existing systems for the guidance of visually impaired people are limited for few functions only. Most systems are built in MATLAB platform and use laptops so they are difficult to carry.

A camera-based text reading is suggested in the paper [1] to help the visually impaired person read the text present in the captured images. This paper process face detection when a person enters into the frame by using the mode control. The proposed idea involves the extraction of text from the scanned image using Tesseract Optical Character Recognition (OCR) and the conversion of a text by an e - Speak tool (google text-to- speech), a process that allows visually impaired people to read the text from the captured image. The proposed hardware is designed using Raspberry Pi and by the use of battery the portability could have achieved.

From this paper, we have taken the concept of how to perform the text extraction from an image and how to process.

The paper [2] proposes an Ultrasonic Navigation based system to help the Visually Impaired person. In two modes, hurdle detection mode and fixed mode, the system can be operated. Using Arduino board, we use an ultrasonic sensor and water sensor in the hurdle detection mode to avoid obstacles. In this mode, the system uses the proposed system to detect solid and liquid obstacles and bring corresponding messages via Bluetooth to the blind person through voice. The fixed mode provides the information and guidance to walk from one place to another safely by assigning a fixed route in the proposed system from source to the destination location. The system also provides instructions to the blind to travel through various places using the GPS navigation system. An Android application is used to send messages via Bluetooth. This system provides complete guidance and protection to a blind person in different situations.

From this paper we have taken the concept of how to perform the GPS tracking and its methods to done.

The paper [3] proposes the deals with the obstacles in the path and their distance from the user are detected using an Ultrasonic Sensor and an Arduino board connected to a smartphone or PC. The distance at which the Ultrasonic Sensors detect the obstacles accurately. The classification of objects which could be determined using a smartphone or a PC. The correct or accurate feature selection is the big task because of the large amount of feature selection. This will cause detection slower. These processes will help in combining the results from Ultrasonic Sensors and Image Processing technique to alarm the user about the distance from it and the type of an obstacle. The combination of Ultrasonic Sensors and CV algorithms used for detecting obstacles in the user's path to enhance the efficiency of the system that it will detect the glass, doors, windows, etc. If the user uses only a CV system for Object Detection. Then the images do not indicate the presence of glasses or mirrors in the user's path and there is a possibility of the user to collide with it. In such a case,

the Ultrasonic Sensor reply back ultrasonic waves from a mirror or glass door; thus, the user will get alert about the presence of an obstacle in the path. The Ultrasonic Sensor provides information about the distance and the number of nearest objects has been detected during their path on the basis of a number of Ultrasonic Sensors used in it. The image processing algorithms which helps in detecting the texts and the objects from captured images. In the Object Detection system, they use the combination of two sensors. One is Ultrasonic Sensors and another is the Camera (smartphone or webcam) to capture images for the further process to determine the information about the object. The user will get alerted about the type of object in the user's path through voice. The Ultrasonic Sensor gives accurate Object Detection results also compares the different Object Detection techniques to determine the best performing algorithm which giving maximum accuracy for Object Detection and further process.

From this paper, we have taken the concept of how the obstacle detection and their various functions will perform.

IV. HARDWARE IMPLEMENTATION

The various hardware component used in the device is Raspberry Pi, ultrasonic sensor, camera, touch keys, USB microphone. Raspberry Pi is a mini computer which can be programmed for particular tasks. The Raspberry Pi 3 Model B is the third generation Raspberry Pi which is used in the system development. The Raspberry Pi 3 Model B has a powerful processor, 10x faster than the first-generation Raspberry Pi. Raspberry Pi works in an open source platform. It has 1GB RAM ,64 Bit CPU, 4 x USB ports, 4 pole Stereo output and Composite video port ,10/100 Base Ethernet socket, CSI camera port for connecting the Raspberry Pi camera, DSI display port is used for connecting with the Raspberry Pi touch screen display. A Micro SD port is used for loading your operating system and storing data. Micro USB power source helps in the running of Raspberry Pi. USB ports available on this board are used to connect the camera with raspberry pi. Three GPIO pins are used, for capturing an image, for more control and for shutting down the system respectively. The board is operated in such a way that the code starts executing when it is powered ON. The audio output is available through the audio jack.

A compactable camera on the device is used for image capturing. It has autofocus capability with a resolution of 1280 X 720 which is capable of capturing good quality images. The USB powered camera is used in order to connect it with the Raspberry Pi board. The captured images are sent to Raspberry Pi and all the image processing was done. The voice output is

available through the audio jack. It can be heard using the headphone.

An Ultrasonic sensor measures the distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from an obstacle. Ultrasonic Sensor measures the distance to the target by measuring the time between the emission and reception of the waves. An optical sensor has one transmitter and one receiver, whereas an ultrasonic sensor which it uses a single ultrasonic element for both the emission and reception. In a reflective model ultrasonic sensor, it consists of a single oscillator which it emits and receives the ultrasonic waves alternately. This enables the miniaturization of the sensor head. Ultrasonic sensors are a reliable and cost-effective solution for distance detection, calculation, and obstacle detection.

We use touch sensor for the operations that are similar to that of switches. If there is contact with the surface of the touch sensor occurs then the circuit will be closed inside the sensor and there is a flow of current will happen. When the contact is released then the circuit will get opened and no current flows. So, the touch sensor will help the user to communicate with the system using touch.

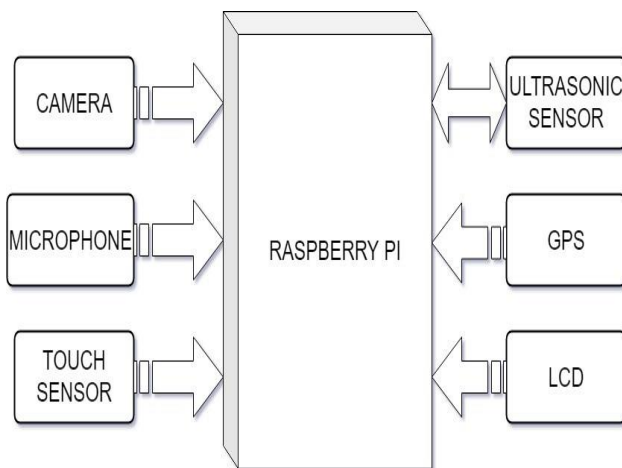


Figure 4.1

The system will start processing whenever a user presses a button specially designed in the user interface. The camera is placed on that device helps in captures an image of the scene. Then the search for text areas will be performed using several different methods by exploiting edge, color, and morphological information. If there any text areas were found at the initial input image, then the camera will zoom in to obtain more detailed images of each text areas. Then the characters are recognized and read out to the blind person using a Headphone.

V. CIRCUIT DIAGRAM

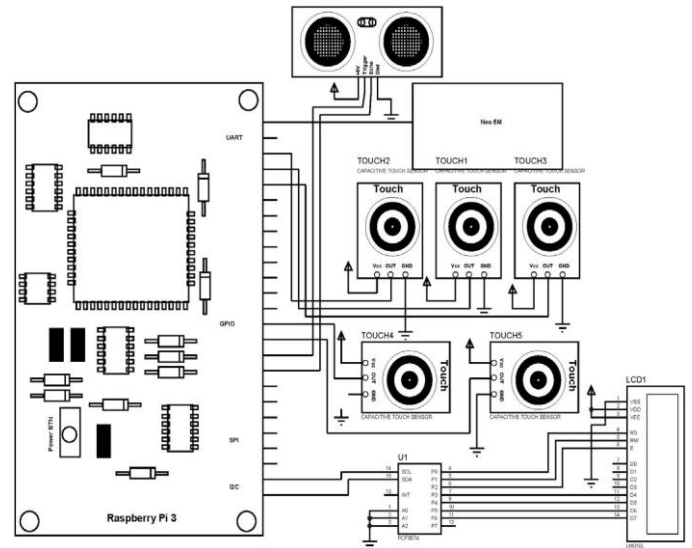


Figure 5.1

The various components that has been connected to the raspberry pi 3 are ultrasonic sensor it consists of 4 pins which it will helps in connecting with the raspberry pi. It consists of 5 touch sensors that each of them will performs various actions or various trigger like selecting the friend from the friend list, triggering camera for capturing images, enables mic for reading the input from the user for personal assistant. The LCD display has been embedded with the raspberry pi for getting the values from various operations each touch sensor has 3 pins. Neo gm is the GPS module that it will helps in getting the current location data. It is directly connected to the raspberry pi. The U1 is another port which enables the ports to connect to the raspberry pi.

VI. SOFTWARE IMPLEMENTATION

Raspberry pi works with Raspbian OS which is derived from the Debian operating system. We use several software's for the working of this prototype.

Raspbian OS is Raspberry Pi's Debian-based operating system. The other versions of Raspbian OS are Raspbian Stretch and Raspbian Jessie. In 2015, the raspberry foundation introduces the Raspbian OS as the primary raspberry series operating system. Mike Thompson and Peter Green are the developers of Raspbian OS as an independent project. The operating system is still under in developing and the support will be also available. Raspbian is highly optimized for the low-performance ARM CPUs.

Python-Tesseract is that the tool for python that it'll helps in acknowledge and browse the text found on pictures. Python-Tesseract might be a wrapper for Google's Tesseract-OCR Engine. It is also useful as a complete invocation script for

Tesseract, as it will browse all image varieties supported by the Python Imaging Library along with jpeg, png, gif, bmp, tiff, and others, while Tesseract - OCR supports tiff and bmp only by default. In addition, if used as a script, Python- Tesseract can print the recognized text rather than writing it to a file.

gTTS (Google Text-to-Speech), a Python library which helps in converting the text to speech and the Command Line Interface (CLI) tool helps in interface with Google Translate's text-to-speech API. It will write the file from an audio file and then stores as digital format. It options versatile pre-processing and tokenizing, furthermore as automatic retrieval of supported languages.

OpenCV-Python is a python library which helps in resolve computer vision issues. it's a cross-platform computer vision library as an open source that began as a research project at Intel in 1999 by Gary Bradsky, and therefore the 1st unharness came to go into 2000. It can be programmed by using several programming languages like C, C++, Python, Java, etc. This will help in writing more powerful image process functions and high-level algorithms. Open CV helps a wide range of image processing applications and it can be used simply also it is easy to handle.

Android Studio is the only and officially integrated development environment (IDE) for Google's Android operating system. It is developed by the JetBrains' IntelliJ IDEA software and is specially designed for Android development. It is available to download on several OS platforms such as windows, Linux, macOS. We use Android studio for developing the Chat-Bot application for an android user. The chat-bot will help in communication with their colleagues or Friends or Relatives. And the Chat-Bot will have gps navigation system.

Visual Studio Code editor is a programming platform developed by Microsoft for Windows, Linux, and macOS. It will help with debugging support, embedded Git control, highlighting syntax, good techniques for code completion, snippets, and code refactoring. It can also be customizable allowing the users to change the editor's theme, keyboard shortcuts, and preferences of the editor. Visual studio is a free and open source code editor. The compiled digitized data are freeware for private or commercial use. We use visual studio code Editor for the development of Graphical User Interface (GUI) and several important developments of the proposed system using the python-PyQt5.

PyQt5 is a collection of Python bindings for Qt v5. It will help in developing the graphical user interface for a particular application. PyQt5 is implemented in C++ itself because of the enhancement of the functionality of that applications. In our project the GUI is designed using this PyQt5.

