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I N D E X

A Simple Reinforcement Learning Mechanism for Resource Allocation in LTE-A Networks with Markov Decision Process and Q-Learning

Einar C. Santos
Federal University of Goias
Av. Dr. Lamartine Pinto de Avelar, 1120
Catalao - GO - Brazil
einar@ufg.br

Abstract—It is proposed a reinforcement learning mechanism in LTE-A networks to choose and limit the number of resources allocated for each traffic class. The proposal implements a Markov Decision Process (MDP) solved by the Q-Learning algorithm. The results exhibit good performance for Video application.

I. INTRODUCTION

Wireless networks are remarkably known due to its unpredictable physical conditions. Its channel suffers intense variation caused by numerous aspects: signal pathloss; fading; et cetera. Additionally, is critical nowadays the offering of Quality of Service (QoS) support for applications since the resource demand is actually becoming far more stringent.

The machine learning is emerging as an attractive choice among the variety of techniques suited to optimize resource allocation for recent wireless networks. Reinforcement learning is particularly unique to help the achievement of an optimal performance by the system orienting it from a resultant output after a performed action.

In this context, it is proposed a reinforcement learning mechanism for Long Term Evolution Advanced (LTE-A) networks designed to determine and restrict the number of Resource Blocks (RBs) available for each traffic class. The proposal models the problem of choosing the number of RBs as a Markov Decision Process (MDP) and is solved running the Q-Learning algorithm.

The mechanism is attractive because of its simplicity. The Q-Learning algorithm is simple, straightforward and efficient to solve finite state MDPs. Concerning complexity, it is computationally cheap and easy to implement [1].

In fact, the MDP is a popular tool for modeling agent-environment interaction [2]. Several works in the literature implement MDP in wireless networks for various applications, raising the interest in the concept and its comprehensiveness. In a MDP every decision corresponds to an action taken towards a represented state of the process, helping the system to evaluate its condition.

The proposed mechanism directs its effort in analyzing the system state subject to the QoS parameters of applications as throughput, delay, and packet loss rate, instead of evaluating physical information of the wireless system.

The mechanism is evaluated at the system level through simulation and compared it with some scheduling algorithms utilized in LTE-A networks.

This paper is arranged as follows: in Section II there is some discuss some of the related works and their resemblances with the proposal; the fundamentals of MDPs are presented in Section III; the description of Q-Learning algorithm is shown in Section IV; in Section V the proposed mechanism is exposed; simulation parameters are shown in Section VI while results are presented in Section VII with some discussion; finally, in Section VIII it brings some conclusion about the whole work.

II. RELATED WORK

In [3], [4] the authors propose a reinforcement learning method aimed to improve QoS provisioning for adaptive multimedia applications in cellular wireless networks defining policies for Call Admission Control (CAC) and Bandwidth Adaptation (BA). They adopted Semi-Markov Decision Pro-cess (SMDP) – which treats continuous-time problems as discrete-time [1] – to model and solve the problem. It is important to take into account the CAC procedure in order to control the system resources, but this also can be accomplished at the resource allocation level.

The authors in [5] devised a distributive reinforcement learn-ing mechanism for joint resource allocation and power control on femtocell networks. Each femtocell seeks to maximize its capacity while maintaining QoS. The Q-Learning algorithm is adopted, and the information about each independent learning procedure is shared among the femtocells to speed up the overall learning process. However, they not consider traffic differentiation and some action to avoid the services may harm each other.

The Scheduling-Admission Control (SAC) for a generic wireless system is appropriately investigated in [6]. Authors also propose two online learning algorithms in order to opti-mize the SAC procedure with low complexity and convergence faster than the Q-Learning algorithm. They approached the

problem with a model-based solution, however, ignoring QoS issues. In contrast, it is important to implement the model-free approach because it can cover any technology in the field, independently.

III. Markov Decision Process

The MDP is a control process model with stochastic, memoryless and discrete time properties. It is formally described as a tuple $hS; A; P; Ri$ where S is the state set, A is the action set, P is a set comprising the transition probabilities among states, and R is a reward set containing a r value for each action a taken [7]–[9]. Each p value, with $p \in P$, measures the probability of an action $a \in A$ be performed at a decision epoch. An action a changes the process state from a s to a new s^0 value and represents a decision-making.

Figure 1 depicts a MDP according to the given definition. For simplicity, transition probabilities P and the reward values R are not displayed.
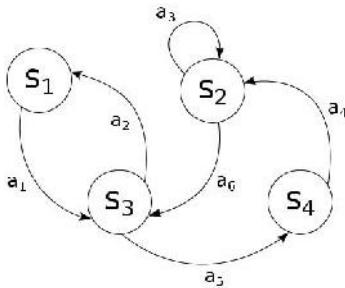
Fig. 1. Markov Decision Process with finite states

The decision epoch is a discrete time unit adopted for decision-making. If the number of decision epochs is finite, the MDP formulation is referred as finite-horizon. The horizon also can be infinite or undefined, when a MDP stops if a final state is reached.

A decision taken at an epoch k is a function d_k that maps the rule $d_k(s) : S \to A$ which also corresponds to an action ($d_k(s) = a_k$) [9]. A policy is defined as the collection of decision rules, given as: $= fd_0; d_1; \ldots ; d_{Z-1}g$. The variable Z is the total number of decision epochs.

An optimal policy is the one that maximizes the measure of long-run expected rewards. It can be obtained from the optimal value of total reward function $u_k(s)$, given as follows [10]:

$$u_k^*(s_k) = \max_{d_k(s) \in A} \left[r_k\left(s_k; d_k(s)\right) + \sum_{s^0 \in S} p\left(s_k; d_k(s); s^0\right) u_{k+1}^*(s^0) \right] \quad (1)$$

The value is the discounting factor used to weight immediate rewards.

In order to store values for every state-action pair the MDP should consider the Q(s; a) function, usually called action-value function or simply Q-function [1]:

$$Q(s; a) = r(s; a) + \max_{a^0} Q(s^0; a^0) \quad (2)$$

IV. Q-Learning Algorithm

Q-Learning [11], [12] is a straightforward and model-free reinforcement learning algorithm adopted to define the values of transition probabilities and to find an optimal policy for a MDP. It also converges to an optimal policy given a finite action-state MDP [13], [14].

The Q-Learning algorithm iteratively updates the Q-table for each (s; a) pair visited. The formula for updating the values at each step t, with the learning rate , is:

$$Q(s_t; a_t) = Q(s_t; a_t) + \left[r_{t+1} + \max_a Q(s^{t+1}; a) - Q(s_t; a_t) \right] \quad (3)$$

The algorithm is given as follows [8]:

Algorithm 1 Q-Learning Algorithm

1: Initialize Q_0 and
2: for $t = 0$ to $T - 1$ do
3:    Select state s_t
4:    Select action a_t
5:    Send a_t and s_t information to the environment
6:    Get reward value r_{t+1}
7:    Calculate $Q(s_t; a_t)$ according to (3)
8: end for

In a deterministic model, to ensure that all state-action pair is going to be visited, the algorithm must randomly select the $(s_t; a_t)$ pair and run the for loop during a sufficient total number of steps T previously chosen. However, considering the case of a stochastic model (with unpredictable reward values), a nice option is to implement online the -greedy method, which selects the (s; a) pair randomly with proba-bility, balancing the system and finding a way to circumvent the exploitation versus exploration dilemma [1]. The second option is also suitable when the system will run during an infinite (or unknown) number of steps.

V. Mechanism Description

The proposed mechanism is just referred as MDP with Q-Learning (MDP-QL).

For QoS guarantee the system should look at the traffic QoS Class Identifier (QCI) priority values [15] and also to classification from these values. The number of resources is selected from the current state of MDP at each Transmission Time Interval (TTI). Meaning that every MDP state denotes a portion of available RBs and one TTI is equivalent to one decision epoch.

If the limit of available resources is reached for a traffic class, the system must advance to the next class observing QCI priority values until all resources or traffic have been exhausted in allocation procedure. RB metrics for every User Equipment (UE) are calculated as usual but restricting the usable load regularly for each class according to the selected proportion.

Firstly, the state-action table Q(s; a) should be created and initialized for the MDP so that the system can perform the selection from state-action values. At the early steps the chosen values will not serve nicely for the needed quantity, but as long as the algorithm runs the state-action table, it will converge to more appropriate values.

A. Model Definition

The MDP adopted in this proposal has a finite number of states and is infinite-horizon once the mechanism should operate indefinitely. However, for simulation purposes the horizon can be assumed as finite, so the number of decision epochs is constrained by the simulation time.

Of course, the value must be carefully chosen. A large number of states consequently makes the running impracticable. This is also referred as the curse of dimensionality [10].

Each state $s_{k;i}$ contains the value that delimitates the maximum number of RBs for a treated traffic class. The total number of RBs N in the system, the state index i and the total number of states settled should be considered:

$$s_{k;i} = \frac{N}{i} \qquad i = \{1; 2; : : : ;\ g; \quad N > \quad : \quad (4)$$

In order to obtain reward at some decision epoch, the mechanism has to monitor some indicators. In this proposal the goal is to improve the system as follows:

$$r_k = \log \underset{R_k}{} \qquad (5)$$

The reward value r_k takes into account the average throughput R_k, the average delay $_k$ and the average packet loss rate $_k$ of all running applications in the system at the decision epoch k. Thus, it is established as overall goal the system throughput maximization while reducing its delay and packet loss rate. The log () function is used to compensate the scale.

The mechanism scheme is depicted in Figure 2.
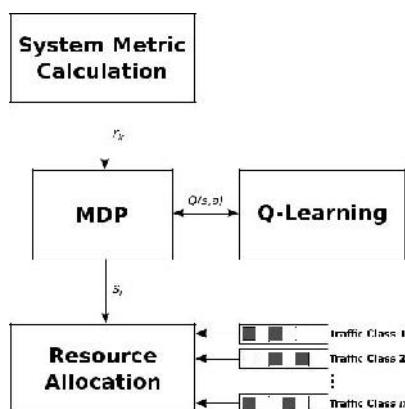
Fig. 2. Scheme of the proposed mechanism

VI. Simulation Parameters

This Section is dedicated to present the values of selected parameters contemplated in simulation definition to perform mechanism evaluation at the system level. In this particular case solely the downlink channel was analyzed. However, the mechanism can be studied from the uplink channel perspective as well. The parameters values are presented in Table I.

Every UE is randomly positioned in the cell before simula-tion starting and has one running instance of each application: real-time Video, VoIP, and Web.

TABLE I
SIMULATION PARAMETERS

Parameter	Value / Description
Modulation	OFDMA
Frequency	2 GHz
Bandwidth	20 MHz
Cell Radius	1 Km Single Cell
Frame Duration	1 ms
Duplexing Mode	FDD
Power - eNB	46 dBm
Power - UE	23 dBm
Pathloss Model	Urban (P_L = 128:1 + 37:6 log d)
Simulation Time	60 s
Traffic Time	54 s
Number of UE	10 – 120
UE Speed	30 Km/h
Application	Video, VoIP and Web
Video	H.264 440 Kbps
VoIP	G.711 64 Kbps
Web	Pareto
Video Delay Limit	150 ms
VoIP Delay Limit	100 ms
Value	20
Value	0.2
Value	0.75
Value	0.1

It was chosen the following scheduling algorithms for comparison: Proportional Fair (PF); Round Robin (RR) and Frame Level Scheduling (FLS) [16].

VII. Results

The following results present the behavior of evaluated algorithms including the proposed mechanism. It was analyzed throughput, delay, jitter, fairness index and packet loss.

Figure 3 presents the throughput performance obtained for the Video application.

The average throughput for Video application running MDP-QL maintains the needed rate for application up to 50 UEs. The MDP-QL also keeps the average throughput higher than the other algorithms when the system has more than 40 UEs. To ensure that this performance is not occurring to the detriment of the VoIP traffic the Figure 4 shows the average throughput for VoIP application is still preserved with MDP-QL as well as in the other algorithms up to 70 UEs.