Spyder is used to edit the python code in Raspberry Pi. It is a powerful tool for coding or programming the device using Python. It provides many built-in integrations with many popular scientific packages such as NumPy, SciPy, Pandas, IPython, QtConsole, Matplotlib, SymPy, etc. It has much more built-in features also its functions could be unlocked even further via first- and third-party plugins. It can also be used as a PyQt5 extension library for the advanced editing processes.

The given flow charts (fig 5.1 and fig 5.2) refers to the flow of execution of the proposed system. The explanation is as follows.

The system first initializes all the components of the proposed system and starts checking the conditions. When the condition (count++) occurs, it will start running. When the condition (count==1) then the image will be captured. When the condition (count==3) then the image will get converted to text and reads out. When the condition (PA button==high) then the microphone will starts working and reads the input as voice and converts it to the text format. Then this text will get compared with the trained data set and gives the response through the headphone.

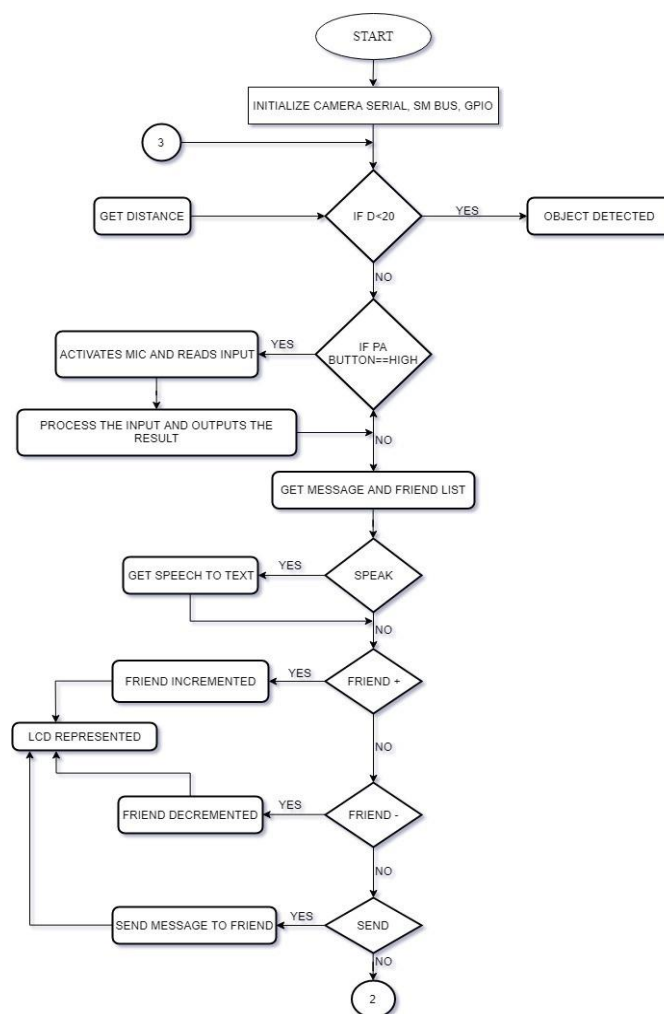


Figure-6.1

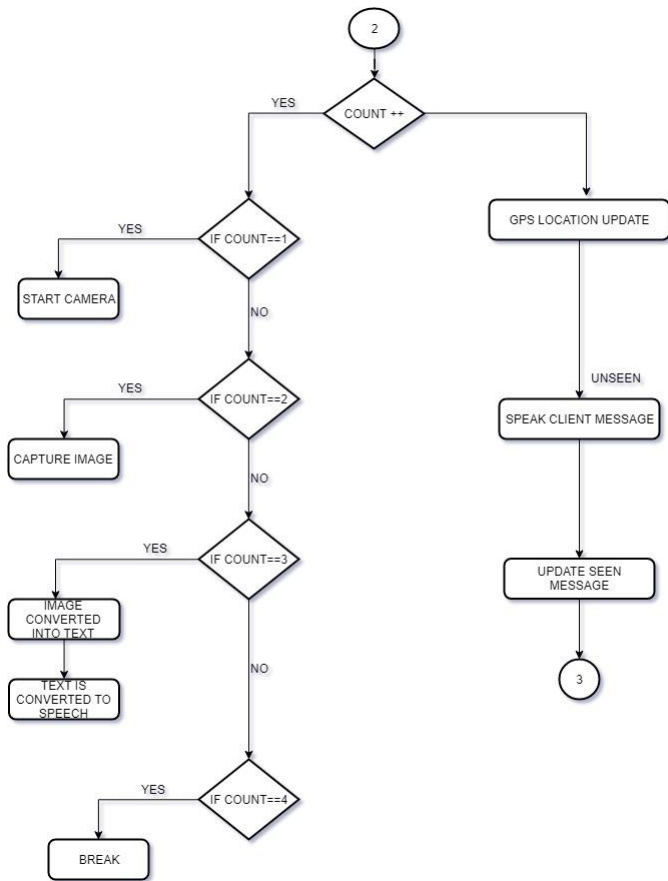


Figure 6.2

While the condition "speak" achieves then the microphone enables and collect your voice, then it converts into text and stored locally. When the condition (Friend +), then the user could select their friend in ascending order. When the condition (Friend -), then the user will get the previous friend. Using the last two conditions the user could select any of their friends and send the message to a friend while the condition (send) satisfies. The Ultrasonic sensor activates and finds the distance of the object when the condition ($d < 20$) satisfies. The GPS location data such as the user's current latitude and longitude will get uploaded to the IOT server using the GPS module and then it will get saved in the server.

VII. OUTPUT

This is a portable device which can wear on the head. The battery backup is used, so the user could carry the device anywhere and able to use at any time. The device helps the visually impaired person in the following ways. Text extraction from the scanned image using Optical Character Recognition (OCR) and convert the text to voice as an output using the Google Text-to-Speech (gTTS) tool. Obstacle detection is done by Ultrasonic Sensor and gives an alert about the obstacle and the distance from the user to that obstacle in front of the blind person. An android based Chat-Bot application help in

communicating with their friends and relatives. Inside the Chat-Bot, an IOT enabled location tracker is included. It will store the location history of the blind user, so the android user could find the person where he is at the instant. Personal Assistant based on Machine Learning helps in the user interaction with the device and it will respond to what he wants to know at the moment.

VIII. CONCLUSION

The proposed system is a voice-based assistive system that will help in the visually impaired person for distinguishing the real-world products. The portability is achieved by using a rechargeable battery. The most difficult problem of a visually impaired person is that they couldn't read the characters or texts for reading and also have difficulty in recognizing the obstacles in their path. Many developments in the field of technology help the blind person by developing camera-based and voice-based system combined with computer vision tools with the existing beneficial products such as an ultrasonic sensor, Google Text to Speech tool, Optical Character Recognition System, etc. This prototype will help the person like a security guard by alerting the surroundings. The guardian could able to watch his movements with the help of GPS and IOT server. This system will be an interactive one to the blind user and with the help of a personal assistant to this prototype. it will respond to what the user questioned the assistant. An Android-based chat-bot application helps in communication with their friends, colleagues, relatives, etc. by converting the text to speech and speech to text.

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Classification of Membrane Protein Types by Using Machine Learning Approach

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ABSTRACT

The Membrane proteins are performing different cellular processes and important functions, which are based on the protein types. Each membrane protein have different roles at the same time this is called multi class classification. A general form of multi class classification is Multi-label classification. Each membrane proteins are lies in different classes at the same time that is known as multi label classification. The main feature of multilabel problem is that the instance can be assigned to any number of classes. Our proposed method is a multi label classification of membrane proteins by implementing machine learning algorithm like Logistic Regression Classification, Random Forest Classification and Neural Network Classification. An essential set of features are extracted from the homo-sapiens dataset S1 which are used for the proposed method, and it was revealed an accuracy of 89.176%, whereas existing methods are revealed an accuracy is 58.923%, 40.769% for the Decision tree and Support vector machine respectively. Both accuracy wise and complexity wise, the proposed method seems to be better than the existing method.

Keywords : Multilabel Classification, Membrane Protein Type, Machine Learning

I. INTRODUCTION

Proteins are essential nutrients for the human body. They are one of the building blocks of body tissue or they are polymer chains made of Amino acids linked together by peptide bonds. Protein type classification methods are progressively used in various research fields. In protein type classification, one of the major types of protein is membrane protein. Membrane proteins[1] are proteins that are part of or interact with biological membranes. In our proposed method is a multi label classification[2]of different types of membrane proteins by implementing various machine

learning approach. Membrane proteins play different roles in cellular biology. About 30% of human genomes have been encoded from membrane proteins. Information of a given membrane protein type helps to determine its function. Membrane proteins are referred as membrane associated proteins or membrane-bound proteins. Membrane proteins participate in important reactions of the cell, including transporting the substance into and out of the cell as a carrier, acting as a specific receptor for the hormone, carrying the recognition function of the cell and being responsible for signal transduction and cell-cell interactions[3]. In

addition, membrane proteins are of particular importance in drug therapy as the targets for many drugs [4].

On the basis of the interactions between membrane proteins and membrane. H. Lodish et. al[5]membrane protein are divided in to two types intrinsic and extrinsic membrane proteins The closely relation between the type and function of membrane proteins, knowing the type can provide clues for the structure and function of the protein . With the incredibly growing number of protein sequences discovered in the post genomic era, there is an urgent need for an effective method to predict membrane proteins and the introduction of machine learning methods greatly solve the problems. Based on their functions, membrane proteins can be classified into three classes: integral, peripheral and lipid-anchored. Membrane proteins are a common type of proteins along with soluble globular proteins, fibrous proteins, and disordered proteins. They are targets of over 50% of all modern medicinal drugs[6] classification of membrane proteins into eight types is a resource intensive and time consuming task. Therefore, developing an effective computational method is an urgent need for the protein functional type prediction. For that datasets S1 is constructed from Swiss prot database. It is reported from the performance of this method that it could be quite effective to classify membrane protein types

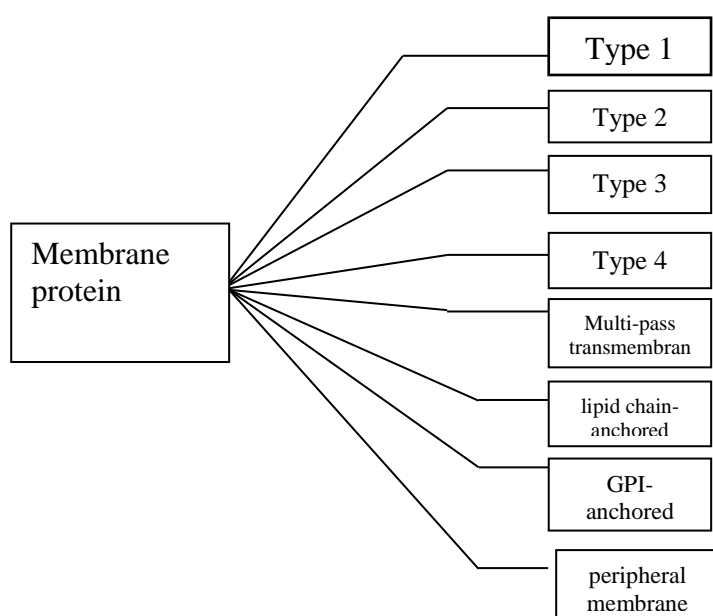


Figure1 : Membrane protein types

Based on the direct interaction relation between membrane proteins and lipid bilayers, the three classes can be further extended into eight basic types: (1) Type I membrane proteins, (2) Type II membrane proteins, (3) Type III membrane proteins, (4) Type IV membrane proteins, (5) Multi-pass trans membrane proteins, (6) Lipid chain-anchored membrane proteins, (7) GPI-anchored membrane proteins, (8) Peripheral membrane proteins. Among them, Types I, II, III, and IV are of single-pass trans membrane proteins.