When analyzing the throughput sharing among UEs is possible to see in Figure 5 that the fairness index for MDP-QL is above 0.9 up to 60 UEs in the system and slightly above the other algorithms from 60 UEs, too. It means that MDP-QL, in
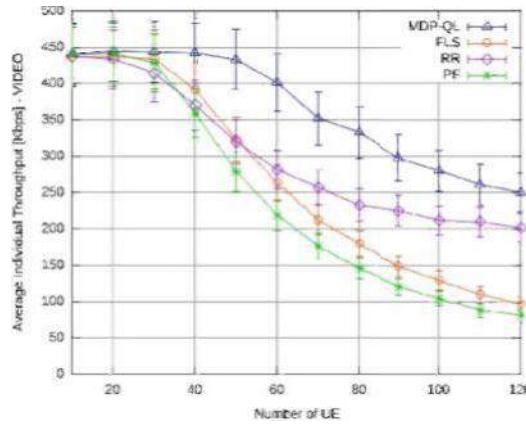
Fig. 3. Average throughput for Video application
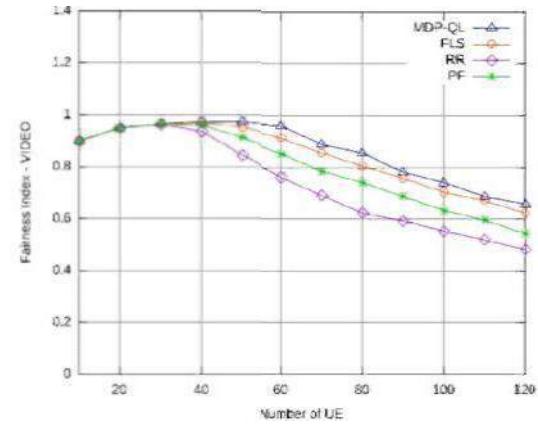
Fig. 5. Fairness index for Video application
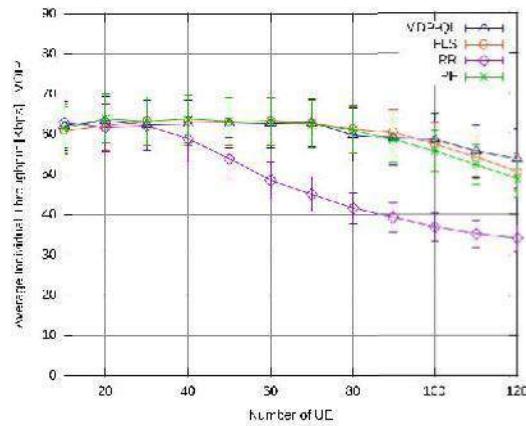
Fig. 4. Average throughput for VoIP application
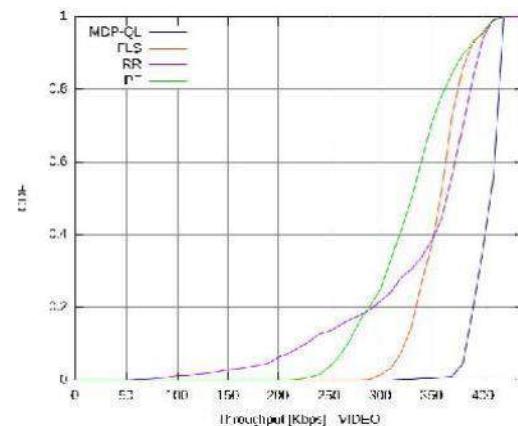
Fig. 6. CDF for Video application with 40 UEs

addition to maintaining a good throughput, still balances it in terms of sharing. Such statement is corroborated by results presented in Figure 6, showing the curves of Cumulative Distribution Function (CDF) for average throughput with 40 UEs in the system. The MDP-QL allocates just over 60% of UEs with throughput higher than 400 Kbps.

Figure 7 exhibit CDF for average throughput with 100 UEs present. The graphic in Figure 7 is useful to demonstrate the behavior of MDP-QL and its evolution from 40 UEs, which still conserves good distributed throughput in such condition.

Figure 8 presents the values for average delay. The average delay for MDP-QL is not so efficient from 50 UEs in the system. Although, all algorithms maintain delay under the limit for the considered Video application.

A significant result is displayed in Figure 9. Keeping low packet loss rate is essential to guarantee QoS for real-time traffic. So, Figure 9 shows that MDP-QL can still preserve some QoS level for Video up to 50 UEs. From 50 UEs, the mechanism still maintains the packet loss rate below the achieved by other algorithms.

The average jitter is presented in Figure 10. The MDP-QL is quite stable regarding jitter, exhibiting values below all the
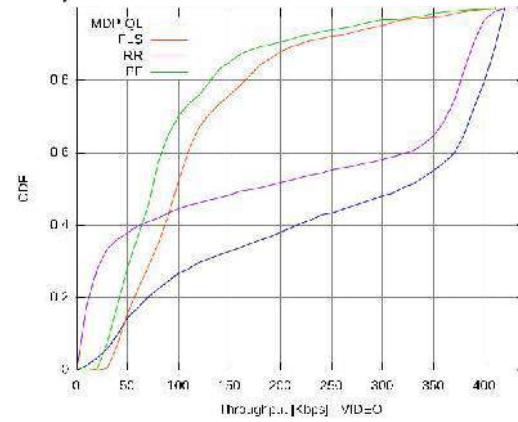
Fig. 7. CDF for Video application with 100 UEs

other algorithms for almost all evaluated scenarios.

Finally, the Figure 11 presents the results of average throughput obtained for the Web application. It is noticeable the FLS does not meet the application demand even with low traffic load, which indicates that all the effort of the algorithm
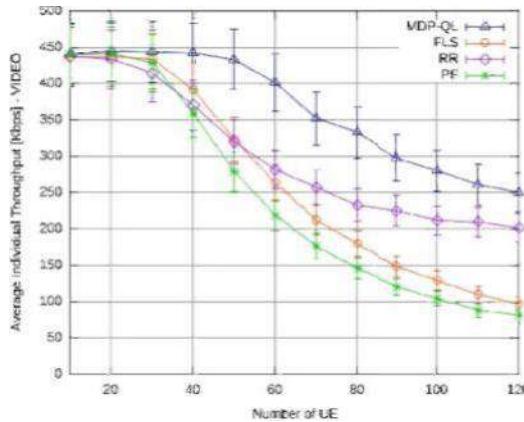
Fig. 8. Average delay for Video application
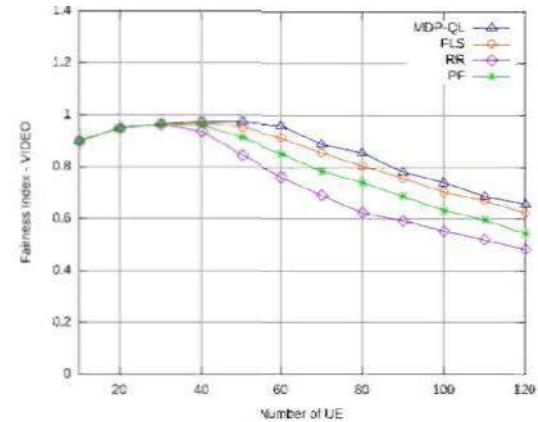
Fig. 11. Average throughput for Web application
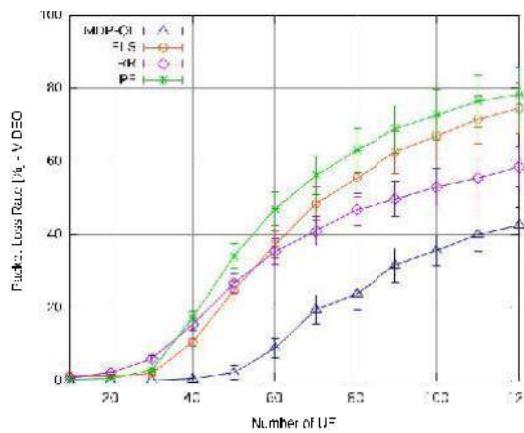
Fig. 9. Packet loss rate for Video application

is directed to support multimedia application in detriment of the best effort traffic. On the other hand, the MDP-QL can support a proper service level, given the adaptive behavior of the reinforcement learning technique.
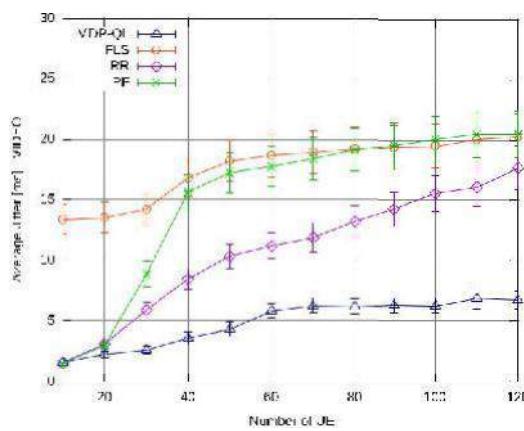
Fig. 10. Average jitter for Video application

Indeed, the proposed mechanism is capable of improving the operation of real-time Video application. It achieves good QoS levels for Video but preserving performance for VoIP and maintaining basic service level for Web application. As the mechanism is based on a technique that aims to optimize some given task, it is expected at least that the proposal can ameliorate some aspects of resource allocation in LTE-A networks.

VIII. CONCLUSION

Hitherto was presented a simple reinforcement learning mechanism employed into resource allocation in wireless net-works, more specifically the LTE-A technology. The proposed mechanism applies MDP to model the problem of selecting and restricting the number of resources available for each traffic class. In addition, it implements Q-Learning in order to solve and enhance the proposed model.

Simulation results show good performance measured for Video application that was achieved by the mechanism, which evidences its importance in offering QoS. The mechanism also reaches favorable levels of packet loss rate, average throughput, and average jitter, standing out the proposal in comparison with the analyzed algorithms.

It would be interesting take advantage of the proposed mechanism integrating it with some technique employed for traffic classification. It is expected therefore some performance improvement with a better traffic classification procedure.

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A Novel Approach for Digital Image Fusion

Harshal Vashi* and G.T. Haldankar†

Abstract—Image fusion is the process in which the most relevant information from more then one image is abstracted and reproduced in the fused image. In other words image fusion is the simplest method of pixel averaging, suitable for more than one source of image. The fusion is often required for those images which are acquired from different instrumental modalities or capturing techniques of the scenes or objects. We propose a novel approach for image fusion based on multi-focus decomposition of source images using Wavelets, sub groups of wavelets and Cosine transforms. The fusion performance for the proposed approach has been extensively tested on standard multi-focus clock images, fused using MATLAB. Also, the fusion performance of the proposed approach has been compared with the various recently published methods. And the analysis concludes that the proposed method has increased the quality of the fused image significantly, both visually and quantitatively, by preserving all the relevant information.

Index Terms—Image fusion, Fusion, Wavelets and Cosine transformations.

I. INTRODUCTION

ONE of the fundamental steps involved in improving the quality of a pixels for generating a clear image is image fusion. Image fusion is nothing but a sub-field of image processing in which two or more images of a scene are combined into a single composite image that is more precise and informative. It is a reliable approach for the image interpretation of the scenes and digital processing.The process of fusion is used to improve the quality of information from a set of images by integrating the multiple images of the scenes into a composite image so that the fused image is more suitable for visualization and detection.Fusion also reduces uncertainty and fully utilize complementary and redundant information from the original images.

The main objective [1] of any image fusion is to retain all the important visual information found in the input images without introducing any artifacts. For example, consider a camera as a visual source of input image. By default, camera has a limited focus-depth of optical lenses which often makes it difficult to get an image that contains all the relevant in-focus objects. In order to obtain an image with 'in-focus' objects, the photographer has to repeatedly change the focus settings of a camera to obtain a sequence of images which contains all the relevant in-focus objects. Instead of repeatedly setting the focus of a camera, one can fused them all to form a single all-in-focus image containing a fully focused [2] objects. In general, image fusion tries to solve the problem of combining various informations from the several images (sensors) taken for the same scene in order to obtained a fused image, which contains the best relevant information from the several images [3].

Multi-focused image data often presents complementary information about the region surveyed, scene or object, so image fusion provides an effective method to enable comparison, interpretation, and analysis of such data. Let us consider an application of a medical imaging [4] . In this application MRI and CT scan of a brain is considered as a source of image fusion. CT scan illustrates the bone structure like skull and MRI illustrates the brain tissue anatomy. When these medical source images of different modalities are fused then the resultant fused image will contain the merits of both the source images [5]. There are dedicated machines used by the few medical institutes which can produce the combined image with some hardware approach. But it is not possible for most of the medical personnel to have it as they are very expensive. Whereas the proposed method in this work can perform fusion on a simple computer and hence provides an inexpensive way to do so.

II. PROPOSED FUSION TECHNIQUE

The techniques proposed in most of the reported work are associated with some of the problems like excess brightness, noise susceptibility, loss of information, etc. Our objective is to formulate a good fusion method that can efficiently overcome the problems of the past research work. The proposed fusion processes are suitable for all the types of the source images. Also the proposed fusion methods will be able to solve the problem of excess brightness by ameliorating the filters of the past work. The resultant fused image will be less susceptible to noise, because in our proposed fusion approach weight of a coefficient is decided by current as well as other finer decomposition levels. In addition to solution of noise and brightness problem our fusion methods will be able to solve the problem of information loss by considering both the (High and Low) frequency components for fusion. As a variety of fusion methods are available in the literature, in order to find out which transform performs the best, we have experimented with two widely used transforms viz.discrete cosine transform (DCT) [7] and discrete wavelet transform (DWT) [9].

A. Proposed image fusion technique using DCT (Discrete Cosine Transform)

The basic idea behind this technique is to segregated the brightness and contrast information of the image on the digital image processing [10] scale of 0 to 255 using the zigzag scanning, where zero is the highest contrast level and two fifty five is the highest brightness level. Then using the energy compaction property of an DCT [11] select the percentage of fusion, and finally reconstruct the fused image by performing the inverse DCT.

Consider the two source images I_1 and I_2 out of which the blur region of one image appears to be the sharp region in the other image and vice versa for the same picture

information.The Fig. 1 shows the algorithm for image fusion using DCT.
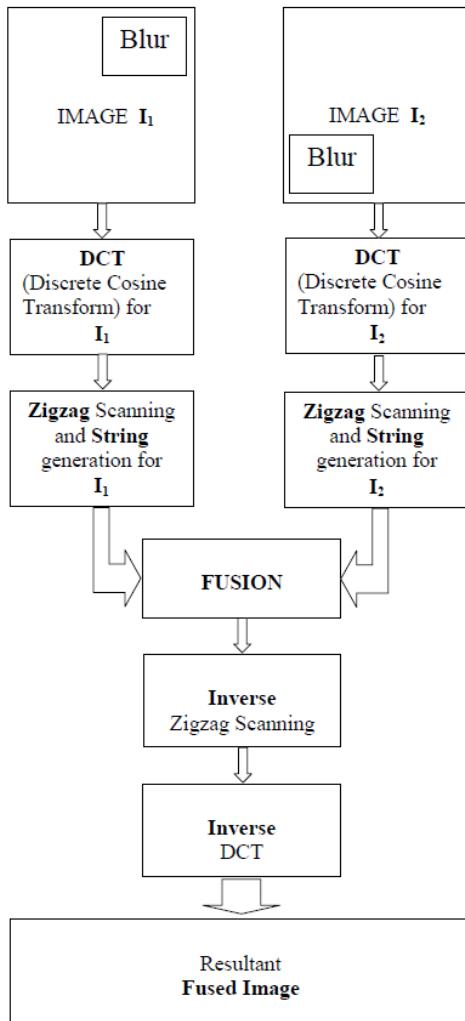
Fig. 1: DCT based Image fusion.

Let Image I_1 be the image in which top part is appeared to be blur and in Image I_2 the Bottom part is appeared to be blur.

- Step 1 :- Obtain DCT of the source image [7].

- Step 2 :- Compute an energy 'E' for each of the source image by applying the energy compaction property of an DCT. Use the equation (1) and find out the source image which has the maximum energy.

$$E = \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} [I(x,y)]^2 \qquad (1)$$

Where,
x,y are the locations of a pixel of an image 'I' whose energy is to be calculated and 'N' is the size of an image.

- Step 3 :- After the energy compaction, perform zigzag scanning of both the source images select the fusion percentage suitable with the energy compaction of the

images in percentages and do the fusion.

- Step 4 :- Once the fusion is done proceed with inverse zigzag scanning of the fused sequence and finally take the inverse DCT i.e IDCT. Finally after applying the inverse DCT to the inverse zigzag scanned sequence the resultant image is the sharp image containing the most relevant information of the source images. In other words we obtained an image without any blur region.

*B. Proposed image fusion technique using **DWT** (Discrete Wavelet Transform)*

The fundamental concept behind this technique is to decompose each source image and template-wise integrate all these decompositions, and finally reconstruct the fused image by performing an inverse wavelet transform. This transformation not only reduces the computation up to certain level. But also it can select few scales and positions based on the powers of the two-Dyadic Scales and positions due to which this analysis becomes very efficient and accurate.

Consider the two source images I_1 and I_2 out of which the blur region of one image appears to be the sharp region in the other image and vice versa for the same picture information.The Fig. 2 shows the algorithm for image fusion using DWT.
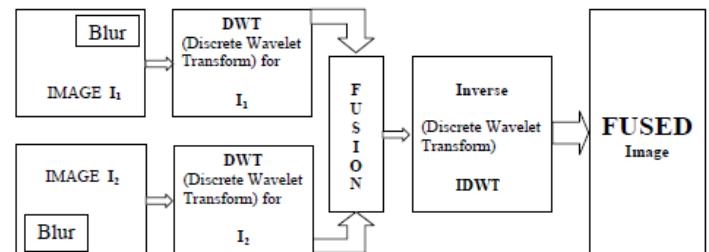
Fig. 2: DWT based Image fusion.

Since the two-dyadic scaling and wavelet functions are separable, so each convolution can break down [6] into the convolutions of rows and columns as described using the following steps:-
Let the size of original Image f(x,y) be NxN

- Step 1 :- Obtain DWT of the source image using the wavelet decompositions recursively [8]. Perform this step as in our case perform is upto the level 3 decomposition of the source images.

- Step 2 :- Perform the template-wise fusion of each decomposed source images. Like fuse only the low frequency components of I_1 and I_2. Then fuse only the high frequency components of I_1 and I_2. Similarly fuse the diagonal elements, etc.

- Step 3 :- Once the fusion is done proceed with the inverse DWT i.e IDWT [12]. Finally after applying the inverse DWT to the fused image the resultant image is the sharp image containing the most relevant information of the

source images. In other words we obtained an image without any blur region.

III. PERFORMANCE EVALUATION

Performance evaluation [13] of fusion is a challenging task in most of the applications. Researchers have used various parameters to make an exhaustive study of the fusion techniques. We have considered several parameters [14] of the literature to evaluate performance of our fusion techniques listed below:-

- Standard Deviation (SD)
  It reflects the spread in data between the gray valued pixel and the mean of all the pixels in that image. In mathematical terms (SD) is the square root of the variance that reflects the spread in data. It can calculated using the equation (2)

$$SD = \sqrt{\frac{\sum_{i=1}^{M}\sum_{j=1}^{N}\{f(i,j) - \bar{F}\}}{MN}} \qquad (2)$$

Where,

f(i,j) $\rightarrow$ Pixel Gray value in the coordinates (i,j) of an image.
$\bar{F} \longrightarrow$ Mean value of the pixels in an image.
M and N $\rightarrow$ Numbers of rows and columns in an image.

- Entropy (E)
  It calculates the information content of an image. It is basically an index to evaluate the information quantity contained in an image. It can calculated using the equation (3)

$$E = -\sum_{i=0}^{L-1} P_i log(P_i) \qquad (3)$$

Where,

E $\rightarrow$ Entropy of an fused image
L $\rightarrow$ Number of Gray level in an histogram of an image
$P_i \rightarrow$ It is the appearance of an probability of pixel i

- Average Gradient (AG)
  It is the measure of sharpness and clarity degree.It basically reflects the tiny details and texture contrast variation of an image.It can calculated using the equation (4)

$$AG = \frac{1}{MN}\sqrt{\frac{\Delta I_x^2 + \Delta I_y^2}{2}} \qquad (4)$$

$Where,$
$\Delta I_x = \sum_{i=1}^{M}\sum_{j=1}^{N} g([i+1],j) - g(i,j)$

$\Delta I_y = \sum_{i=1}^{M}\sum_{j=1}^{N} g(i,[j+1]) - g(i,j)$

M and N$\rightarrow$ Numbers of rows and columns in an image.

- Mutual Information (MI) or Fusion Factor
  It is a measure of correlative information content in fused image with respect to source images. Let us consider images A and B to be the source images and image F

to be an fused image. Then MI is calculated using the equation (5)

$$MI = \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}\sum_{k=0}^{L-1} P_{ABF}(i,j,k)log\frac{P_{ABF}(i,j,k)}{P_{AB}(i,j)P_F(k)} \qquad (5)$$

Where,

$P_{AB}(i,j) \longrightarrow$ Normalized joint histogram between image A and B.
$P_{ABF}(i,j,k) \rightarrow$ Normalized joint histogram between image A B and F.

IV. ANALYSIS AND RESULTS

Consider the two input images I_1 and I_2. Let say the top part of the image I_1 is appeared to be Blur whereas in image I_2 the bottom part is appeared to be blur as shown in the Fig. 3(a) and 3(b) respectively. These clock images are the source images for the fusion methods.

(a) Image I_1 (b) Image I_2

Fig. 3: Source images

Now applying the proposed fusion techniques like DCT and DWT to the clock source of an image using MATLAB.

(a) DCT   (b) DWT

Fig. 4: Proposed fusion results

After the completion of fusion process it is observed that the resultant single output image is being completely eliminated by blur part and only the sharp image is left. This is nothing

but the fused image using DCT and DWT as shown in the Fig. 4(a) and 4(b) respectively.

TABLE I: Performance comparison of a simulated '**Clock**' image pairs

Sr no.	Fusion Methods	Evaluation Parameters			
		SD	E	AG	MI
1	WA [3]	50.7633	7.3147	4.6976	7.5244
2	LPT [3]	53.5705	7.4325	6.7406	7.4333
3	GPT [3]	49.6848	7.4279	5.4164	7.5169
4	Proposed DCT	53.3135	7.3578	8.0630	7.3205
5	Proposed DWT	56.7645	7.6243	7.0832	7.0541

Experiments and analysis were done on the proposed fusion methods like DCT (Discrete Cosine Transform) and DWT (Discrete Wavelet Transform) using the various evaluation parameters like SD(Standard Deviation), H(Entropy), AG(Average Gradient) and MI(Mutual Information) were computed respectively. Table 1 is basically a representation for the evaluation parameters of existing and proposed fusion methods. This table illustrates the performance comparison of various fusion methods for the source input images of an multi-focus clock.

It can be illustrated from the Fig. 4(a) and 4(b) that the fused image by DCT and DWT have more details and clarity than the source image. This is because DCT and DWT method uses the techniques of pixel wise fusion and multi-subband fusions due to which more details from the original two multi-focus source images can be extracted.

V. Applications

There are various applications of image fusion such as

- Remote sensing Remote sensing is a typical application for image fusion, Modern spectral scanners gather up to several hundred of spectral bands which can be either visualized and processed individually or which can be fused into a single image, depending on the image analysis task.

- Aircraft navigation To allow helicopter pilots navigate under poor visibility conditions (such as fog or heavy rain) helicopters are equipped with several imaging sensors, which can be viewed by the pilot in a helmet mounted display. A typical sensor [15] suite includes both a LLTV (Low Light Television) sensor and a thermal imaging FLIR (Forward Looking Infrared) sensor. A possible improvement is combining both imaging sources into a single fused image which contains the most relevant image information of both the imaging devices.

Also there are various other applications of image fusion in the field of Medical diagnosis, Merging out of focus images, Robotics vision, Medicines, Surveillance, etc.

VI. Conclusion

In this paper, DCT and DWT fusion method were introduced for multi-focus images to overcome the shortcomings of traditional image fusion methods. The proposed fusion methods based on pixel significance with multiple sub-band decomposition shows significant improvement over the existing methods. Results shows that the fusions using DCT and DWT can retain more details of original multi-focus images and are more easy to realize. Also, the proposed fusion methods gives consistently good fusion performance with superior overall visual quality. The novelty of this proposed fusion method is that it can enhance the quality of an image by preserving its edges along with its excellent sharpness. Further, it can be concluded that the proposed image fusion methods converts the blur or the poor quality region in the image into the sharp or the good quality region and as a result one can obtained a clear ,better quality and a sharp image without affecting the picture details of an image. In simple words image fusion improves the subjective quality of an image without affecting any information present in the image.

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Comparative Analysis of DWT & DCT Speech Features for Marathi Digit Recognition

Atul Narkhede

Faculty of Engineering,
Pacific Academy of Higher Education and Research
University, Udaipur, India.
atulnarkhede22@gmail.com

M. U. Nemade

Professor, Department of Electronics Engineering,
K. J. Somaiya Institute of Engineering & Information
Technology, Mumbai,
India.mnemade@somaiya.edu

Abstract — **In this paper, our work on Marathi digit speech recognition is proposed using comparative analysis of discrete wavelet transform (DWT) and discrete cosine transform (DCT) through soft computing technique. Marathi digit speech signals are obtained from twenty different speakers that include ten males and ten females. The words are selected from one to nine digits pronounced in Marathi language. Transform domain and soft computing approaches are mostly preferred for speech feature extraction and classification respectively. The main objective was to estimate the performance of the DWT and DCT in speech feature extraction process so as to achieve better speech representation, low computational complexity and better recognition rate. Linear predictive coding (LPC) coefficients were derived from DWT decomposed sub bands and artificial neural network (ANN) was used as classifier in the implementation of speech recognition system. An experimental result was obtained to measure the performance of DWT and DCT on the speech recognition rate. Thus experimental results clearly demonstrate that DWT with LPC coefficients achieves better recognition rate at lower feature length as compared to DCT for same dataset.**

Index Terms — **Discrete wavelet transform, Discrete cosine transform, Speech recognition system, Recognition rate.**

INTRODUCTION

Tremendous development in the digital technology especially in digital signal processors, memory chip, programmable devices and application specific integrated circuits (ASIC) has accelerated the development of speech processing system. Speech recognition systems finds applications in the area of voice recognition, voice activated commands for machine control and operations, communications systems, security systems, etc. One of the important issues associated with speech recognition system is computational complexity mainly at feature extraction and classification process [1] – [3]. However the speech recognition system may become complex performing recognition under noisy environment, large vocabulary and speaker independent. Therefore optimization of the process at feature extraction and / or classification process is required [4] – [6]. Also implementation of robust feature extraction process through transform domain approach in noisy environment is essential [7] – [10]. Mel-Frequency Cepstral Coefficients (MFCC) and linear predictive coding (LPC) are mostly employed in feature extraction process in automatic speech recognition system. Mainly the research in speech feature extraction has been discrete wavelet transform due to fixed resolution in the representation of time-frequency resolution in the short time Fourier transform (STFT).

Wavelet transform is found to be suitable for speech feature extraction process due to its variable time-frequency window. Any speech signal consists of high frequencies at the beginning for small duration followed by low frequencies for longer duration [11]. The speech signal is decomposed into four frequency sub-bands in dyadic fashion. It is useful to determine the coefficients or parameters of the speech signal. LPC coefficients are found to be suitable in speech recognition system for its simplicity and performance [12] – [14]. Therefore LPC coefficients are mostly calculated through auto regression model. Mel Frequency Cepstral Coefficients (MFCC) is a speech feature extraction technique that depends upon human hearing behavior that cannot recognize frequencies above 1KHz. MFCC uses the difference in frequencies that the human ear can distinguish. The speech signal is represented in mel scale that is obtained through filter banks that are linearly spaced below 1 KHz and logarithmically spaced above 1 KHz. FFT is used to convert time domain speech signal frame with N samples into frequency domain. The above calculated frequency spectrum is then mapped into mel scale through triangular filter bank. These filter banks are the set of band pass filters whose frequencies bandwidth are decided by mel frequency-time. For mel-scaling mapping is need to done among the given real frequency scales (Hz) and the perceived frequency scale (Mels). During the mapping, when a given frequency value is up to 1 KHz the Mel-frequency scaling is linear frequency spacing, but after 1 KHz the spacing is logarithmic. A discrete cosine transform (DCT) expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. Therefore DCT is used to convert the log Mel spectrum into time domain. The result of the conversion is called Mel Frequency Cepstrum Coefficients. Artificial Neural Network (ANN) is an effective pattern recognition mechanism which analyses the neurological data of human brain. During learning, the system characteristics of Neural Network changes time to time and are

classified by their ability of native and parallel calculation, simplicity and uniformity. Therefore probabilistic feed forward neural network was used as a classifier.