II. Related work

M. Hayat, A. Khan, [7]Predicting membrane protein types by fusing composite protein sequence features into pseudo amino acid composition. In this paper, neural networks based membrane protein type prediction system is proposed. Composite protein sequence representation(CPSR) is used to extract the features of a protein sequence. The SVM success rates obtained using self consistency, jackknife, and independent dataset test are99. 9%, 86. 01%, and 95. 23% accuracy respectively, while that of PNN are 99. 9%, 82. 51%, and 95. 73%, respectively. These are the best prediction results reported so far and thus show the effectiveness of neural networks based classification strategies using CPSR based feature extraction for membrane protein type prediction

A. Garg, M. Bhasin, G. P. Raghava[8]Support vector machine based method for subcellular localization of human proteins using amino acid compositions, their order, and similarity search. Garg *et a*[8]introduced a systematic approach for predicting subcellular localizations(SL) of human proteins. A set of human proteins with experimentally annotated SL has been retrieved from the SWISS-PROT database[9]. The SVM-based modules for predicting SL using traditional amino acid and di-peptide (i+1) composition achieved accuracy of 76. 6% and 77. 8%. PSI-BLAST, when carried out using a similarity-based search against a non

redundant database of experimentally annotated proteins, yielded 73.3% accuracy.

Yu-Dong at el[10]proposed a new method for predicting the membrane protein types using the Nearest Neighbor Algorithm. They used manually constructed dataset from Swiss Prot [11]mainly according to the annotation line stated as SL, to classify the six types of membrane proteins. The predictor achieved the accuracy of 87.02%by using the 56 most contributive features .

Lipeng at el[12]proposed a new method in which, protein can be represented by a high dimensional feature vector by using Dipeptide composition method. They used membrane protein sequences from the dataset prepared by Chou and Elord, [13]with prediction accuracy of 82.0%.

NijilRajNandT. Mahalekshmi[2]Multilabel Classification of Membrane Protein in Human by Decision Tree(DT)Approach. ” In multi-label classification, each sample can be associated with a set of class labels. In protein type classification, one of the major types of protein is membrane protein. In this study proposes membrane protein type classification using Decision Tree (DT) classification algorithm. The DT classifies a membrane protein into six types . An essential set of features are extracted from the membrane protein dataset S1 which are used for the proposed method, and it was revealed an accuracy of 69.81%

| Author name | Method | Accuracy |
|---|--|----------|
| A. Garg, M. Bhasin, G. P. Raghava, 2005 | Support vector machine | 73.3% |
| Yu-Dong 2008 | Nearest Neighbor Algorithm | 87.02% |
| Lipeng 2010 | Dipeptide composition method | 82.0% |
| M. Hayat, A. Khan 2012 | Neural networks | 86.01% |
| NijilRajN and T. Mahalekshmi 2018 | Decision Tree classification algorithm | 69.81% |

Table 1: Comparison of existing method with corresponding accuracies

Table 1 shows the comparison of existing method with corresponding accuracies

III. MATERIALS AND METHODOLOGY

Dataset

A total of 3249 human membrane protein sequence were downloaded and verified from Swiss prot Protein database. . In the proposed method use the dataset S1 for classification.

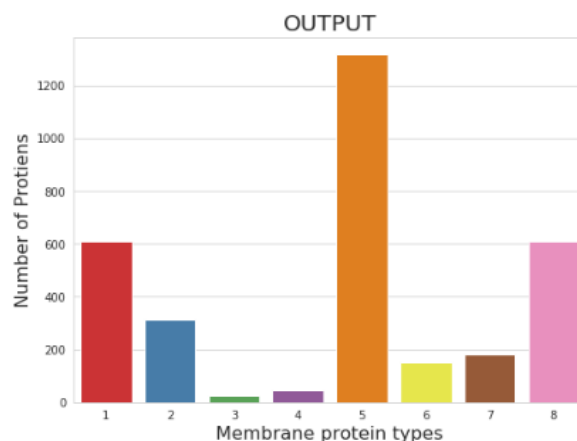


Figure 2 : Different Types of Membrane Proteins on Dataset S1

The figure 2 shows that the bar chart of different types of membrane proteins on dataset S1. From the bar chart Type 5 is the highest number of protein in dataset S1. Second highest is both Type 1 and Type 8. Type 3 is the least number of proteins in the dataset S1.

1. Feature Extraction

To establish an effective membrane protein prediction system, the key point is how to convert an original membrane protein sequence into a feature vector. To capture as much information of protein samples as possible and apply such feature extraction methodProteins are represented by a chain of amino acids. Features are usually extracted from the protein sequence. A sequence comprises of 20 unique amino acids namely A, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, and Y.

| Features | Dimension |
|-------------------|-----------|
| Di-Amino Acid | 400 |
| Isoelectric point | 1 |
| Molecular weight | 1 |
| Aromaticity | 1 |
| Count | 20 |
| Total | 423 |

Table 2 : Feature Vector and its Dimension

From the table2 represent the list of feature vector with dimension. There are five set of feature are extracted from the dataset S1. Totally 423 feature are extracted for the each protein sequence of the dataset S1.

a. Count

Count of each amino acid residue is one of the feature of protein. For example, let 'AANDCC' be a amino acid sequence, count of amino acid residue A is 2, N is 1, D is 1 and C is 2. A total 20features are collected as count for each amino acid.

b. Di-Amino Acid Count

Amino acids frequency is the number of combinations of amino acid residue. The count of the combination of sequence pattern AA, AC, . . . , AY, CA, CC, . . . CY, and . . . , YA, YC, . . . , YY in the protein sequence is called the amino acid frequency. From this, only count the combination of sequence patterns of Amino acid A, C, D, E. For example the sequence AA, AC, AD, AE, . . AY (20 numbers) and CA, CC, CD, CE. . . CY(20 numbers), and DA, DC, DD, . . . , DY (20 numbers) and EA, EC, ED, . . . EY (20numbers) are counted. As a total of 400 features are generated as frequency for a particular Protein sequence.

c. Molecular Weight

Molecular weight is the mass of a molecule. The size of a protein can be represented with the number of amino acids contained in that protein or by using molecular weight. It is represented by unit of Daltons or in KiloDaltons(KDa). tools used for finding the molecular

weight of a protein from its protein sequence. For example, molecular weight of the sequence 'ACDEFGHIKLMNPQRSTVWY' is 2. 4 kilodaltons, and protein with protein id Q9P299 has the molecular weight of 23679. 0820 KDa.

d. Aromaticity

Aromaticity is a property of conjugated cycloalkenes in which the stabilization of the molecule is enhanced due to the ability of the electrons in the orbitals to delocalize.

This act as a framework to create a planar molecule. In organic chemistry, the term aromaticity is used to describe a cyclic (ring-shaped), planar (flat) molecule with a ring of resonance bonds that exhibits more stability than other geometric or connective arrangements with the same set of atoms. Aromatic molecules are very stable, and do not break apart easily to react with other substances. Organic compounds that are not aromatic are classified as aliphatic compounds they might be cyclic, but only aromatic rings have special stability (low reactivity).

e. Isoelectric point

The isoelectric point (pI, pH(I), IEP), is the pH at which a particular molecule carries no net electrical charge or is electrically neutral in the statistical mean. The standard nomenclature to represent the isoelectric point is pH(I), although pI is also commonly seen, [2] and is used in this article for brevity. The net charge on the molecule is affected by pH of its surrounding environment and can become more positively or negatively charged due to the gain or loss, respectively, of protons(H⁺). The pH at which the electrolyte concentration of an amphoteric substance such as protein is electrically zero because the concentration of its cation form equals the concentration of its anion form.

2. Methods

a. Logistic Regression Classification

Like all regression analyses, the logistic regression is a predictive analysis. Logistic regression is used to

describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables.

b. Random forest classification

Random forest or Random decision forests are ensemble learning method for classification and other task that are operated by constructing a multiple of decision trees at training time and outputting the class that is the mode of the classes or mean prediction of individual trees.

c. Neural Network Classification

The neural network algorithm are inspired by the human brain. It is interconnected and communicate with each other. Each connection is weighted by previous learning events and with each new input of data more learning takesplace

3. METHODOLOGY

The step by step explanation for membrane protein prediction by using various Classifier algorithms is shows in figure 3. In the first step 3249 membrane proteins from dataset S1 are used as input. In the next step the features are extracted from the dataset S1. Then applying various classifying algorithms such as logistic regression, neural network and random forest. Then evaluate the performance matrices and count corresponding accuracies.

Algorithm for predicting membrane protein types by applying various machine learning approach is follows;

Step1: Start.

Step2: Input Dataset S1 (3249 membrane protein sequence)

Step3: Pre processing the data from the data set S1

Step4: Extract the feature set from the dataset S1.

Step5: Apply various machine learning approaches for classifying membrane protein types.

step6: Evaluate the performance matrices.

Step7:prediction of membrane protein types

Step8:stop.

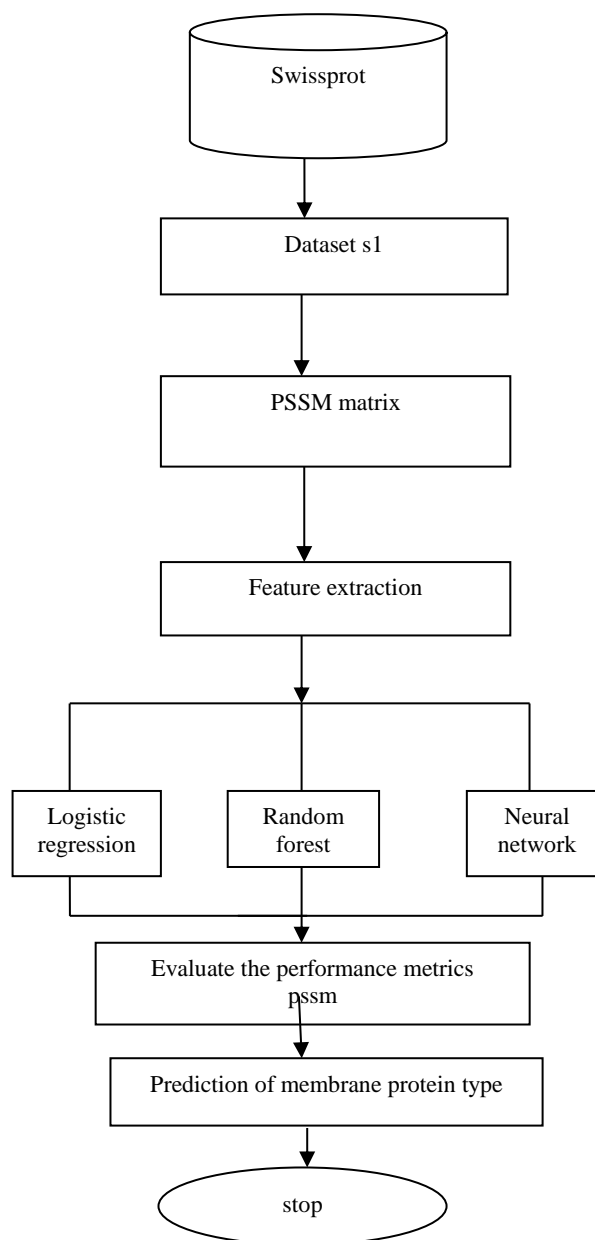


Figure 3 : Work flow diagram

IV. RESULTS AND DISCUSSION

This section depicts the results of both existing Method, and proposed classification algorithms using methods. The proposed classification performs classification on the dataset S1. This method uses the whole number of proteins from the dataset for the classification purpose. It is obvious that the Neural network method contributed the most, annotating 3249 proteins and achieved accuracy of 89. 176%, on datasets S1and the random forest classification with accuracy of 70. 154%, on the dataset S1 and logistic regression classification with accuracy 66. 769% on the dataset S1

V. CONCLUSION

In our proposed method, the system can predict the membrane protein type based on the effective accuracies followed by different classification algorithms. In the future, more features can be added than the existing system. This helps to improve the prediction accuracy. The use of classification algorithms helps to get the prediction type more accurate. As per the literature reveals that different classification algorithms are accurately predict that 5 types of membrane proteins. But in our proposed method predicting the 8 different types of membrane protein by machine learning approach. Our proposed method reveals that the Neural N/W MLP as the better classification algorithm for membrane protein type.