In this paper, our work on Marathi digit speech recognition is proposed using comparative analysis of discrete wavelet transform (DWT) and discrete cosine transform (DCT) through soft computing technique. Marathi digit speech signals are obtained from twenty different speakers that include ten males and ten females. The words are selected from one to nine digits pronounced in Marathi language. The main objective of the paper to perform comparative analysis of transform domain approach based on DWT and DCT. To determine suitability for speech feature extraction process through recognition rate, length of feature vector and computational complexity.

The paper is organized as follows section I introduces to automatic speech recognition system; section II describes proposed speech recognition system through DWT and DCT in details. Results are discussed in section III and finally concluded in section IV.

PROPOSED METHODOLOGY

In this section, overall block diagram of the speech recognition system through preprocessing, feature extraction and classification is discussed. The feature extraction process through wavelet transform followed by LPC coefficients and FFT, filter banks and DCT is evaluated. The suitability of feature extraction process using recognition rate, feature vector length and computational complexity was compared. The overall block diagram of the speech recognition system is depicted in fig. 1.
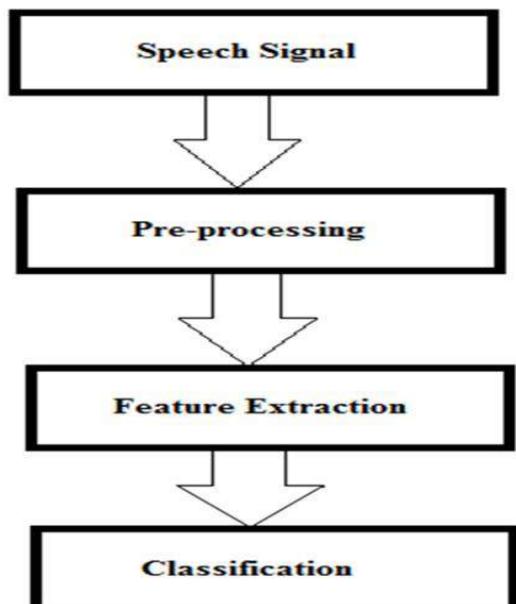
Fig. 1 Block diagram of speech recognition system

A. Speech recognition system through DWT & LPC coefficients

The overall block diagram of the speech recognition system framework through preprocessing, feature extract using DWT & LPC and classification using PNN is depicted in fig. 2.
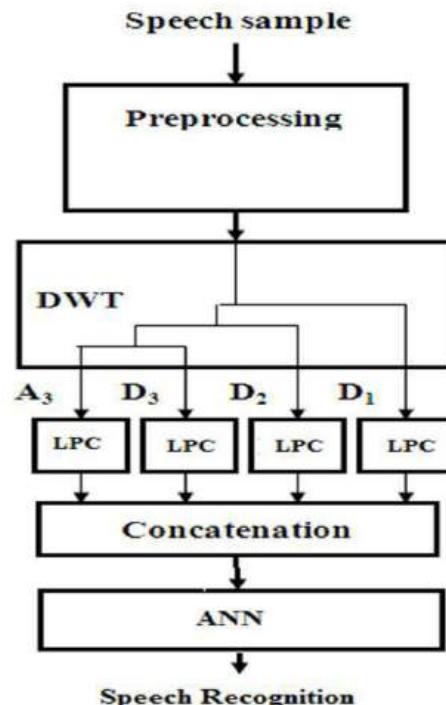
Fig. 2 Speech recognition system through DWT & LPC

First step consist of preprocessing of speech samples that includes preemphasis, framing and windowing. Preemphasis of the input speech signal was achieved through first order high pass filter that helps to emphasis high frequency signals. The output of the high pass filter was framed to N samples. It was followed with windowing using hamming window to suppress discontinuities in the speech frames. Secondly the output of preprocessing steps was applied to Daubechies's three level wavelet transform to decomposed speech framed signals to subbands. These subbands from three levels of decomposition were arranged in dyadic fashion represented by (1).

$$\mathbf{f} = [\,a_{A_3}, a_{D_3}, a_{D_2}, a_{D_1}] \tag{1}$$

where f is the feature vector. LPC features of 6th order are extracted from each sub band of wavelet decomposed speech signal. Final LPC feature vector was obtained through the process of concatenation of these sub-vectors of LPC coefficients obtained from each sub band. Six prediction coefficients from each sub band gives feature vector of dimension twenty four (24). The architecture of the network is the feed-forward structure employed for classification in this work. The input layer has twenty four processing elements and receives the vector fi per frame, followed by one hidden layer of forty eight elements. The final layer (outer layer) has ten output neurons, with each output processing element (neuron) uniquely representing one category. The training algorithm

used in the classification is back propagation applied to feed forward neural networks.

B. Speech recognition system through FFT, filter banks & DCT

The overall block diagram of the speech recognition system framework through preprocessing, feature extract using FFT, filter banks & DCT and classification using PNN is depicted in fig. 3.
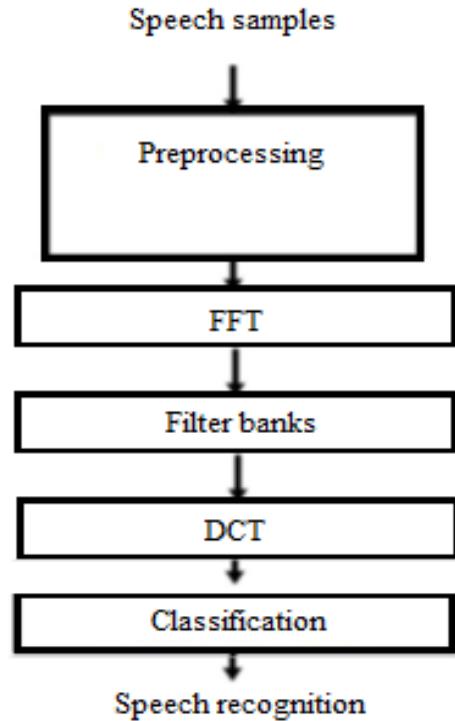
Fig. 3 Speech recognition system through FFT, filter banks & DCT

First step that consist of preprocessing was similar to that followed during DWT & LPC feature extraction process. In second step, framed speech signals with N samples were converted into frequency domain through FFT. These frequency domain signals were then applied to triangular filter banks. These filters compute a weighted sum of spectral components so as to filter the output and approach to the mel scale. The response of each filter is the given by the frequency magnitude in a triangular shape and is equal to unity at the center frequency and decreases linearly to zero at the center frequency of two adjacent filters. Finally each output of the filter is summed of its filtered spectral components. The response of the filter is given by (2)

$$F_{mel} = 2595 * \log_{10}\left(1 + \frac{f}{700}\right) \quad (2)$$

Mel Frequency Cepstrum Coefficients were obtained through DCT that converts mel spectrum to time domain signal. Finally in second stage delta features and double delta features were added to the signal. In this work, we calculated 12 MFCC, 1 energy feature, 12 delta MFCC features, 12 double-delta MFCC features, 1 delta energy feature and 1 double-delta energy feature, in total 39-dimensional features.

Finally these dimensional features were applied to feed-forward structure employed for classification in this work.

EXPERIMENTAL RESULTS & DISCUSSIONS

The database used for experimentation was one to nine digits pronounced in Marathi language. The speech signal data was collected from ten male and ten female speakers. Each speaker was requested to utter each digit ten times and recorded with sampling frequency 44 KHz using mobile phone. The input speech signal was decimated by 5 to reduce the number of samples. It was decided that out of ten utterances per word per speaker half of them were used for training and remaining half were used for testing. Hence, the complete speech sample size was two hundred (200), thus hundred (100) samples for training and hundred (100) samples for testing. Manually the speech signal was cropped to remove non-utterance of digit. Preemphasis of speech signal was obtained and then the signal was divided into frames of 250 msec having 2200 samples. Performances of these features were tested using ANN on clean database of Marathi digits. Table 1 shows the performance of features in terms of percentage recognition rate on clean speech samples. Fig 4 shows the graph of percentage recognition rate and feature vector length for both the speech recognition system.

Table 1. Performance of the systems

Speech recognition system (Feature extraction process)	Recognition rate (%)	Feature vector length
DWT & LPC	79	24
FFT, Filter banks & DCT	76	39

(a)) Recognition rate
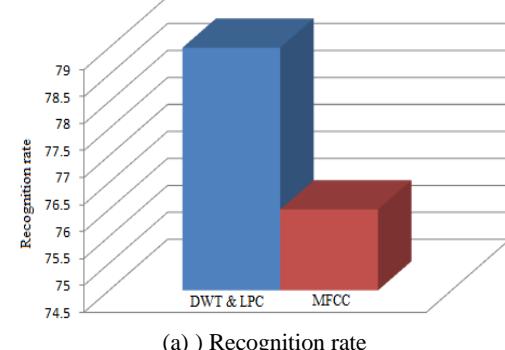
(b) Length of feature vector
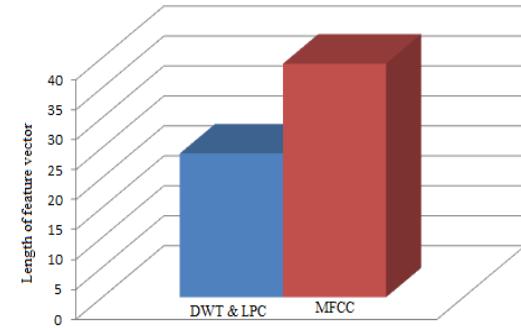
Fig. 4 Performance evaluation through recognition rate and feature vector

Mostly in the speech recognition system feature extraction process plays the important role. Optimum length of feature vector and robust algorithm is desired to obtained better recognition rate. Experimental results clearly indicates better recognition rate of DWT & LPC algorithm by 3 % as compared to FFT, filter banks & DCT. Also it was observed that higher recognition rate was obtained for 61.5 % lesser feature size. Computational complexity can be measured in terms of the processes required to calculate the feature vector. In case of DWT & LPC, were dyadic fashion was employed requires only three low pass filters and three high pass filters for decomposition of the speech signal frame. Also these filters can be implemented through convolution algorithm. Whereas N-point FFT followed by 13 bandpass filters for calculation of mel spectrum and finally DCT re-quires significant computational power as compared to DWT & LPC. Thus it is clearly illustrates that computational complexity for DWT & LPC is much less as compared to MFCC coefficients through FFT, filter banks & DCT.

CONCLUSION

In this paper, our work on Marathi digit speech recognition is proposed using comparative analysis of discrete wavelet transform (DWT) and discrete cosine transform (DCT) through soft computing technique. Experimental results clearly indicates better recognition rate of DWT & LPC algorithm by 3 % as compared to FFT, filter banks & DCT. Also it was observed that higher recognition rate was obtained for 61.5 % lesser feature size. DWT can be implemented through convolution process that reduces computational complexity as compared to FFT and DCT. Finally LPC coefficients can be preferred over MFCC coefficients in automatic speech recognition system. Further the robustness of the proposed algorithm can be evaluated in noisy environment and large number of dataset.

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Distributed Filter Design Using Pole-Zero Enforcement Technique

Mr. Adarsh Nair
Mr. Jayesh Sharma
Dr. Pragnan Chakravorty
Department of Electronics and Telecommunications Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Abstract—**The article introduces an intuitive method of designing distributed filters namely pole zero enforcement technique. It is shown that the formation of standing waves localizes the positions of nodes and antinodes thereby enforcing poles and zeros required in filter design. The method is exemplified over design of bandpass and bandstop filters using microstrip lines with FR4 substrate. Circuit simulated results are verified using state of the art 2.5D electromagnetic (EM) simulators. Both circuit and EM simulations show good agreements.**

Index Terms—**stub, FR-4, open-end effect, pole-zero enforcement**

I. INTRODUCTION

For designing practical microwave filters, the knowledge of distributed transmission lines is of much importance. The lumped elements like resistors, inductors and capacitors are assumed to be distributed continuously across the material in the distributed or transmission line model of the circuit. The ability of microstrip lines to behave as distributed elements at higher frequency ranges and further emulate the behavior of lumped elements helps in optimizing their characteristics and use of these microstrip lines as filters. Filters designed using lumped elements like capacitors and inductors are bulky and increase the cost of manufacturing. Also, the consideration of parasitic elements in the filters designed using lumped elements is very necessary in implementing such filters. This is a tedious job and thus, the implementation of such lumped element filters is undesirable to an extent. Besides, filters using lumped elements have certain frequency restrictions for optimum operation [9]. Operating the filters beyond their recommended range would make them useless in such cases. These shortcomings are managed by the use of distributed elements in filter designing.

The microstrip components used in microstrip filter design in this article are resonators. Resonators are distributed elements of quarter wavelength or half wavelength microstrip patch. The filters are designed using microstrip line of FR-4 material. The reason for choosing FR-4 is because of its affordability and reliability. The filters have been simulated on Ansoft Designer SV (Student Version).

After investigating various design methods [2] [3] [4] [5], it is observed that though the designs are implemented, the underlying physics that drives these filters into operation has not been explicitly explained. Apart from rendering an approximate design method, the article fulfills this purpose too. The design of the filter discussed in this article is also less complex.

The microstrip line filter designed is continuous in structure, which overcomes the drawback of insertion losses that are present in filters with coupled structures due to irregular spacing.