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| | Author name | Method | Accuracy |
|-----------------|---|---|----------------|
| Existing method | A. Garg, M. Bhasin, G. P. Raghava, 2005 | Supportve ctor machine | 73. 3% |
| | Yu-Dong 2008 | Nearest Neighbor Algori thm | 87. 02 % |
| | Lipeng2010 | Dipeptide compositi on method | 82. 0%. |
| | M. Hayat, A. Khan 2012 | neuralnet works | 86. 01% |
| | NijilRajN and T. Mahalekshmi , 2018 | Decision Tree classificati on algorithm | 69. 81% |
| Proposed method | | Logistic regression | 66. 769 |
| | | Random forest | 70. 154 |
| | | Neural network | 89. 176 |

Table 3 : comparison between existing and proposed method with corresponding accuracies

The proposed classification accuracy Results are shown in the Table 3. From Table 3 it is obvious that the Neural network method contributed the most, annotating 3249 proteins and achieved accuracy of 89. 176%, on datasets S1, random forest classification with Accuracy of 70. 154%, on the dataset S1 and logistic regression classification with accuracy 66. 769% on the dataset S1.

A. Figures and Table

| Algorithm | Precision | Recall | Accuracy |
|-----------------------|---------------|---------------|----------------|
| Logistic regression | 62. 5 | 62. 5 | 66. 769 |
| Random forest | 76. 8 | 66. 5 | 70. 154 |
| Neural N/W MLP | 84. 86 | 80. 30 | 89. 176 |

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A Two Stage Method for Classifying the Cyber Attacks in Amazon Web Service Cloud By Machine Learning Techniques

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ABSTRACT

In Modern digital world, security of our valuable information is always an essential issue. There may chances of deferent cyber attacks. Against these, IDS and many security techniques have been used. To obtain high detection rate and low false alarm rate the researchers also been used data mining techniques and other Machine Learning (ML) techniques. Machine learning is a type of artificial intelligence(AI) that provides computers with the ability to learn without being explicitly programmed. This paper proposed to classify the cyber attack in Amazon Web Service Cloud by using Multiclass SVM and Pattern Matching ML techniques. The system uses a two stage method for classification. The first stage classify the maximum number of attacks by using Multiclass SVM algorithm. The second stage is Pattern Matching to classify and prevent the remaining attacks. The existing ML techniques do not provide well processing of large data sets because of the network traffic. The Proposed method is an cloud based ML technique, which uses NSL KDD CUP99 dataset. The model is evaluated in terms of accuracy with the benchmark.

Keywords: Amazon web service , Machine learning, Multiclass support vector machine(MCSVM), Pattern Matching Algorithms.

I. INTRODUCTION

Security of valuable information is always a very essential issue for modern digital world. Intrusion Detection System (IDS) and many security techniques is widely used against cyber attacks. In recent years, the number of attacks on the computer networks and its components are getting increasing. To protect from these attacks various Intrusion detection techniques have been used. Intrusion Detection System (IDS) is a system which collects and analyzes the information from the network to identify various attacks made against the

components of a network. There are many types of Cyber Attacks like Brute Force, Probing, Denial of Service, Bot

Attack, Phishing, SQL Injection. Cyber attack detection system inspects all inside and outside network movement and identifies mistrustful patterns that may point to a network or system attack from someone attempting to break into or compromise a network. In cyber attack detection, we generally deal with a large amount of data collected from cyber agent to make a decision on the current situation of the network. Different types of attacks may have different effects

on the operations of a cyber network. As a result, the data that need to be collected from cyber agent vary from one kind of attacks to the other.

Cloud is a Secure Layer. Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application data and file storage.

Cloud Providers offer services that can be grouped into three categories.

- ✓ Software as a Service (SaaS): In this model, a complete application is offered to the customer, as a service on demand.
- ✓ Platform as a Service (PaaS): Here, a layer of software, or development environment is encapsulated offered as a service, upon which other higher levels of service can be built.
- ✓ Infrastructure as a Service (IaaS): IaaS provides basic storage and computing capabilities as standardized services over the network.

The customer would typically deploy his own software on the infrastructure. Some common examples of cloud are Amazon, GoGrid, 3 Tera, etc. Enterprises can choose to deploy applications on

Public, Private or Hybrid clouds. Cloud Integrators can play a vital part in determining the right cloud path for each organization. Public clouds are owned and operated by third parties; they deliver superior economies of scale to customers, as the infrastructure costs are spread among a mix of users, giving each individual client an attractive low-cost, "Pay-as-you-go" model. There are two variations to a private cloud.

- ✓ On-premise Private Cloud: On-premise private clouds, also known as internal clouds are hosted within ones own data center.
- ✓ Externally hosted Private Cloud: This type of private cloud is hosted externally with a cloud provider, where the provider facilitates an

exclusive cloud environment with full guarantee of privacy.

AWS [Amazon web service cloud] provides you with guidance and expertise through online resources, personnel, and partners. AWS provides you with advisories for current issues, plus you have the opportunity to work with AWS when you encounter security issues. You get access to hundreds of tools and features to help you to meet your security objectives. network security, configuration management, access control, and data encryption. Finally, AWS environments are continuously audited, with certifications from accreditation bodies across geographies and verticals. In the AWS environment, you can take advantage of automated tools for asset inventory and privileged access reporting.

- ✓ Keep Your Data Safe: The AWS infrastructure puts strong safeguards in place to help protect your privacy. All data is stored in highly secure AWS data centers.
- ✓ Meet Compliance Requirements: AWS manages dozens of compliance programs in its infrastructure.
- ✓ Save Money: Cut costs by using AWS data centers. Maintain the highest standard of security without having to manage your own facility
- ✓ Scale Quickly: Security scales with your AWS Cloud usage. No matter the size of your business, the AWS infrastructure is designed to keep your data safe.

II. RELATED WORKS

Network security starts with authorization, commonly with a username and a password. Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, modification in system, misuse, or denial of a

computer network and network-accessible resources. Traditional Intrusion detection system using data mining and machine learning techniques are work on information system they are not working on cloud environment [5]. Here give some literature about Intrusion detection system and using cloud for classification with machine learning algorithms. Intrusion Detection Systems (IDSs) are used to improve network security. An ID improves the security of the network by identifying, assessing, and reporting unauthorized network activities. IDS are categorized into two classes: network-based and host-based. Network based Intrusion Detection Systems analyses network packets retrieved from the network. Host-based Intrusion Detection System analyses system calls generated by individual hosts[10].The data flows through a network is very large and it is difficult to analyze and detect the attacks using traditional methods. Multiple choices of cloud computing models are performance and computational requirements. The popular statistical tools and environments like Octave, R and Python are now embedded in the cloud as well [1]. Anku Jaiswal [2] proposed the cloud based attack system. Authors add new valued feature to the cloud- based websites and at the same time introduces new threats for such services. DDoS attack is one such serious threat. Covariance matrix approach is used in

III. MATERIALS AND METHOD

Dataset

The Proposed system uses NSL KDD CUP99 dataset.In Earlier days the researcher focused on DARPA dataset for analyzing intrusion detection. It consists of seven weeks of training and also two weeks of testing raw tcpdump data. The main drawback is its packet loss. To solve these issues, a new data set as, NSL-KDD is proposed, which consists of selected records of the complete KDD data set. It have 5 million single connections for training and 2 million connections for dataset.testing.

It affects the Performance of the system.So we use improved version of KDD. It can mostly used data set for evaluation of anomaly detection methods. The advantages of this dataset is,no redundant copies in training set and hence no duplicate copy in testing,will not produce any biased result.And also it have better reduction rates.The number of selected records from each difficult level group is inversely proportional to the percentage of records in the original KDD data set.

Multiclass SVM

Support Vector Machine is a machine learning approach used for classification and regression analysis. It depends on supervised learning models and trained by learning algorithms. They analyze the large amount of data to identify patterns from them.An SVM generates parallel partitions by generating two parallel lines. For each category of data in a high-dimensional space and uses almost all attributes. It separates the space in a single pass to generate flat and linear partitions. Divide the 2 categories by a clear gap that should be as wide as possible.Do this partitioning by a plane called hyperplane.Support vector machines (SVM) were originally designed for binary classification. Several methods have been proposed where typically we construct a multi-class classifier by combining several binary classifiers.Here, we compare their performance with three methods based on binary classifications: “one-against-all,” “one-against-one,” and DAGSVM. Our experiments indicate that the “one-against-many” and DAG methods are more suitable for practical use than the other methods. Results also show that for large problems methods by considering all data at once in general need fewer support vectors. At a time,chances of many attack are there,this help to classify each attack at a time.This algorithm helps to train the classifier and classify the attack.At a time, one trains $K(K - 1)/2$ binary classifiers for a K-way multiclass problem; each receives the samples of a pair of classes from

the original training set, and must learn to distinguish these two classes. At prediction time, a voting scheme is applied: all $K(K - 1) / 2$ classifiers are applied. The figure the comparison of accuracy of SVM with other networks.

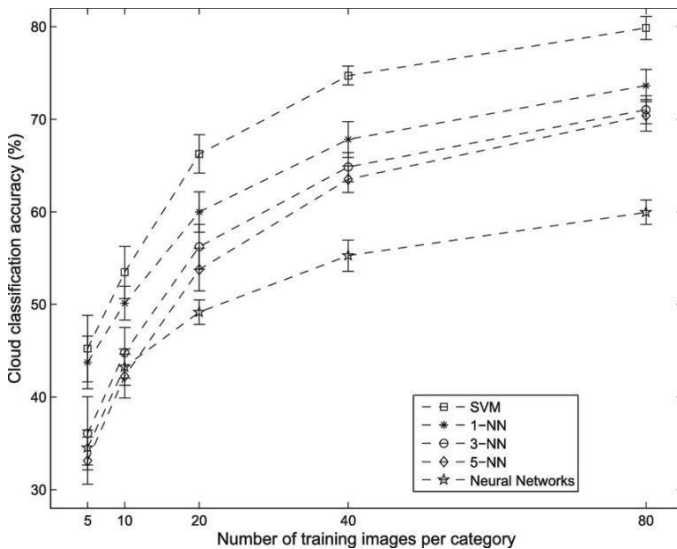


Fig 2. comparison chart

Pattern Matching Algorithm

Pattern Matching algorithm is used to develop password equivalent to a corresponding pattern. When a user login into a application or site thus we convert the hash code of password entered. It Identifies the pattern is matched with the login process and check whether the pattern is matched. Then equivalent password is generated,by depending the pattern matching process.It automatically generate the chances of dummy password,depends on the hash code of real password.When an attacker try to login with multiple password,the system automatically considered as a malicious activity. Then the system block the corresponding IP and

potentially suspend the account.For a period,the account is blocked even real user login.

IV. METHODOLOGY

The machine learning process, which includes;

- Input Stage
- Preprocessing Stage
- Apply Classification Algorithms

The machine learning process in this system contains different stages.Initially,input the dataset or the input data,then preprocess this data.Data preprocessing include data cleaning,data integrity,data redundancy.There is two stages of machine learning methods,which is MCSVM and Pattern Matching algorithm.First stage classify the maximum number of attacks by using MCSVM and the attack that cannot be detected by MCSVM is detected and prevented by using Pattern Matching algorithm.Here,apply Machine Learning Algorithm and an ensemble method for better accuracy in classifying and detecting the attack. The execution flow of the system,

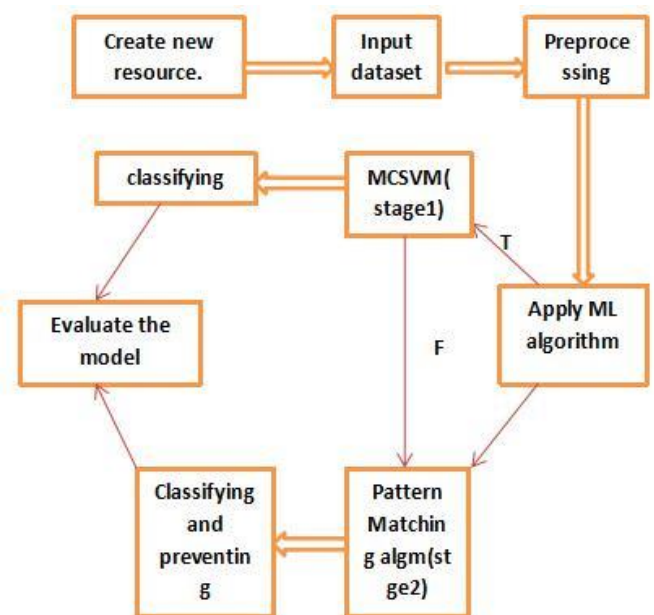


Figure 1: Execution flow

Algorithm

It implies execution of Implemented Work (Experiment Steps):The experimental steps that are represented and explained below:

Step 1: Create New Resource

Step 2: Import/Upload the dataset. Step 3: Pre-process the dataset

Step 4: Randomly split and partition the data into 70%

training and 30% testing, using the 'Split Data' module. Step 5: Identify categorical attributes and cast them into

categorical features using the 'Edit Metadata' module.

Step 6: Convert to Indicator Values module to convert columns.

Step 7: Select Columns in Dataset those are relevant

Step 8: Apply Ensemble Method

Step 9: Apply Machine Learning Algorithm to Train the model.

Step 10: Now Score and Evaluate the Model.

Step 11: The 'Evaluate model' also visualizes the results through confusion matrix.

MCSVM helps to classify the attack and Pattern matching is used to develop equivalent pattern to the corresponding pattern. The dummy passwords are created instead of real passwords .Any hackers tries to login an account ,it considered as a malicious activity.Create the new resource for upload the dataset and pre-process it.The dataset is split for training and testing the data.The categorical attributes are identified and cast them to convert into Indicator value.The converted coloumns are selected for applying machine learning technique and ensemble methods for better accuracy.Finally evaluate the model.

PERFORMANCE METRICS

The metrics used for the research work is described in this section.

Precision

Precision is the part of significant instances between the retrieved instances. The Eq.of precision is,

$$\text{Precision} = \text{TP}/(\text{TP}+\text{FP})$$

Recall

Recall is the small part of appropriate instances that have been retrieved over the total quantity of relevant instances.

The Eq.of recall is,

$$\text{Recall} = \text{TP}/(\text{TP} + \text{FN})$$

Accuracy

Accuracy is the most intuitive performance measure and it is simply a ratio of correctly predicted observation to the total observations. One may think that, if we have high accuracy then our model is best. Yes, accuracy is a great measure but only when you have symmetric datasets where values of false positive and false negatives are almost same.

Accuracy = $\text{TP}+\text{TN}/\text{TP}+\text{FP}+\text{FN}+\text{TN}$ The work proposes following types of attacks:

- Dos attack: DoS attack is a type of attack in which the hacker makes a computing or memory resources too busy or too full to serve legitimate networking requests and hence denying users access to a machine.
- Bot attack
- Phishing attack
- Probing attack: Scan networks to gather deeper information.

- U2R attack: Illegal access to gain super user privileges.
- R2L attack: It has been widely known to be launched by an attacker to gain unauthorized access to a victim machine in the entire network.
- Sql injection: It is the vulnerability that results when you give an attacker the ability to influence the Structured Query Language (SQL)queries that an application passes to a back-end database.

V. RESULT AND DISCUSSION

The experiment is evaluated on a simple multiclass SVM algorithm by accuracy parameter. Accuracy is well more for this proposed method when compared with existing method. The results obtained using the benchmark code by setting the support vector machine model. The results obtained using the benchmark code or traditional method got the accuracy of 0.50241 in experiment in detecting the cyber attack, while the proposed system uses two stages of algorithms which helps in detecting and preventing the cyber attack, results with 0.9633 accuracy.MCSVM helps in classifying and detecting the attack at an accuracy of

0.8409 (84%) and Pattern Matching algorithm gives better accuracy of 0.9633.By considering both the accuracy level,the system achieves 0.96332 of accuracy. The IP of unauthorised user is blocked by Pattern Matching Algorithm and is potentially suspended for a period. The system is implemented in cloud which gives more secure for our valuable information.

| | |
|---------------------------------------|----------|
| Overall accuracy (Proposed system) | 0.9633 |
| Accuracy(Existing system) | 0.50241 |
| Recall | 0.963326 |
| Precision | 0.9626 |

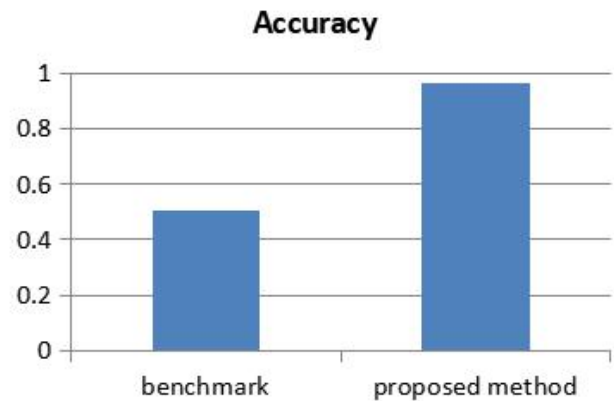


Figure 2:Comparison chart

VI. CONCLUSION AND FUTURE WORK

The paper proposes a new Cloud Based Machine Learning technique for improving the Cyber Attack classification. The model classify the attacks using “multiclass SVM” and Pattern Matching algorithm with high accuracy than benchmark. The benchmark with the accuracy of 0.50241 and our method have the accuracy of 0.9633.The model have low false alarm rate and high detection rate for many attack classification. In future work our system aims to design a model that can be optimized to handle attack classification in vaious platforms and domains. Also, the model can be modified for applying on Hadoop MapReduce platform for more accuracy.

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Prediction of Heart Disease and Breast Cancer Using Random Forest (RF) and Multi-Layer Perceptron Neural Network (MLP) Approaches

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ABSTRACT

Disease diagnosis is one of most important application of data mining to proving successful results. Breast Cancer Diagnosis are two medical applications which became a big challenge to the researchers. The use of machine learning and data mining techniques has changed the whole process of breast cancer Diagnosis. Most data mining methods which are commonly used in this domain are considered as classification category and applied prediction techniques assign patients to either a "benign" group that is non-cancerous or a "malignant" group that is cancerous. The project focuses on the prediction of various diseases like heart disease and breast cancer that can assist medical professionals in predicting disease status based on the clinical data of patients. In existing method reveals that 91% accuracy by using random forest approach in breast cancer and heart disease datasets. In our proposed method reveal that 94.4% and 85% accuracy in random forest, and multi-layer perceptron approach reveals that 95.8% and 86.7% respectively in breast cancer and heart disease datasets. It seems to be that our proposed methods are better than the existing method.

Keywords : Random forest, Multi-layer perceptron, Machine Learning

I. INTRODUCTION

Heart disease also called as coronary artery disease is a condition that affects the heart. Heart disease is a leading cause of death worldwide. Physicians generally make decisions by evaluating current test results of the patients. Previous decisions taken by other patients with the same conditions are also examined. So diagnosing heart disease requires experience and highly skilled physicians. Heart disease will become a leading cause of death by 2020. Heart disease diagnosis is an important yet complicated task. Today many hospitals collect patient data to manage health care of patients. This information is in different format like numbers, charts, text and images. But this database contains

rich information but poorly used for clinical decision making.

The main cause of breast cancer is when a single cell or group of cells escapes from the usual controls, that regulate cellular growth and begins to multiply and spread. This activity may result in a mass, tumor or neoplasm. Many masses are benign that means the abnormal growth is mainly restricted to a circumscribed, single and expanding mass of cells. Medical data mining has great potential for exploring predictions in this research work. The predictions are made using the classification model that is built from the classification algorithms when the heart disease dataset is used for training. This

final model can be used for prediction of any types of heart diseases and breast cancer.

II. RELATED WORKS

Smaranda Belciug [2] proposed a two stage model containing several different neural networks : multi-layer neural perceptron(MLP), radial basis function(RBF)and Probabilistic Neural Networks (PNN), and the effectiveness of this system on a real breast cancer database, to support the medical decision process The classification results were consistent with some of the highest results obtained by using sophisticated and expensive imaging medical techniques and finally get 85% accuracy.

Gouda I. Salama et.al [6] proposed a comparison among the different classifiers decision tree (J48), Multi-Layer Perception (MLP), Naive Bayes (NB), Sequential Minimal Optimization (SMO), and Instance Based for K-Nearest neighbor (IBK) on three different databases of breast cancer (Wisconsin Breast Cancer (WBC), Wisconsin Diagnosis Breast Cancer (WDBC) and Wisconsin Prognosis Breast Cancer (WPBC)) by using classification accuracy 75% and confusion matrix based on 10-fold cross validation method

Sanjay Kumar Sen proposed[3] "Predicting and Diagnosing of Heart Disease Using Machine Learning" In this paper, they carried out an experiment to find the predictive performance of different classifiers. select four popular classifiers considering their qualitative performance for the experiment. We also choose one dataset from heart available at UCI machine learning repository. Naïve base classifier is the best in performance. Finally get an accuracy of 77%.

Mai shouman et.al [4] proposed a decision tree for diagnosing heart disease patients. Different types of decision trees are used for classification. The research involves data discretization, decision tree

selection and reduced error pruning. Their method outperforms bagging and j48 decision tree. Their approach achieved 79.1% accuracy.

P.K.Anooj [2] developed a clinical decision support system to predict heart disease using fuzzy weighted approach. The method consists of two phases. First phase consists of generation of weighted fuzzy rules, and in second phase fuzzy rule based decision support system is developed. Author used attribute selection and attribute weight method to generate fuzzy weighted rules. Experiments were carried out on UCI repository and obtained accuracy of 57.85%

Robert Detrano et.al [3] proposed probability algorithm for the diagnosis of coronary artery disease. The probabilities that resulted from the application of the Cleveland algorithm were compared with Bayesian algorithm. Their method obtained an accuracy of 77% .