II. BAND-STOP FILTER DESIGN USING QUARTER WAVELENGTH OPEN STUB

A. Zero Enforcement
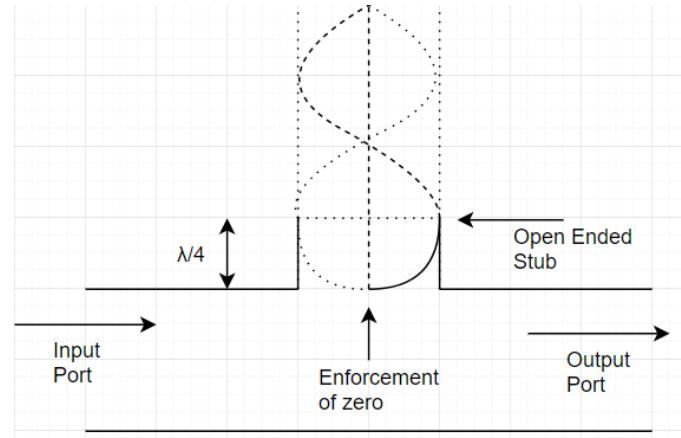
Figure 1. Behavior of quarter wavelength open stub

The microwaves traverse in the transmission line and consequently into the open-ended stub and due to the electrical open circuit at the end, the resultant standing waves that are formed oscillate about the open-end point, a pole is enforced, which results in the formation of an antinode (maxima) at the open end of the stub and the wave reflects back. As the electrical length of the stub is of quarter wavelength, a consequent node (minima) is formed on reflection at the other end of the stub. This results in a blockage of path for the microwaves and thus the signals are offered resistance, causing a band-reject response for the resonant frequency of 2 GHz.

B. Transmission line model

(a)

(b)
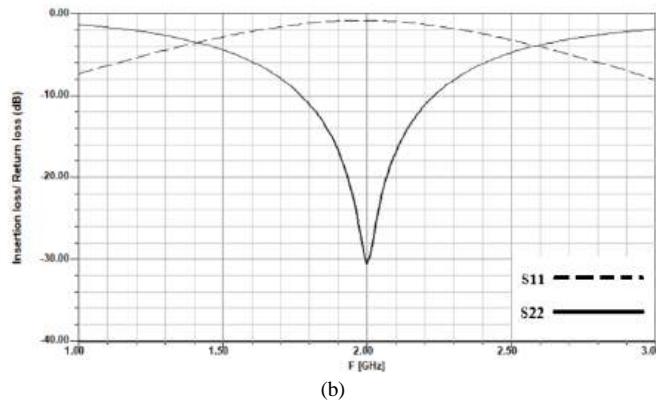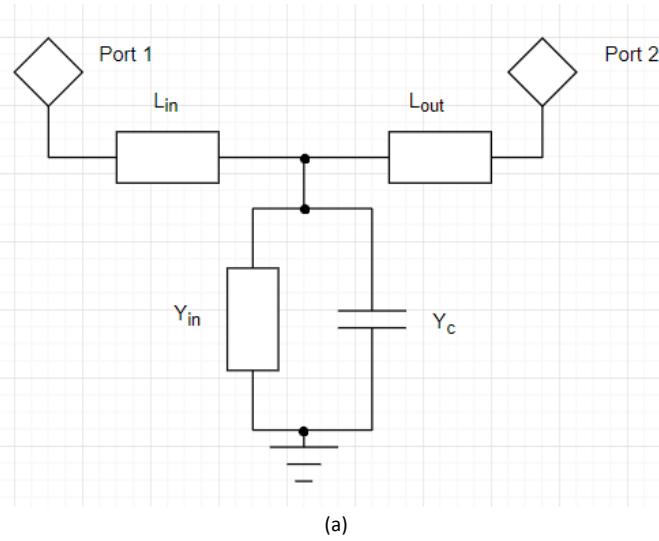
Figure 2. (a) Transmission line model (b) Frequency Response

An open circuited stub is equivalent in behavior to a shunt capacitor having admittance given by the equation, $Y_{in} = j\ Y_C\ tan(2\pi l/\lambda_g)$ Where Y_{in} is the input admittance, Y_C is the characteristic admittance of the transmission line taking T model characteristics into picture[7] and propagation time constant $\beta = 2\pi/\lambda_g$. [1] The admittance of stub can be given by,

$$Y_t = Y_c\ tanh\ (\gamma\ l_t + l_{open}) + j\ B_T\ [2] \qquad (1)$$

The quarter wavelength open stub in the microstrip line with mid-band frequency of 2 GHz results in band-stop behavior with 31.5% fractional bandwidth. Characteristic impedance of 50 Ω transmission line is used in accordance with the width of the line.

III. BAND-PASS FILTER DESIGN USING QUARTER WAVELENGTH GROUNDED STUB

A. Pole Enforcement
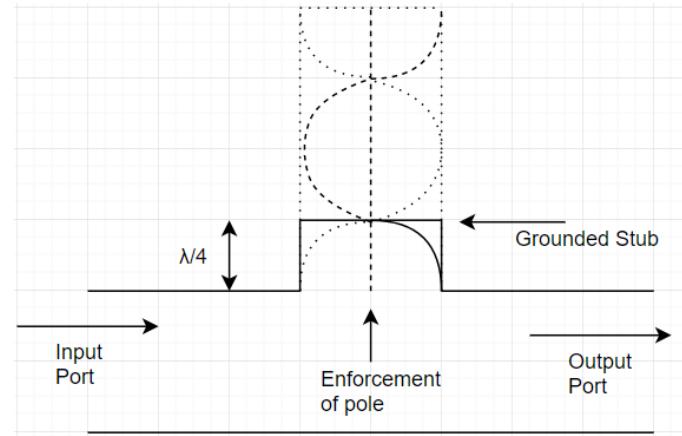
Figure 3. Behavior of quarter wavelength grounded stub

The microwaves traverse in the transmission line and consequently travel into the grounded stub. Due to the electrical short circuit at the grounded end, the resultant standing waves that are formed about the grounded end, and a zero is enforced which forms a node and the wave reflects back. As the electrical length of the stub is quarter wavelength, a consequent pole is enforced, forming an antinode (maxima), at the other end of the stub. This allows the microwaves to pass to the output port, causing a band-pass response for the mid-band frequency of 2 GHz.

B. Transmission line model

(a)
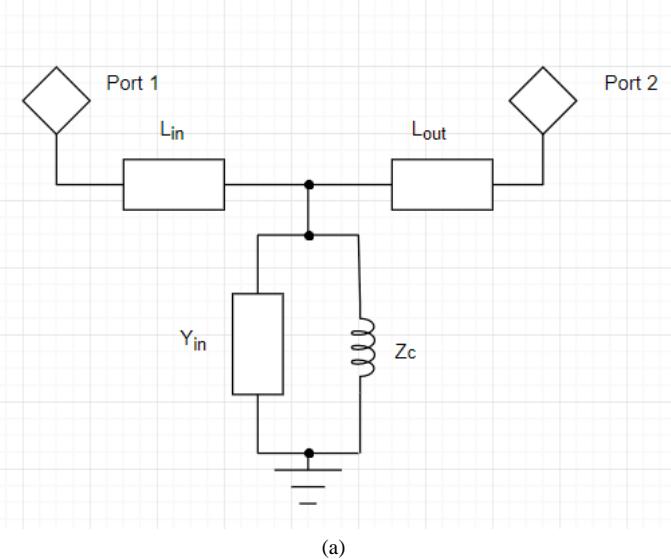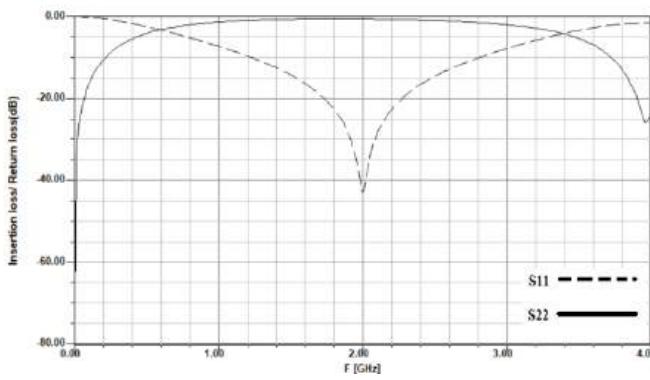
(b)

Figure 4. (a) Transmission line model (b) Frequency Response

A grounded stub is equivalent in behavior to a shunt inductor having admittance given by the equation, $\mathbf{Z_{in}= jZ_C \ tan(2\pi l/\lambda_g)}$ Where Z_{in} is the input admittance, Z_C is the characteristic admittance of the transmission line and propagation time constant $\beta = 2\pi/\lambda_g$. [1]

The quarter wavelength grounded stub in the microstrip line with mid-band frequency of 2 GHz results in band-pass behavior with 69.5% fractional bandwidth. Characteristic impedance of 50 Ω transmission line is used in accordance with the width of the line.

IV. BANDWIDTH ENHANCEMENT

A. Radial stub

The concept of pole-zero enforcement for band-stop filters can be enhanced by the use of radial stubs. Radial stubs have a non-linear shape by virtue of the aperture width parameter, which in turn gives it a 'wider expanse' [8] and this helps in providing greater bandwidth in filter operation.

B. Open-End effect

At the open end of a microstrip line with a width of *W*, the fields do not stop abruptly but extend slightly further due to the effect of the fringing field.[6] This effect can be modelled either with an equivalent shunt capacitance C_p or with an equivalent length of transmission line Δl. The use of equivalent length being more convenient for filter design, is used here respectively. It is important to note that the effect due to the open end of the lines must be taken into account. This can be done by increasing the line length such that $l \rightarrow l + \Delta l$, where Δl may be approximated by the single line open end.

C. Circuit model of band-stop filter using quarter wavelength Radial Stub microstrip line
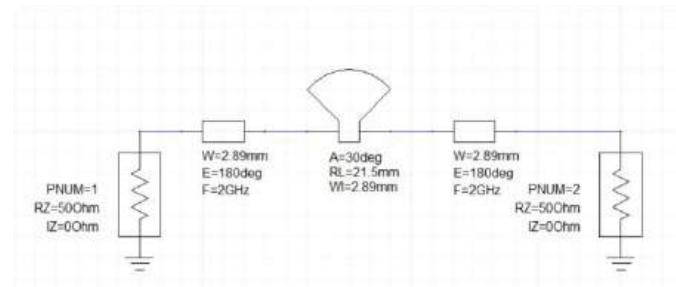
(a)
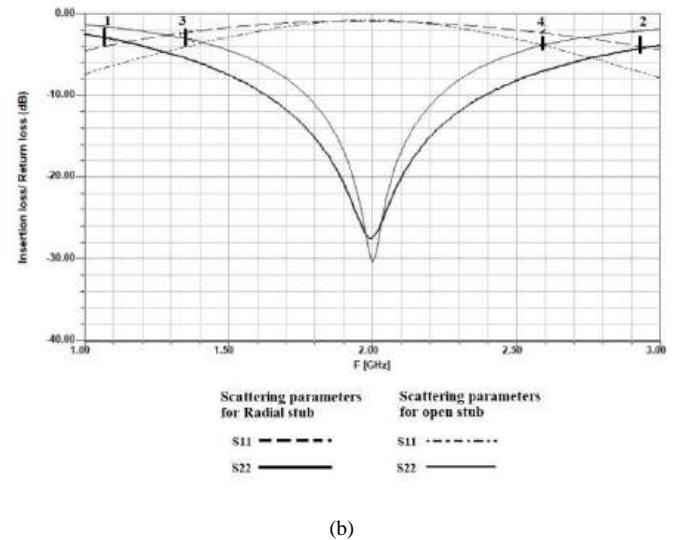
(b)

Figure 5. (a) Transmission line model (b) Frequency Response Comparison between open-ended stub and radial open-ended stub
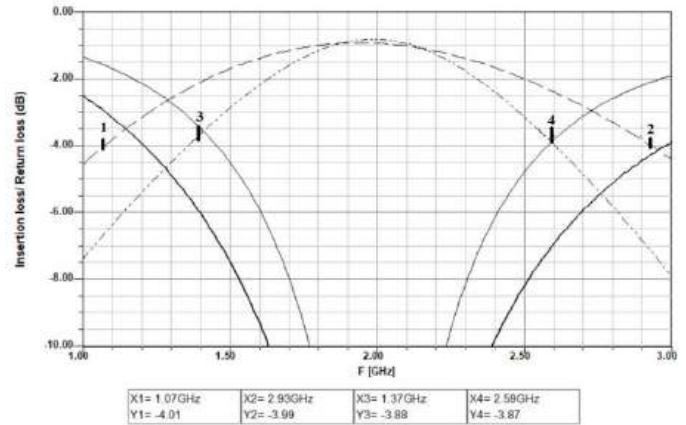
Figure 6. 3 dB bandwidth comparison of open-ended stub and radial open-ended stub

Figure 6 shows the bandwidth comparison of the open-ended stub and radial open-ended stub. The graph clearly demonstrates the use of the radial stub for bandwidth enhancement in band-stop filter operation. The 3-dB fractional bandwidth of the radial stub filter is approximately 46.5% as

compared to 31.5% fractional bandwidth of the open-ended stub at 2GHz in both the cases.

D. Application

Bandstop filters using radial stubs can be applied in high frequency space wave communications for suppression and removal of static noises that interferes with the original information signal. The advantage of using radial stub filters is that a wideband bandstop behaviour is obtained which is suitable for high frequency noise suppressions.

CONCLUSION

The article concludes that distributed element behavior of microstrip lines at higher frequencies can be utilized as an important parameter for filter designing having better bandwidth and is also economical for manufacturing. Pass band response of grounded stubbed microstrip line is good for practical application as compared to passband filter design from lumped elements. The use of open stub credits for good stop band response but the use of radial open stub instead, can be done for a wider stop band response.

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Recognition & Translation of Hand Gesture for Indian Sign Language Based on KNN & PNN Classifier

Umang Patel PG Student,
Dept of EXTC DJSCE, Vile Parle Mumbai, India
patelumang09@gmail.com

Aarti G. Ambekar Assistant Prof,
Dept of EXTC DJSCE, Vile Parle Mumbai, India
arti1910@gmail.com

Abstract—Communication is very challenging for normal people to do with deaf, dumb & blind people & vice versa. This is because of a deaf, dumb use sign language for communication and normal people are unable to understand sign language easily. Therefore there is a necessity of converting and translating sign languages. This paper removes the barrier of communication between them. In this paper, hand gestures are captured, processed and then translated into speech & text. For speech & text, two languages are chosen English & Hindi. We have considered not only characters but also words for recognizing the sign language. In this paper features value of images are evaluated based on moment technique and gray level co-occurrence matrix. Two classification techniques (PNN & KNN) are used & performance parameter is compared between both classifiers. This paper will help to do the smoothest communication between normal & hearing impaired people. And this can be also implementing in smartphone.

Keywords— Hand Gesture, Sign Recognition, Image Processing, Indian Sign Language (ISL), 7Hu Moments, KNN Classifier , PNN Classifier, GLCM

I. INTRODUCTION

In our day-to-day life, communication plays a crucial role to convey information from one person to another. It becomes very difficult for the people who are deaf and dumb to communicate with others. Sign language is the only way which connects them however not everyone is familiar with sign language. So there is need of translating sign language into text & speech. It is known as Sign Recognition. Sign language is a combination of body languages, hand gestures, and facial expressions. Among those, hand gestures is the most effective method hence the majority of research going is going on decoding the hand gestures. There are two approaches for decoding the hand gestures as listed below a) Image Based b) Sensor Based. From the listed methods, the sensor based method is a very complicated method as it needs hardware and sensor based hand gloves and also troubleshooting is very difficult so there is a need of highly skilled person. While the image based method is relatively very easy to implement, decode and use. Therefore most of the research is done on this method. There are many sign languages used worldwide, which differs from each other.

India is a multilingual country in which almost around 25 different languages are used according to the respective region. Hindi is India‟s national language, hence mostly all the Indians are aware of Hindi language. All the documentations are done mostly in three scripts basically English, Hindi and regional language of that particular region all over the India. Considering all these, proposed work make use of Hindi script for Indian sign languages (ISL) and English script for American Sign Language (ASL).Sign language is also classified as one handed and double handed. In the proposed methodology double handed sign language is used for sign recognition. The method uses a web camera for capturing gestures which are then pre-processed .After pre-processing feature extraction is followed by the classification. Finally recognized gestures are displayed as Hindi and English text. Along with the text sound files of respective gestures are also available for getting speech conversion. The proposed method, considers a single character and words in both English and Hindi sign languages. In single character, alphabets of each individual language are used. While words which are used more frequently in day to day life and most common for communication such as „Hello‟, „Stop‟, „Hi‟, Days of week, etc. has only single gestures for recognition. This is known as Single Word Using Single Gesture (SWSG). Words which are uncommon and rarely used for communication such as name of the person, random words are unable to represent in single gesture. For those kinds of words, one need to recognize each letter of word by respective alphabet so multiple gestures need to be decoded to recognize the entire word. This is known as Single Word Using Multiple Gestures (SWMG).

II. LITERATURE SURVEY

Currently Image-based method is studied in research area [1]. In Image based method a web camera is used for capturing gestures and then it will pre-process by MATLAB, next step is feature extraction & then processed by classifier. Sign language translator easily implemented on the mobile phone with the help of image based method, due to its flexibility, mobility and ease of use.[1] Gestures captured by camera are translated into text & speech. Developing a system

without sensors and only by capturing the gesture movements is faster & more accurate. Double handed Indian sign language is captured in a series of gestures and it is processed with the help of MATLAB and then it is translated into voice and text. Orthogonal transform method used for Indian sign language recognition has a disadvantage of more computation speed. While capturing images following parameter needs to be considered.

a) lighting changes
b) different sizes & shapes of users hand
c) background
d) skin color
e) distance from camera
f) angle position of Hand

III. HINDI SIGN LANGUAGE

In India more than 6.5% of its population is deaf, dumb people. In the country like India, where person with ability to read & write is very less [8], therefore it is very difficult for hearing impaired people to interact with illiterate people. There are many regional languages in India as per region and states. So there is different sign language for each language alphabet. As Hindi is national language of India, so we have consider Hindi as another sign language for recognition & translation Therefore it is essential to translate sign recognition into Hindi text & speech.

IV. PROPOSED METHOD

The block diagram shown in Fig 2 is proposed method for extracting gestures and translates them into text & speech of both languages Hindi & English for character & word recognitions.
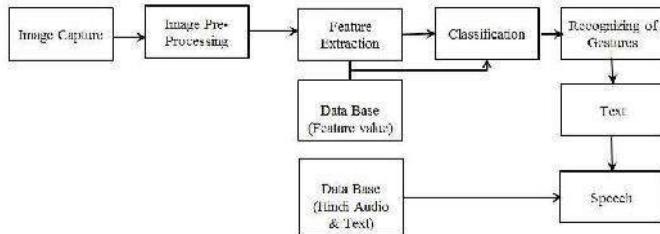
Fig. 1.   Block diagram of Proposed Method

A. Image Capture

In sign recognition, first step is capturing a gesture. Interfacing a camera is very crucial work. To capture the hand gesture, web camera is used. Now a day"s web camera is inbuilt in laptops or one can use external camera for interfacing. Captured images should be in good quality. So selection of good webcam & its interfacing is an important task of this method.

B. Image Preprocessing

Image preprocessing contains filtering, cropping, brightness adjustment, contrast adjustment, skin segmentation, binary conversion & many more. To do such process concept of image cropping, image enhancement & image segmentation are required.

Captured images are in the form of RGB. So the first step is to convert RGB images to binary images. To remove unwanted information from captured image, cropping of image is to be done. To improve quality of image, enhancement can be done in certain selected area. In image segmentation, edge detection & skin segmentation method is used. Edge detection used for detecting the boundary of images. Skin segmentation helps to remove complex background. Those all pre-processing techniques help for evaluating features values.

C. Feature Extraction

Feature extraction is a very important step to create the database of sign gestures. To characterize property of gesture in efficiently and effectively manner, both the global visual features and the local visual features are extracted for captured gestures. There are mainly two types of feature extraction method involved in sign recognition, first is contour based shape representation and description methods & another is region based shape representation and description methods. Method is selecting depending on application. [8] In this proposed method, two methods are used for extracting features. Those two methods are 7Hu moments technique & GLCM technique. The both methods are evaluated from every pixel of image. Using both methods, we had evaluated 28 parameters from images.

1) 7Hu invariant moments

7Hu moments are a vector of algebraic invariants that added regular moment. They are invariant under change of translation, size and rotation. Hu moments have been widely used in classification [3].7Hu moments have been developed by Mark.Hu in 1961: The formula to caluncate 7 moments are list below.

$$M_1 = \eta_{20} + \eta_{02}$$

$$M_2 = (\eta_{20} - \eta_{02})^2 + 4\eta_{11}^2$$

$$M_3 = (\eta_{30} - 3\eta_{12})^2 + (3\eta_{21} - \eta_{03})^2$$

$$M_4 = (\eta_{30} + \eta_{12})^2 + (\eta_{21} + \eta_{03})^2$$

$$M_5 = (\eta_{30} - 3\eta_{12})(\eta_{30} + \eta_{12})[(\eta_{30} + \eta_{12})^2 - 3(\eta_{21} + \eta_{03})^2] + 3(\eta_{21} - \eta_{03})(\eta_{21} + \eta_{03})[3(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2]$$

$$M_6 = (\eta_{20} - \eta_{02})[(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2] + 4\eta_{11}(\eta_{30} + \eta_{12})(\eta_{21} + \eta_{03})$$

$$M_7 = (3\eta_{21} - \eta_{03})(\eta_{21} + \eta_{03})[3(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2] - (\eta_{30} - 3\eta_{12})(\eta_{21} + \eta_{03})[3(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2]$$

Where,

$$\eta_{pq} = \mu_{pq} / \mu_{00}$$

We used all 7Hu moments as a vector to describe the image properties. The feature vectors are M1, M2, M3, M4, M5, M6, M7 stored in database.

2) Gray Level Co-Occurrence Matrix (GLCM)

The GLCM method first developed by Haralick. A gray

level co-occurrence matrix is translation from two dimensional matrix of histogram. Gray level co-occurrence matrix is obtain by calculating how often a pixel intensity i occur in spatial relationship to pixel intensity j. Spatial relationship is defined as pixel to its immediate right in horizontally adjacent. In Fig 4 shown how to calculate GLCM matrix.

Gray level co-occurrence matrix can be calculated based on different offset value. In this paper, we compute GLCM for offset value (2, 0). Based on each computed value of GLCM, 21 features that can successfully characterize the behavior of gray level co-occurrence matrix. The following are the features calculated from co-occurrence matrix. Autocorrelation, Contrast, Correlation, Cluster Shade, Cluster Prominence, Dissimilarity, Energy, Entropy, Homogeneity, Maximum probability, Variance, Sum average, Sum variance, Sum entropy, Difference variance, Difference entropy, Information measure of correlation1, Information measure of correlation2, Inverse difference normalized, Inverse difference moment normalized, maximal correlation coefficient. Those all 21 features have their own formulas to calculate. In this paper, some of formulas are listed below.

$$\text{Correlation} = \frac{(\quad)(\quad)(\ )}{\qquad} \qquad (9)$$

$$\text{Entropy} = \frac{(\quad)}{(\ )} \qquad (10)$$

$$\text{Contrast} = \begin{matrix} ; & , & \end{matrix} \qquad (11)$$

$$\text{Variance} = (1 - \quad (\quad)^2 \quad (\quad)) \qquad (12)$$

$$\text{Inverse difference moment} = \frac{\qquad}{(\quad)(\ )} \qquad (13)$$

D. Classifier

Classification data is used to assign corresponding level with respect to groups with homogeneous characteristics, with the aim of discriminating multiple objects from each other within the image. The level is called as class. Classifier is classified in two types 1) Supervised, 2) Unsupervised. [10]. Supervised classification is dependence on the suggested method that a user can select sample values from an image that can be representative of specific classes and then applying the image processing by software to use these training samples as references for the classification of all other values in the image. Unsupervised classification is where the outcomes are dependence on the software analysis of an image without the providing sample classes to user. The computer uses algorithm to check which values are related and then groups them into classes accordingly.
Classification involved in two Steps:-
1. Training step: In this step, with use of the training samples matrix, the method calculates the parameters of a probability distribution, considering features are conditionally independent given the class.
2. Testing step: For any untested sample, the method finds the posterior probability of that sample belonging to each class.

The method then classifies the test sample according the largest posterior probability.

1) KNN classifier

The KNN algorithm which is known as k nearest neighbor algorithm. It is mostly used for character recognition. The method used for classification and regression in KNN classifier is non-parametric method. The output of system depends on whether KNN is used for regression or classification. While using as k-NN classification, the output is a class membership of an object. It is classified by majority values of its neighbors. The object is assigned to the class by most common among its nearest neighbors k (k is a small positive integer) [11]. With the help of MATLAB command "knnclassify" we can classify the sample vector.

KNN classifier is unsupervised classifier. In which some train features vector are assign to group & after that class has been assign to input set. The following syntax used for classifier in MATLAB.

Class = knnclassify (Sample, Training, Group, k, distance, rule) Where,

Sample = It is the rows which will be classified into groups. Sample set must have same number of columns as Training.

Training = Each row of training matrix must represent the row value of Group matrix. So group set must have same number of row as training.

Group = Matrix whose value represent & grouping the rows in training matrix.

k = The default value is 1. It is nearest neighbors used in the classification. This value should be greater than 1.

Distance = It will be any one method from Euclidean, Cityblock, Cosine, Correlation, Hamming code. But default it takes 'Euclidean' distance.

Rule = This is used to decide that how to classify the Sample Matrix. „Nearest rule" is default rule used in „knnclassify". Other rules are Nearest, Random, Consensus.

2) PNN classifier

The abbreviation of PNN is Probabilistic Neural Network. It is neural network based classifier. It is mostly used in Pattern recognition & classification. It is based on feed-forward neural network. This is supervised classifier which is used to train the network and next step is to testing the Sample vector. The MATLAB command „newpnn" is used to create the network & train the network„. In this command, input vector & class vector is needed to train the network. After this, Sample vector is simulated using simulate command.

The following MATLAB command used for PNN classifier

1. net = newpnn(P,T)
2. y = sim(net,S)

E. Text & Speech

Now final step is to display a recognize character or word & speech output is given to speaker from audio database in both Hindi and English languages. English text is easily displayed using MATLAB inbuilt function. For English sound, the function called as system.Speech.Synthesis.SpeechSynthesizer is used. Now major task is to implement Hindi text & Hindi speech. MATLAB doesn"t support Hindi character so Hindi text is displayed by creating database of each alphabet with the help of images of individual alphabet & display respectively. Similarly, the database of Hindi speech is made of audio files for each alphabet. To generate Hindi sound file .wav format is used as it is give very good sound quality.

V.   RESULT

The proposed system is implementing on MATLAB software. As we have mentioned previously that in this paper we have recognized not only characters but also words. For both we have included English and Hindi languages. Indian sign language consists of some words with only single gesture which are common and use in day to day life. For example stop, hello, weekdays and etc. For uncommon word such as person name or rarely use words, we have to use single gesture for single character in words. Therefore multiple gestures are needed to recognize only single word. So considering above parameter we have categorized result mainly in 5 categories. Those categories are listed below.