Jabbar et.al [7] proposed a decision tree for early diagnosis of heart disease. Alternating decision tree is a new type of classification, which is a generalization of decision tree, voted decision trees and voted decision stumps. Principal component analysis is used as a feature selection measure and used to select best features .Heart disease data consists of 96 patient's records with 10 features. Their proposed approach achieved an accuracy of 91.66%.

My chau Tu et.al [5] proposed diagnosis of heart disease through bagging approach. Proposed bagging algorithm is used to identify warning signs of heart disease. They made a comparison with decision tree. Their approach claimed an accuracy of 81.4%.

Resul das et.al[1] proposed method creates a new model by combining posterior probabilities from multiple predecessor models. They implemented the method with SAS base software on Cleveland heart disease data set and obtained 89.01% accuracy

Table 1 : comparison of related work

| Author | Algorithm | Accuracy | Year |
|------------------|---|----------------------------|------|
| Smaranda Belciug | Multi layer perceptron | 85% | 2015 |
| Sanjay Kumar sen | 1. Naive base 2. Decision tree 3. SVM | 83.49% 77.55% 84.15% | 2017 |
| Gouda I salama | MLP | 75% | 2013 |

III. METHODS AND METHODOLOGY

A. DATA SETS

The Stat Log dataset from UCI machine learning repository is utilized for making heart disease and breast cancer prediction in this research work. Two sets of data's are used for heart diseases and breast cancer.

S1 - Heart diseases

S2 - Breast cancer

1. Heart diseases (S1)

This database contains 76 attributes, but all published experiments refer to using a subset of 14 of them. In particular, the Cleveland database is the only one that has been used by ML researchers to this date. The "goal" field

the hidden patterns in the data sets of the medical domain. These patterns can be utilized for clinical diagnosis. However, the available raw medical data are widely distributed, heterogeneous in nature, and voluminous. These data need to be collected in an organized form. This collected data can be then integrated to form a hospital information system. Data mining technology provides a user oriented approach to novel and hidden patterns in the data. The term Heart disease encompasses the diverse diseases that affect the heart. Heart disease was the major cause of casualties in the different countries including India. Heart disease is a term covering any disorder of the heart. Unlike cardiovascular disease, which describes problems with the blood vessels and circulatory system as well as the heart, heart disease refers to issues and deformities in the heart itself. Heart disease kills one person every 34 seconds in the United States.

In this research work, the supervised machine learning concept is utilized for making the predictions. A comparative analysis of the three data mining classification algorithms namely Decision Tree and Logistic Regression are used to make predictions. The Stat Log dataset from UCI machine learning repository is utilized for making heart disease refers to the presence of heart disease in the patient. It is integer valued from 0 (no presence) to 4. Experiments with the Cleveland database have concentrated on simply attempting to distinguish presence (values 1,2,3,4) from absence (value 0). One file has been "processed", that one containing the Cleveland database. All four unprocessed files also exist in this directory.

1.1 Attribute information

Only 14 attributes used:

1. age
2. sex
3. Cp = chest pain type

4. trestbps - resting blood pressure
5. Chol- serum cholesterol in mg/dl
6. Fbs- (fasting blood sugar > 120 mg/dl) (1 = true; 0 = false)
7. restecg - resting electrocardiographic results
8. thalach - maximum heart rate achieved
9. Exang- exercise induced angina (1 = yes; 0 = no)
10. Oldpeak- ST depression induced by exercise relative to rest
11. Slope- the slope of the peak exercise ST segment
12. Ca- number of major vessels (0-3) colored by fluoroscopy
13. Thal- : 3 = normal; 6 = fixed defect; 7 = reversible defect
14. num- diagnosis of heart disease (angiographic disease status)

2. Breast Cancer (S2)

The data set consist of 15 types of attributes

1. Number of instances: 569
2. Number of attributes: 32 (ID, diagnosis, 30 real-valued input features)
3. Attribute information
 - 1) ID number
 - 2) Diagnosis (M = malignant, B = benign)

Ten real-valued features are computed for each cell nucleus:

- a) radius (mean of distances from center to points on the peri)
- b) texture (standard deviation of gray-scale values)
- c) perimeter d) area
- e) smoothness (local variation in radius lengths)
- f) compactness ($\text{perimeter}^2 / \text{area} - 1.0$)
- g) concavity (severity of concave portions of the contour)
- h) concave points (number of concave portions of the contour)
- i) symmetry
- j) fractal dimension ("coastline approximation" - 1)

Several of the papers listed above contain detailed descriptions of how these features are computed. The mean, standard error, and "worst" or largest (mean of the three largest values) of these features were computed for each

image, resulting in 30 features. For instance, field 3 is Mean

Radius, field 13 is Radius SE, and field 23 is Worst Radius. All feature values are recoded with four significant digits.

4. Missing attribute values: none

5. Class distribution: 357 benign, 212 malignant

B. ALGORITHMS USED

1. Classification using random forest

Random forest algorithm is one of the most effective ensemble classification approach. The RF algorithm has been used in prediction and probability estimation. RF consists of many decision trees. Each decision tree gives a vote that indicate the decision about class of the object. Random forest item was first proposed by Tin kam HO of bell labs in 1995.

RF method combines bagging and random selection of features. There are three important tuning parameters in random forest

- 1) No. of trees (n tree)
- 2) Minimum node size
- 3) No. of features employed in splitting each node
- 4) No. of features employed in splitting each node for each tree (m try).

2. Classification using multi layer perceptron

The most common neural network model is the multi layer perceptron (MLP). This type of neural network is known as a supervised network because it requires a desired output in order to learn. The goal of this type of network is to create a model that correctly maps the input to the output using

historical data so that the model can then be used to produce the output when the desired output is unknown. The MLP and many other neural networks learn using an algorithm called back propagation. With back propagation, the input data is repeatedly presented to the neural network. With each presentation the output of the neural network is compared to the desired output and an error is computed. This error is then fed back (back propagated) to the neural network and used to adjust the weights such that the error decreases with each iteration and the neural model gets closer and closer to producing the desired output. This process is known as training.

The supervised learning problem of the MLP can be solved with the back-propagation algorithm. The algorithm consists of two steps. In the forward pass, the predicted outputs are calculated corresponding to the given inputs. In the backward pass, partial derivatives of the cost function with respect to the different parameters are propagated back through the network. A typical multilayer perceptron (MLP) network consists of a set of source nodes forming the input layer, one or more hidden layers of computation nodes, and an output layer of nodes.

C. PERFORMANCE METRICS

1. Precision

Precision Recall graphs of heart diseases and breast cancer are shown below. In Precision is the part of significant instances between the retrieved instances. The Eq. of precision is given in Eq.(2)

$$\text{Precision} = \text{TP}/(\text{TP}+\text{FP}) \quad (2)$$

2. Recall

Recall is the small part of appropriate instances that have been retrieved over the total quantity of relevant instances. The Eq. of recall is given in Eq.(3).

$$\text{Recall} = \text{TP}/(\text{TP} + \text{FN}) \quad (3)$$

3.ROC area

Roc Curves are commonly used to show in a graphical way the connection/ trade off involving clinical sensitivity and specificity for every potential cut off for a test or an arrangement of tests.

4. Accuracy

Accuracy is the most intuitive performance measure and it is simply a ratio of correctly predicted observation to the total observations. One may think that, if we have high accuracy then our model is best. Yes, accuracy is a great measure but only when you have symmetric datasets where values of false positive and false negatives are almost same

$$\text{Accuracy} = \text{TP}+\text{TN}/\text{TP}+\text{FP}+\text{FN}+\text{TN}$$

D. METHODOLOGY

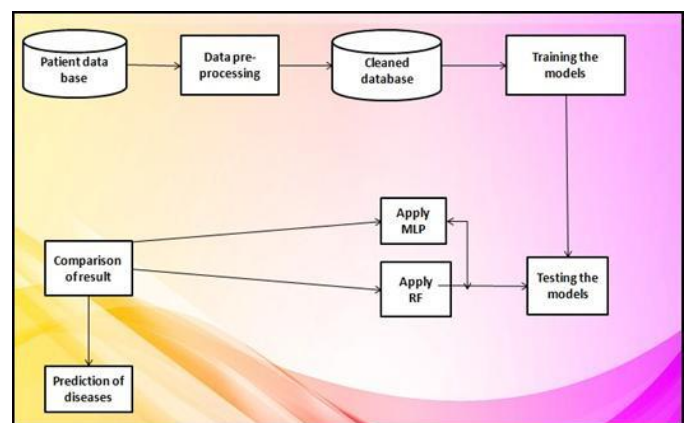


Fig 2: Methodology

The heart disease and breast cancer prediction can be performed by following the procedure which is similar to Fig.1 which specifies the research methodology for building a

classification model required for the prediction of the heart diseases and breast cancer in patients.

The following algorithm refers the actual description of the methodology of the system recall values are shown in table 1&3. Fig 1 shows the entire methodology of the system research work

- 1) Initialise the processes
- 2) Collect all the heart diseases and breast cancer database from patients(UCI machine learning repository)
- 3) The collected data undergoing pre-processing
- 4) Clean the two database by removing all the missing values and attributes.
- 5) Train the model
- 6) Test the model by using the algorithm"s such as logistic regression and decision tree.
- 7) Comparising both the training result.
- 8) Finally predicting the diseases.

The model forms a fundamental procedure for carrying out the heart diseases and breast cancer prediction using any machine learning techniques. Firstly collect all the datasets of heart diseases and breast cancer, and train all the datasets by using classification algorithms such as decision tree and logistic regression. In the third step the training datasets undergoing testing also using decision tree and logistic regression, Finally applying these two algorithms to the sufficient datasets, prediction of result is obtained and accuracy of these algorithms are compared.

IV. RESULTS AND DISCUSSION

Our Method describes the results of both proposed and existing system. Random forest and multilayer preceptor neural network algorithms are used to predict the breast cancer and heart diseases in existing system. By comparing the two systems, proposed system depicts accurate results

than existing system.

| Data sets | Algorithm | Precision | Recall | Accuracy |
|-----------|-----------|-----------|--------|----------|
| S1 | RF | 0.862 | 0.844 | 85% |
| S1 | MLP | 0.875 | 0.862 | 86.7% |
| S2 | RF | 0.940 | 0.940 | 94.4% |
| S2 | MLP | 0.959 | 0.951 | 95.8% |

Table 2 : proposed and existing system accuracy

The analysis and identification of the best classification algorithm in this research work is done and the results are provided here. Accuracy of proposed and existing precision and recall values are shown in table 3&5. Fig 2 shows the entire methodology of the system.

1. FIGURES AND TABLES

1. S1

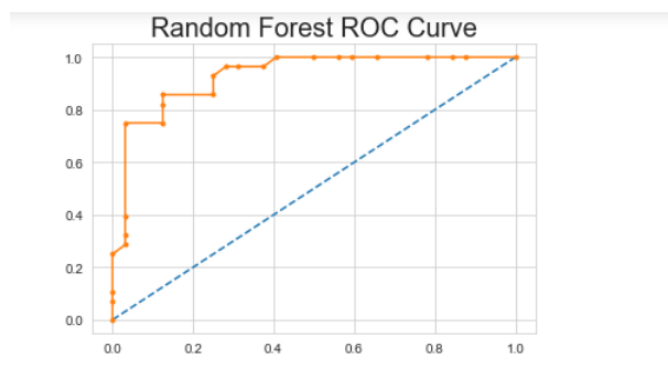


Fig 3: ROC of random forest

A receiver operating characteristic (ROC), or simply ROC curve, is a graphical plot which illustrates the performance of a binary classifier system as its discrimination threshold is varied. It is created by

plotting the fraction of true positives out of the positives (TPR = true positive rate) vs. the fraction of false positives out of the negatives (FPR = false positive rate), at various threshold settings. TPR is also known as sensitivity, and FPR is one minus the specificity or true negative rate.”

Fig 3 shows the receiver operating characteristics of random forest x axis denotes the false positive rate ,y axis denotes the true positive rate

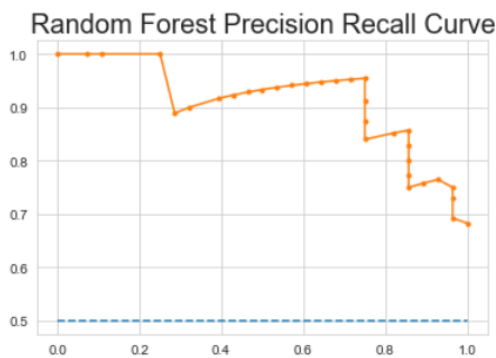


Fig 4: precision recall curve of Random forest

Precision (P) is defined as the number of true positives (Tp) over the number of true positives plus the number of false positives (Fp). Fig 4 shows the precision recall curve of Random forest classifier.

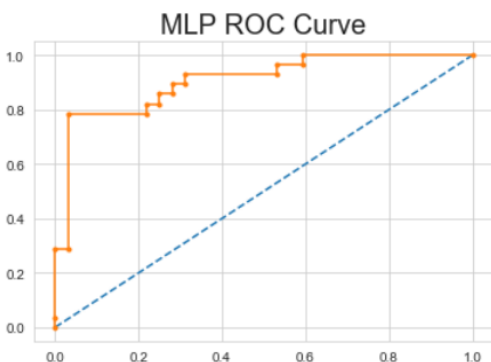


Fig 5: ROC of Multi layer perceptron

Fig 5 plot the receiver operating characteristics multi layer perceptron.

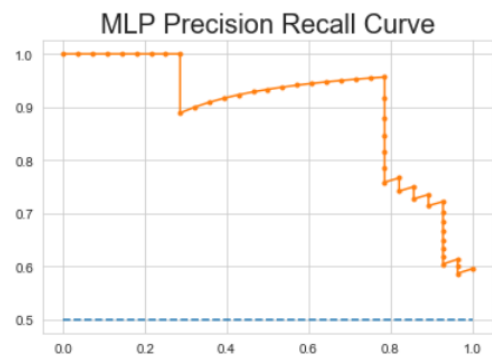


Fig 6: precision recall curve of Multi layer perceptron

Fig 5 shows precision recall curve of heart diseases using multi layer perceptron

1.2 S2

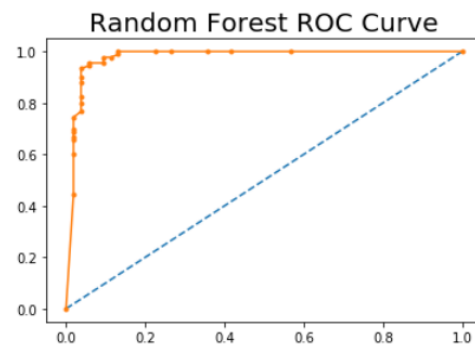


Fig 7 : Roc of random forest

Fig 7 depicts the region operating characteristics of random forest in breast cancer prediction

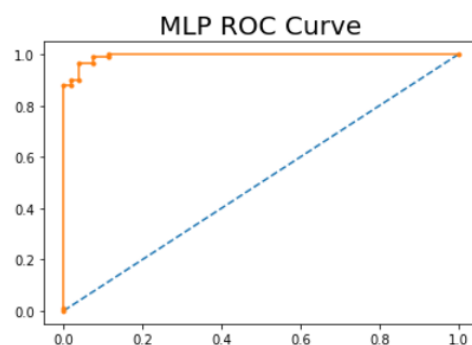


Fig 8 : precision recall curve of random forest

This graph shows the precision recall curve of breast cancer by using random forest classifier. A precision recall curve is a plot of the precision (y-axis) and the recall (x-axis) for different thresholds

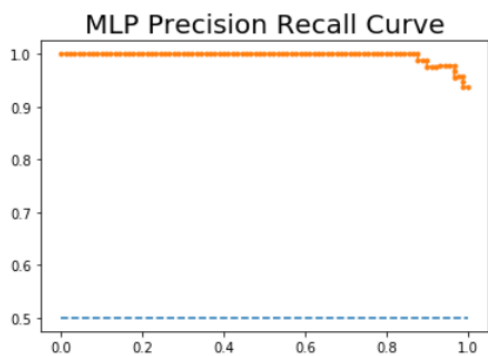


Fig 9 : ROC of Multi layer preceptor

It plots the region operating characteristics of multi layer preceptor classifier used in breast cancer prediction. It is created by plotting the fraction of true positives out of the positives (TPR = true positive rate) vs. the fraction of false positives out of the negatives (FPR = false positive rate)

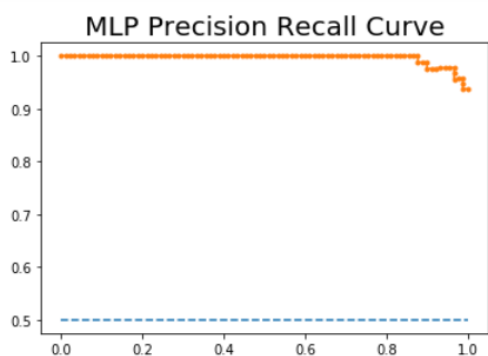


Fig 10 : precision recall of Multi layer preceptor

The graph shows the precision recall curve of multi layer preceptor in breast cancer prediction. If you change a binary classifier parameter, it turns out the precision and recall will change. If you graph these points (with precision on the y-axis and recall on the x-axis), you get a precision-recall curve (or equivalently, a precision-recall graph)

1.3 Existing System v/s Proposed System

By analyzing both the system's propose system gives better result than existing system. Table 3 shows the accuracy's of both system's by applying machine learning techniques and also comparison of both the system.

Table 3 : Existing v/s proposed system

| Data sets | Algorithm | Proposed system | Existing system |
|-----------|-----------------------|-----------------|-----------------|
| S1 | Multi layer preceptor | 86.7% | 76% |
| S1 | Random forest | 85% | Nil |
| S2 | Multi layer preceptor | 95.8% | 70.72% |
| S2 | Random forest | 94.4% | Nil |

V. CONCLUSION AND FUTURE WORK

Random forest and Multi layer preceptor Neural Networks are powerful data mining techniques that can be used to classify cancerous tumours and Heart disease. Random forest algorithm creates user-friendly rules that indicates important attributes and requires less computation compared to other algorithms such as Neural Networks. On the other hand. Various data mining techniques are available in medical diagnosis, where the objective of these techniques is to assign patients to either a „healthy“ group that does not have a certain disease. Data mining have proved the ability to reduce the number of error rate in decisions. Random forest and MLP are the most popular and effective data mining methods. DT provides a pathway to find “rules” that could be evaluated for separating the input samples into one of several groups without having to express the functional relationship directly. The proposed work can be further enhanced and expanded for the automation of Heart disease prediction. In our feature work we plan to reduce no. of attributes and to determine the attribute which contribute towards the diagnosis of disease.

VI. ACKNOWLEDGMENT

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Facial Emotion Recognition Analysis using Deep Convolution Neural Network

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ABSTRACT

Human emotions are the unpredictable fluctuations of the visual model which plays a vital role in non verbal communication. Emotions are the mental states of feelings that occur spontaneously and when combined with facial muscles form an expression. The basic emotions are happy, sad, angry, fear, disgust, and surprise. The paper presents a method for emotion recognition. The proposed methodology involves 2 stages, the first stage is image preprocessing which includes face detection using viola-jones algorithm. In the next stage detection of emotions is done by using convolution neural network(CNN) which shows the intensity changes from low level to high level of emotions on a face. when compared with existing system, our proposed system has better accuracy in recognition, also works as real time system with much less complexity than the existing system, In this system FEREC-2013 dataset is used as standard image dataset. The assessment of proposed system gives a quick good result and provides an encouragement for the future researchers in emotion recognition system.

Keywords : Face recognition, facial expressions, emotions, non-verbal communications, face detection convolution neural network (CNN), Deep learning, image preprocessing

I. INTRODUCTION

Human emotions are multidimensional visual model which is very complex to predict Human faces and its emotion is an important application of biometric identification expressions are clue about the mind state of a person which enables us to make communication on the basis of their mood. These fluctuations of expressions play a vital role in non verbal communication.

Developing a emotion recognition model is an exciting field for the researchers due to its wide real world applications like criminal identification, security systems, surveillance systems, human behaviour prediction and medical rehabilitation. The seven primary categories of human emotions which are common among all human across different culture are ;sadness, happiness, angry, fear, surprise, disgust and neutral. The success ingredients of the emotional happenings are the availability of large set of training data. We use [FERC-

2013] dataset. There exist some other methods for facial expressions identification which includes identical bilateral amygdala impairment recognition, image pre processing methods and descriptors based local binary patterns, the active shape models arrangement of a multi resolution method, combining multiple kernel method. Convolution Neural Network(CNN) has taken the computer community top with its quick result with great accuracy.

The main focus of our proposed system is to find the standardized expression in face. Human face and hence the expressions all are the blood line. The emotion which has high paternity resulting emotion likewise more experimental outputs, training and supervision of several emotional phases(frame by frame) also stimulates is to enlarge a real time facial emotion recognition system to achieve such compound classification of image , a wide and robust training is necessary.

Hence in this recommend approach abstraction of deep learning using convolution neural network is applied to train and test. the implementation of a neural network mainly stuck on to issues like training data, initial random weight, number of hidden layers, activation function and network structure of system.

In CNN the image is directly inputed as fill-in of handcrafted midway feature, convolutional neural network are used to involuntary learn a stacking of features which can be applied future.

II. RELATED WORK

During past few years,many papers have emerge About facial emotion recognition systems.

Rajesh Kumar G.A proposed an approach for facial emotion recognition using viola jones algorithm trained with FER-2013 database without Deep convolution neural network.The trained algorithm are compared using accuracy and computing time and finally 84%accuracy is developed.

Yong-Soo Seol proposed facial emotion recognition using a knowledge based ANN during the year 2008 which uses Hybrid approach combining knowledge based ANN gives an accuracy of 81.5% Sebe and Nicu predicts emotion recognition based on joint visual and audio cues using pattern recognition and resulted with accuracy 78% on 2006.

Shan,Caifeng,Shaogang Gong and peter W propoed a method for facial expression recognition based on local binary patterns.This paper gives overview of support vector machine classification and local binary pattern features .The paper provide accuracy of 80.04% and was published in 2009

Table 1:Comparison of related work

| AUTHOR | ALGORITHMS | ACCURACY | YEAR |
|-----------------------|---|----------|------|
| Rajesh Kumar G.A | Viola Jones algorithm | 84% | 2017 |
| Yong-soo seol | Hybrid approach combining knowledge based ANN | 81.5% | 2008 |
| Sebe,Nicu | Pattern Recognition | 78% | 2006 |
| Shan,Caifeng,Shaogang | Support Vector Machine | 80.04% | 2009 |

III.METHODS AND MATERIAL

A. System architecture

The complete architecture of proposed system has been represented below.