A. English alphabet characters
B. Hindi alphabet characters
C. Single word with single gestures (SWSG)
D. Single word with multiple gestures (SWMG) – English Word
E. Single word with multiple gestures (SWMG) – Hindi Word

The following are the step wise output of each category. Same procedure is followed for each category with minor changes. So each category consists of captured image, binary images, features values, comparison of classifier parameter and finally recognized output. Speech has an audio output so it is unable to cover in this paper as a result.

A. English Alphabet Characters

Fig 2a) shows the captured gesture for English alphabet „B" from web camera of computer. Now with help MATLAB function captured gesture is converted into binary image as shown in Fig 2b).

Next step is to evaluate a feature value using feature extraction methods. Table 1. Shows a 7 features value using 7Hu moment techniques & Table 2. Shows a 21 features value calculated from gray level co-occurrence matrix. So we have evaluated total 28 features values of each image. Using data base for all letters, we can easily recognize the capture gesture with help of classifier. Fig 6 Shows recognize output for captured gesture. In output we have shown captured gesture, recognize letter in Hindi and English languages.
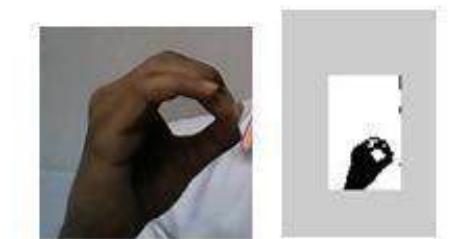
Fig. 2.   a) Captured Gesture for Alphabet „O" b) Binary conversion of captured gesture c) Recognize output for English character „O"

Fig 4 shows the captured gesture for English alphabet „B" from web camera of computer. Now with help MATLAB function captured gesture is converted into binary image as shown in Fig 5.

Next step is to evaluate a feature value using feature extraction methods. Table 1. Shows a 7 features value using 7Hu moment techniques & Table 2. Shows a 21 features value calculated from gray level co-occurrence matrix. So we have evaluated total 28 features values of each image. Using data base for all letters, we can easily recognize the capture gesture with help of classifier. Fig 6 Shows recognize output for captured gesture. In output we have shown captured gesture, recognize letter in Hindi and English languages.

B. Hindi Alphabet Characters
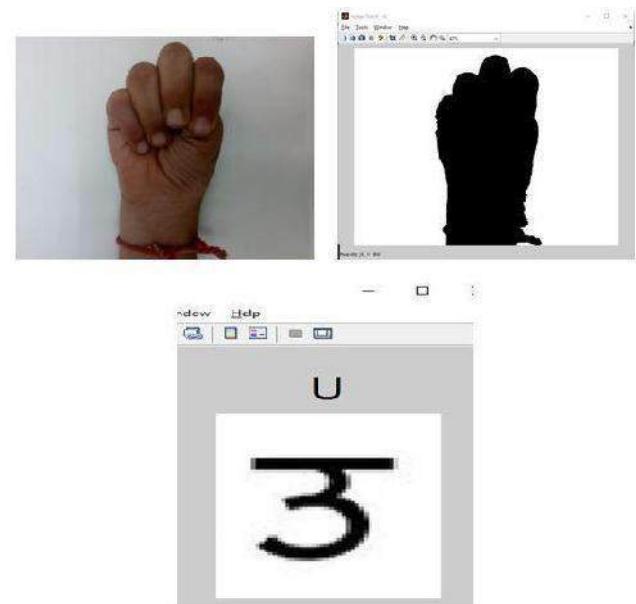
Fig. 3.   a) Captured Gesture for Hindi alphabet „उ" b) Binary conversion of

captured gesture „उ" c) Recognize output for Hindi character

„उ"

C. Single word with single gestures (SWSG)

In single word with single gesture, we have considered days of week. So seven days has been considered for SWSG and we have shown one of the days as result.

Fig. 4.   a) Captured gesture for word „Saturday" b) Binary Image of captured gesture „Saturday" c) Recognize output for word „saturday"

TABLE 1. Calculated features value using 7Hu moment technique for Character / Words

Moment	Character / Words		
	O	उ	Saturday
M1	0.203813	0.492023	0.3417
M2	0.004242	0.052286	0.087485
M3	3.13E-05	0.001627	0.01047
M4	6.16E-05	0.002	0.002108
M5	-1.5E-10	5.3E-07	-3.7E-06
M6	-3.7E-07	3.51E-05	0.000297
M7	8.38E-10	-1.1E-06	9.26E-06

TABLE 2. Calculated features value from gray level co-occurrence matrix (GLCM) for Character / Words

Moment	Character / Words		
	O	उ	Saturday
Autocorrelation	17.18559	27.53655	23.82297
Contrast	0.070195	0.143958	0.071916
Correlation: MATLAB	0.976243	0.986028	0.979531
Correlation	0.976243	0.986028	0.979531
Cluster	134.2255	675.7224	100.6514

Prominence			
Cluster Shade	-12.9696	3.823047	-9.43755
Dissimilarity	0.057309	0.140161	0.070654
Energy	0.269031	0.106684	0.253808
Entropy	1.667406	2.493145	1.726773
Homogeneity: MATLAB	0.973211	0.930538	0.964876
Homogeneity	0.972632	0.930299	0.964799
Maximum probability	0.388556	0.163461	0.412676
Sum of squares	17.12461	27.46979	23.71777
Sum average	7.935892	9.477798	9.402599
Sum variance	45.80119	70.76337	66.68406
Sum entropy	1.613947	2.385416	1.674136
Difference variance	0.070195	0.143958	0.071916
Difference entropy	0.221448	0.411684	0.257207
Information measure of correlation1	-0.83463	-0.76313	-0.80998
Information measure of correlation2	0.953021	0.976673	0.951173
Inverse difference moment normalized	0.993769	0.984468	0.992163

TABLE 3. Comparison between KNN & PNN classifier based on Performance evaluation Parameter

Parameter	KNN	PNN
Classified Rate	0.84	0.88
Error Rate	0.16	0.12
Prevalance	0.44	0.46
Sensitivity	0.8148	0.8519
Specificity	0.8696	0.913
Positive predictive value	0.88	0.92
Negative predictive value	0.8148	0.8519
Positive Likelihood	6.2469	9.79
Negative Likelihood	0.213	0.162

D. Single word with multiple gestures (SWSG) English word

For word with multiple gestures, it is very difficult to show captured & binary conversion of each alphabet so Fig 14 shows final result of recognize word „UMANG".

23
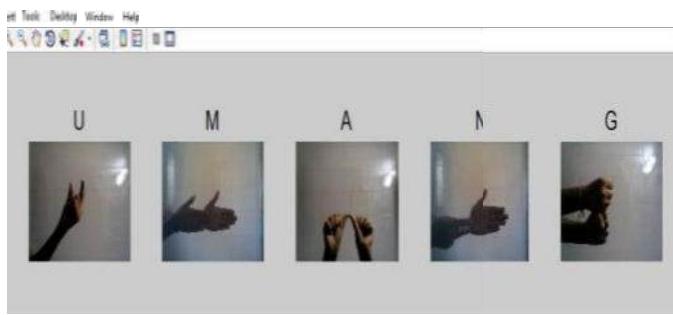
Fig. 5.   Recognize English word with multiple gestures

E. Single word with multiple gestures (SWSG) Hindi word

To recognize Hindi word, it is very difficult task because it consists of words with modifiers also. In this paper, we have considered words without modifier. Fig 15 shows the output of Hindi word करन (karan). It also consists of captured

images and English, Hindi alphabets respectively.

Fig. 6.   Recognize Hindi word „करन‟ with multiple gestures

VI.   CONCLUSION & FUTURE WORK

Using two methods, 7Hu moment techniques & gray level co-occurrence matrix for feature extraction strong database has been implemented. KNN & PNN classifier are compared & we conclude that PNN classifier is better. Considering all categories average more than 84% accuracy is achieved. English Speech has very good Quality because of inbuilt MATLAB function while Hindi speech is pre-recorded sound file saved in database therefore quality depends on recorded sound file. In this method .wav audio file format is used for Hindi speech. In future work ISL can be converting into other Indian languages such as Marathi, Gujarati, and various south languages etc. and also we can implement in ASL or BSL. Using many performance parameter of classifier we had compared both classification techniques & conclude that PNN

classification gives better classification rate. We can recognition Hindi words with modifier also. We can also convert and translate other Indian sign language. Considering time parameter we can use this concept for video conferencing with deaf & dumb people for advanced communication. Even we can translate and apply on the smartphone platform, due to its easy use, mobility and tremendous growth.

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Review of Image Processing based Forest fire Detection system

Dharani Bandi
UG Student, KJSIEIT, Mumbai
University of Mumbai, India
dharani.b@somaiya.edu

Pratik Shah
UG Student, KJSIEIT, Mumbai
University of Mumbai, India
pratik.rs@somaiya.edu

Yash Mistry
UG Student, KJSIEIT, Mumbai
University of Mumbai, India
yash.mistry@somaiya.edu

Amruta Vibhute
UG Student, KJSIEIT, Mumbai
University of Mumbai, India
amruta.v@somaiya.edu

Rupali Kadu
Faculty, KJSIEIT, Mumbai
University of Mumbai, India
radvirkar@somaiya.edu

Abstract—**This paper is about forest fire detection system which is unmanned and arial. Forest is considered as the most important source of resources. Detection of forest fire before it causes huge damage is of concern. Traditional fire detection methods such as watch towers and human observer require extensive labor and are also not that efficient. Also fire detection methods dependent on humans are hazardous and also time consuming. In this project we are going to use advanced technological system to overcome the shortcomings of the traditional methods. We are using image processing method to detect the fire based on RGB hues in the image. The whole fire detection system is placed on the unmanned arial vehicle (UAV). This system is more effective and gives real time information about the fire and also helps to control fire before large damage.**

Keywords: Unmanned Arial Vehicle (UAV), image processing, fire detection, RGB hues, multi rotor control board.

I. INTRODUCTION

Forests are important factor of nature and human society. It protects environment, serves as habitat for fauna, and also contributes to large amount of natural wealth. Millions of hectares of land is destroyed because of forest fire every year which is serious threat to ecosystem and safety of living beings [1]. For protection of humans safety and preservation of natural resources, monitoring and detection of forest fire and attained much importance and awareness around the world. Increase in forest fire accidents around the earth which requires automatic and advanced fire detection alarms.

With the development of modern technologies, more advanced automatic fire detection methods are adopted and more effective and flexible platforms are developed to overcome the disadvantages of traditional methods such as satellites, ground based equipments [1]. UAV are one of the advanced system implemented for fire detection system. They are highly reliable and efficient they also require less labor.

When remote sensing techniques are implemented with UAVs work as very powerful system for fire detection for application of UAVs in forest fire monitoring and detection [4, 5, 6]. Image processing based fire detection technique is very crucial in fire detection system using UAVs for its number of advantages which include wide range object detection giving intuitive and real time information and surveillance. More specifically, charge-couple device (CCD) cameras are mounted on UAVs, this has ability of delivering more representative information and low cost compared to infrared (IR) cameras and other fire sensors [1].

Fire detection using image processing works in 3 steps: (1) Capturing image by digital camera, (2) Analysis and enhancement of image to detect fire, (3) An alarm is generated in case of existence of fire by analysis of output image [2]. There could be a case wherein there is generation of false alarms when any fire like objects appear in image and the system classify it as fire due to pixels value of such object matches with the pixels value of the fire.
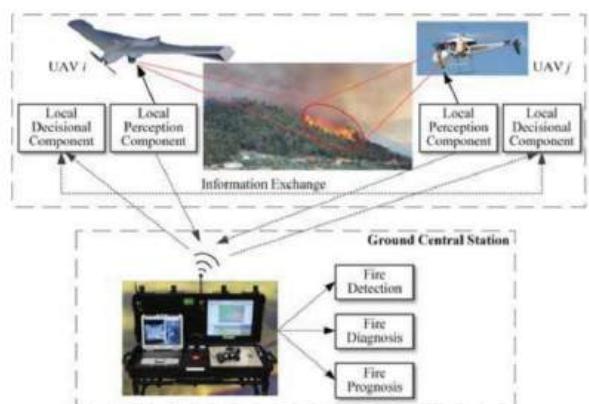
Fig.1. Schematic illustration of UAVs based forest fire monitoring and detection [1,2].

II. FIRE DETECTION TECHNIQUES

To increase the efficiency of image processing based fire detection, flame and smoke color detection is combined with edge, motion, area and texture analysis [2].

1. **Fire detection based on Flame Detection [2]**

    This technique is based on color of the flame and its detection. Pixels of fire tend to have higher red component intensity

    In RGB model
      R intensity > G intensity > B intensity
      R intensity > R thresholding

    In HSV color model
      S > (225-R)*S Threshold/R Threshold

    In YCbCr color model
      Here the Luminance, Blue and Red components are compared by using chrominance of any pixel with mean value to detect if fire pixels are present.

2. **Fire detection based on Flame motion Detection [2].**

    This technique detects the occurrence of motion in flames by comparison of adjacent frames in fire videos and analyzing the number of fire pixels identifies along with their position in adjacent frames.

3. **Fire Detection based on intensity and growth of fire [2].**

    Fire tends to grow; the motion of fire and area covered by fire will change with time. The comparison between the images of fire during different timestamp detects the growth of the fire. These difference between frames are compared with threshold to check whether the fire exists. Comparison of frames is done by using motion and edge detection methods.