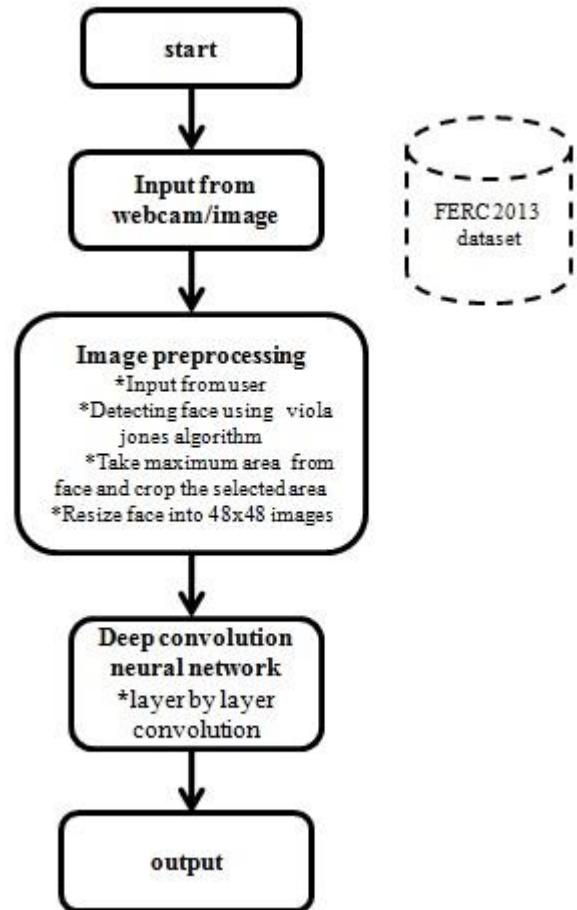


Figure 1: system workflow

The main algorithm involves two parts, testing and training. The first step is to train the network to classify the emotions of given face. The initial step of algorithm is to check whether the trained data are present or not. If not, then firstly we need to train the system and then perform testing for emotion classification.

Algorithm1: Image pre-processing

The feature computation is done by using integral images, an algorithm for generations of sum of pixel intensities is a specified rectangle in an image. it is used for compute the Haar-like features. Calculation of the sum of a rectangular area inside original image is extremely efficient requiring only four additions for any arbitrary rectangle size. Adaboost method used for feature selection of picture, by construction of strong classifiers as linear combination of weak classifiers and also to boost performances .The viola jones is a face

detector algorithm which can able to state whether a picture containing human face or not also viola jones is the most robust face detection algorithm. haar like features which are advanced features and used for object classification .from the haar feature applied to the face, the sum of black pixel and sum of white pixel calculated and they are subtracted to get a single value. If the value is more in that region, then its represents a part of the face and is identified as eyes, nose ,neck ,etc.

The integral image concept is used for reducing the limit taken on computational task. The Haar function produces almost 160000 features per image, out of which all are not related for face localizing , so the Adaboost also used to removing irrelevant features. Adaboost determines relevant and irrelevant features. The set of relevant features is named as weak classifier and also constructs a strong classifier as a linear combination of weak classifier

B. Training data

Before training we pre-processed the FER2013 database images. To pre-process, the Viola-Jones algorithm is used on the dataset. 25304 samples are used for pre-processing and validation, among them we got 11758 valid samples for training. Many samples are failed in face detection task due to the draw back of viola-jones algorithm, some issues are shown below;

Recently, the CNN have confirmed inspiring performance in computer vision task for the use of CNN, excessive hardware performance is very important due to the computation difficulty. To achieve better accuracy, utilize CNN architecture according to our classification requirement parameters.

To achieve this, nine main layers are employed while designing CNN architecture.

Algorithm 2 : Deep convolutional neural network

In neural networks, Convolutional neural network (ConvNets or CNNs) is one of the main categories to do images recognition, images classifications. Objects detections, recognition faces etc., are some of the areas where CNNs are widely used. CNN image classifications takes an input image, process it and classify it under certain categories (Eg., Dog, Cat, Tiger, Lion). Computers sees an input image as array of pixels and it depends on the image resolution. Based on the image resolution, it will see $h \times w \times d$ (h = Height, w = Width, d = Dimension). Technically, deep learning CNN models to train and test, each input image will pass it through a series of convolution layers with filters (Kernels), Pooling, fully connected layers (FC) and apply Softmax function to classify an object with probabilistic values between 0 and 1. The below figure

is a complete flow of CNN to process an input image and classifies the objects based on values.

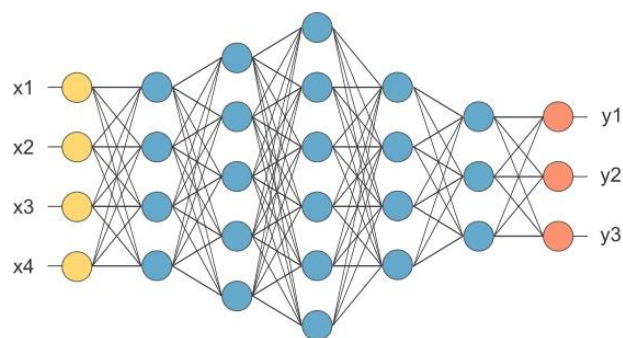


Figure 2:convolution neural network

Pooling layers section would reduce the number of parameters when the images are too large.The fully connected layer flattened our matrix into vector and feed it into a fully connected layer like neural network In the above diagram, feature map matrix will be converted as vector (x1, x2, x3, ...). With the fully connected layers, we combined these features together to create a model. Finally, we have an activation function such as softmax or sigmoid to classify the outputs as cat, dog, car, truck etc.

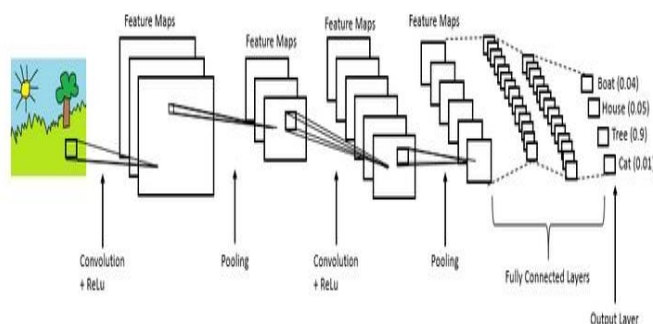


Figure 3 : Complete CNN architecture

Phase1: initialize all the weights and filters with random values

Phase2: Input the training images to the network and goes over between propagation phases and detects output probabilities for all class.

For example: the output probabilities for the first input image are [0,0,0,0.3,0.3,0.2,0.5].

The weights are randomly assign for the first training image ,so output probabilities are also random.

Phase3: Calculate the entire error at output layer by using the equation,

$$\text{Total error} = [(target\ probability - output\ probability)^2]$$

Phase4: Using the back propagation algorithm, calculate the gradients of error for all weights in the network. To

minimize the output error use that gradient decent to update all weights, filter values and parameter values. The weights are updated is proportion to reducing the total error when the same image is inputed again, the probabilities might be [0,0,0,0.1,0.7,0.1,0.1] which is closer to the target letter[0,0,0,0,1,0,0] this implies that by altering its weights and filters the network has learnt to categorize this particular image correctly. so that error of output is reduced. factors such as network architecture ,number of filters used and filter sizes, etc have been fixed before first step and don't change during training process. only the values of filter matrix and connection weight updated during the training process

Layer by layer explanation of CNN

Layer 0: input layer

[48x48x1] the pixel value of the input image. Width 48,height 48 and with one colour channel

Layer1: convolutional layer

Compute output of all neurons associated to local regions in the input layer, each calculating a dot product among their weights and a small region they are related in .

Layer2: Rectifier linear unit layer

Most commonly deployed activation function for the output of the CNN neurons. This is done usually as $\max(0,x)$ zero. This leaves the volume size same ([44x44x64]),and group normalization is done

Layer 3: Max pool layer:

This will perform a down sampling operation along the spatial dimensions (width, height), resulting in volume such as [22x22x64]. Max-Pooling with 3x3 filter and stride 2, gives size [22x22x64], i.e. $(44-3)/2+1=22$ is output size, depth is same as before, i.e. 64 because pooling is done independently on each layer.

Layer 4:

Convolution with 64 filters, size 5x5, stride 1, now size is [18x18x64],i.e. $(22-5)/1+1=18$; is size of output 64 depths because of 64 filters.

Layer 5:

Max Poling Layer with 64 filters, size 5x5, stride 1,now size is [18x18x64],i.e. $(18+2*1-3)+1=18$ original size is restored..

Layer 6:

Convolution with 128 filters of size 4x4 and stride 1and we used padding 0,therefore now size is given as [15x15x128], i.e. $(18-4)/1+1=15$, is size of output 64 and depths of 128 filters.

Layer 7:

Fully connected with 3072 neurons. In this layer, each of the $15 \times 15 \times 128 = 28800$ pixels is fed into each of the 3072 neurons and weights determined by back-propagation.

Layer 8:

Fully-connected layer calculates the class scores, resultant volume of size [1x1x7], where each of the seven numbers correspond to a class score, such as among the seven classes of emotions. As with normal neural networks and as the name implies, each neuron in this layer will be linked to all the numbers in the previous volume and soft max layer with 3072 neurons.

Layer 9:

Soft max layer with 7 neurons to predict 7 classes output

IV. RESULTS AND DISCUSSION

The detected facial emotions and their percentage have been shown below

Successfully detected emotions



Figure 2 :Row wise (1)is Angry face,(2)is disgusted face,(3)is surprised face,(4)is happy face,(5)is sad face,(6)is fearful face

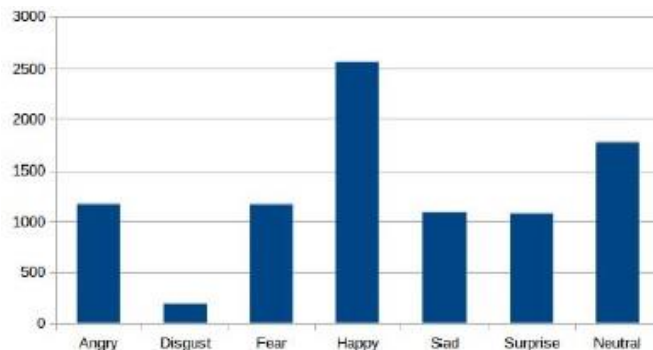


Figure 3.successfully detected percentage of facial emotions

| | Algorithm | Accuracy |
|-----------------|---|----------|
| Proposed System | Viola Jones algorithm | 84% |
| | Hybrid approach combining knowledge based ANN | 81.5% |
| | Pattern Recognition | 78% |
| | Support Vector Machine | 80.04% |
| Existing System | Viola jones,Deep Convolution Neural Network | 90% |

Table 2. Existing v/s Proposed system

This section describes the results of both proposed and existing systems. when comparing the proposed system with the existing system the rate of accuracy spots much increase to better extend with the less consumption of time.This system also performs as a real time emotion detector and also so in return provides better precision.

V. CONCLUSION

Feature extraction from the emotions are quite tricky phase in the process of recognition .the percentage of emotions differs from stages to stages.In our proposed system we use 9 layers of convolution neural network for classification and training of 7 types of standard emotions.FERC-2013 database provides the data. Viola jones algorithm is implemented for face detection. By using convolution neural network our proposed system projects an accuracy of around 90+% than the many existing systems.

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