4. **Fire detection by flame texture and smoke detection [2].**

    The existence of fire can also be identifies by texture, shape, change in area occupied by flames and presence of smoke. The feature such as temperature and brightness being highest at the edges and lowest in the centre can differentiate between true fire and fire like objects. The R,B and G has similar intensities in cased of smoke. As smoke is of low frequency and smoke edges are of high frequencies they help in detecting the smoke region.
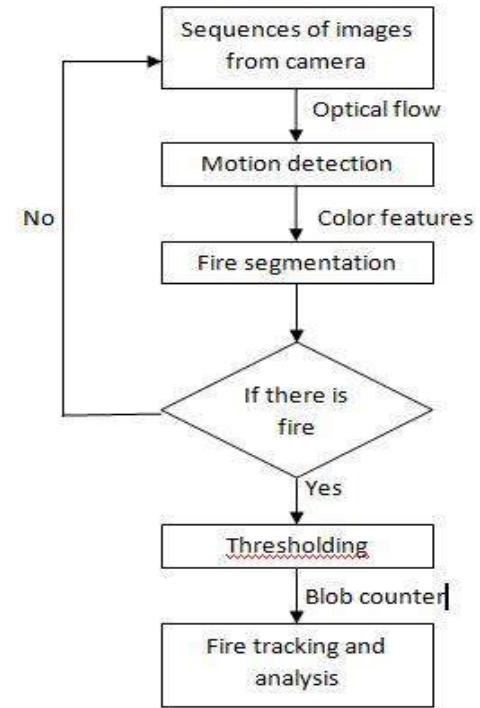
Fig.2. Flowchart of proposed fire detection and tracking [1].

III. Technical Parameter

Fire detection system is the most important components in surveillance systems used to the environment and the buildings. Forest fires fighting is considered as one of the most significant roles in the preservation of natural resources and protection of personal and property security.Particular, due to the fast convection propagation and long combustion period of forest fires, early detection of forest fires is considered to be a predominant way for minimizing the destruction that is probably caused by fires As part of an early warning mechanism, it is preferable that the system has the capacity to report the earliest stage of a fire. Currently, almost all fire detection systems use built-in sensors that depend primarily on the reliability and the positional distribution of the sensors that may be static or mobile. It is essential that these sensors are distributed densely for a high accuracy fire detection system. In a sensor-based fire detection system for an outdoor environment, coverage of large areas is impractical due to the necessity of a regular distribution of sensors in close proximity. Due to increasing developments in digital camera technology and video processing techniques, there is a major trend to replace the conventional fire detection methods with computer vision based systems. Computer vision-based fire detection systems employ three major stages: pixel classification of fire, segmentation of moving object and the analysis of the candidate regions. This analysis is usually based on: the shape of the region and the temporal changes of the region. The fire detection performance depends mainly on the effectiveness of the fire pixel classifier which generates seed areas that the rest of the system will exercise. The fire pixel classifier is thus required to have a very high detection rate and preferably, a low false alarm rate. In the existing research works, vision-based systems generally detect fires according to three features: color, motion, and geometry.

Especially, most of researchers tend to combine the color and motion features to provide more reliable fire detection results, rather than using single feature. In, the RGB /HSI (Hue, Saturation, Intensity) color models are adopted, the disordered characteristics of flames are dynamically analysed to verify the possibility of fire occurrence. A real-time fire detection method using an adaptive background subtraction algorithm is designed in in order to extract foreground information; a statistical fire color model is then adopted to check the existence of fires.

IV. Fire Detection

This section covers the details of the fire detection algorithm. Figure 1 shows the flow chart of the proposed algorithm for fire detection in a video. It is assumed that the image acquisition device produces its output in RGB format. The algorithm consists of three main stages: fire pixel detection using color information, detecting moving pixels, and analyzing dynamics of moving fire pixels in consecutive frames. In following, each part is described in detail. a)1. RGB to CIE L*a*b* Color Space Conversion: The first stage in our algorithm is the conversion from RGB to CIE L*a*b* color space. Most of the existing CCTV video cameras provide output in RGB color space, but there are also other color spaces used for data output representation. The conversion from any color space representation to CIE L*a*b* color space is straightforward.

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Comparative Study of Wavelet Methods for Resolution Enhancement of Satellite Images

Mr.Mansing Rathod

Department of Information Technology
Assistant Professor
K.J. Somaiya Institute of Engineering &IT
Sion, Mumbai, India: 400022
Research Scholar Pacific Academy of Higher Education and
Research University, Udaipur
rathodm@somaiya.edu

Dr.Jayashree Khanapuri

Department of EXTC,
Professor
K.J. Somaiya Institute of Engineering &IT
Sion, Mumbai, India: 400022
jayashreek@somaiya.edu

Abstract: *Today various fields require satellite images for their research work, but resolution is the main drawback of satellite images. Some important transform domain methods such as stationary wavelet transform (SWT), Discrete Wavelet Transform (DWT) and proposed method i.e. Integer Wavelet Transform (IWT) are presented to solve the resolution problem of satellite images. The proposed method uses the integer coefficient of the image. Here integer coefficient of IWT is processed in proposed method. The low resolution input is image is decomposed into sub band images such as LL, LH, HL and HH. The high frequency components of IWT are interpolated with factor 2 for resizing sub band images. To estimate the sub band images by mean of the high frequency sub band images of IWT. The interpolation factor alpha/2 applied on estimated images and low resolution input image and combine both images with Inverse Lifting wavelet transform (ILWT) to get high resolution image. The proposed method is tested and compared with different categories of satellite images that are LANDSAT8, LANDSAT7 and IKONOS. The proposed method produces sharper and more detailed image. The evaluation parameters PSNR, RMSE, MAE and MSE show the superiority of the proposed method compared to other transform domain methods.*

Keywords: *Resolution Enhancement, Discrete Wavelet Transform, Stationary Wavelet Transform, Dual-Tree Complex Wavelet Transform, Enhancement, Integer Wavelet Transform.*

I. INTRODUCTION

Satellite images are significant in research activity and some of research field that uses the satellite images are astronomy, geographical information and geosciences etc. Resolution enhancement is one of the application in image processing and it improves the quality resolution of satellite image. Some of the conventional spatial domain methods are used to improve resolution are nearest neighbour, bilinear and bi-cubic interpolation, but the disadvantage is computational problem as the order of interpolation factor is increased and find out the additional pixel values by neighbouring pixels. The Bi-cubic interpolation is more efficient compared to other two interpolation methods, because Bi-cubic interpolation produces more detail edges in image compared to other two methods. The transform domain methods produce exceptional resolution of satellite images because they directly work on the pixel of image. The wavelet is one of the techniques to increase the good quality of image. It is one of the new signal processing tool that has been successfully used in various fields. The wavelet is small, wave with finite energy. It resolves the drawback of Fourier transform because time information is lost in Fourier transform. Wavelet analysis provides time as well as frequency information together i.e., which frequency at what time. Wavelet has the ability to allow simultaneous time and frequency analysis. Many researchers have been used wavelet to improve the resolution of satellite images. This is done by determining the coefficient of wavelets that increase the sharpness of the image. In this paper we have compared some of transform domain methods such as SWT, DWT and proposed method that is IWT. These methods have been tested with different sets of satellite images. The evaluation parameters that are PSNR, RMSE, MAE and MSE show the supremacy of methods.

II. LITERATURE SURVEY

An enormous literature survey has been studied for transform and spatial domain methods to improve the resolution of satellite images. Paper [1] has presented bilateral filter and the goal is to give the spatial averaging but edges are not smoothened. The result radically changes on selecting the parameters of bilateral filters. Paper [2] has discussed super resolution with downscaling and Cokriging. It used in remote sensing images to improve the spatial resolution and spectral contents are preserved of original images but need various covariance and cross covariance information ,but some of which are not practically reachable. Paper [3] has presented complex wavelet transform. The directional selectivity is good and produces sharpness of the image. The information is collected from six different directions, so it is called direction selectivity transform. The super resolution Variable Pixel Linear Reconstruction (SRVPLR) is discussed in paper [4]. It is not suitable for remote sensing data set and spatial resolution scale is very less, but calculates the objects. Paper [5] has implemented Discrete Wavelet Transform (DWT). It decomposes the low resolution input image into four sub band images and all the sub band images are down sampled images.

The interpolation factor 2 is required to resize the sub band or down sample images. Paper [6] has proposed projection onto Convex Sets (POCS) algorithm. It uses system point spread function to remove the blurress in the image and work on simultaneous for restoration and interpolation on set of low resolution image. The main drawback of this algorithm is the need of the past knowledge of imaging system. Brightness and smoothened image presented in paper [7] and discussed about DWT and Singular Value Decomposition (SVD) algorithm. Paper [8] studied about the Adaptive Histogram Equalization (AHE) and Dual-Tree Complex Wavelet Transform (DT-CWT). Adaptive Histogram Equalization (AHE) method is used to improve the contrast in the image and produce more detailed image, also increase the local contrast of the image. The disadvantage of this algorithm is to calculate different histograms for different section of the image, but redistributed bright values available in the image with the help of Adaptive Histogram Equalization (AHE). Paper [9] has proposed DWT with stationary wavelet transform (SWT) and it overcomes the problems of DWT, because SWT does not use down sample image but it is distortion is in the image. Paper [10] has compared the transform domain methods such as DWT, SWT, DWT with SWT and DT-CWT .It is concluded that DT-CWT gives good quality for resolution enhancement, due to good directional selectivity. Paper [11] has studied the comparison of spatial and transform domain methods and suggested that transform domain methods maintain good frequency component than spatial domain methods. Paper [12] has considered medical and satellite images and improved the sharpness of image. It is concluded that using interpolation in wavelet domain provides good resolution enhancement. Paper [13] has suggested removal of the blur and noise in the satellite image by adapting good shift invariance and directional property of DT-CWT transform. Paper [14] has presented some resolution enhancement methods that are discrete wavelet transform (DWT), complex wavelet transform (CWT), cycle spinning (CS) and as wavelet zero padding (WZP) all these methods are compared with satellite image. Iterative Back Projection of Uniqueness Techniques is studied in paper [15]. They have reconstructed high resolution satellite image with multiple low resolution or degraded images. It is concluded that low computational complexity is the goal of frequency domain methods compared to spatial domain methods. Paper [16] proposed Block matching and 3D filtering (BM3D) method. It is used for noise removal of the image and compared with DWT method. Paper [17] has presented contrast and resolution enhancement techniques for color and grey level satellite images. It has used DWT and singular Value Decomposition method to improve the resolution as well as contrast of the image. Paper [18] has compared the existing wavelet techniques such as WZP, CS, DWT and SWT with moderate resolution imaging spectroradiometer (MODIS). It overcomes the drawback of many existing techniques. It concludes that MODIS method gives better resolution enhancement for satellite images. The resolution and contrast of satellite image is improved by using DWT with Singular Value Decomposition (SVD) [19]. It has

compared local histogram equalization and general histogram equalization. Paper [20] has compared discrete cosign transform (DCT) and discrete wavelet method (DWT). It concludes that DWT gives the better resolution enhancement due to maintained high frequency components. DCT stretches the images due to zero padding. Paper [21] has presented wavelet transform domain method such as SWT and DWT with SWT and both methods have been compared with PSNR, RMSE. It is suggested that DWT with SWT produces high resolution of satellite image. Paper [22] has studied literature survey on transform domain methods and compared some of the important algorithms such as DWT, SWT, DT-CWT and SWT & DWT. This paper provides comparison of transform domain methods such as DWT, SWT, DWT with SWT and DT-CWT for resolution enhancement of satellite images. Paper [23] has presented the concept of integer wavelet transform and they have combined the feature of DWT and IWT. The main goal is to determine the integer coefficient from IWT and floating point coefficient from DWT to improve the resolution of satellite image. The above mentioned methods are compared and analyzed with the evaluation parameters such as Peak Signal to Noise Ratio, Root Mean Square Error, Mean Square Error and Mean Absolute Error.

III. RESOLUTION ENHANCEMENT METHODS FOR SATELLITE IMAGES

A. Stationary Wavelet Transform (SWT)
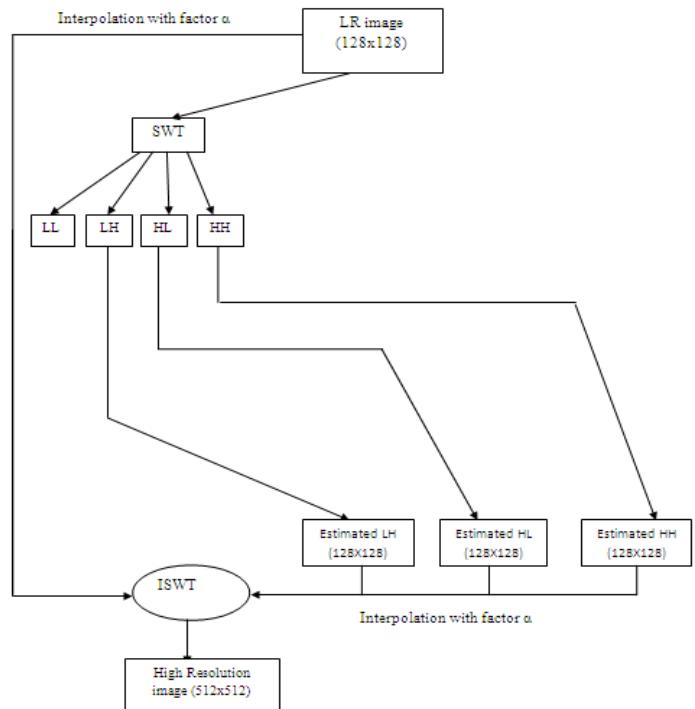
Fig.1. Block diagram of stationary wavelet transform

It is one of the transform domain method to enhance the satellite image. The feature of SWT is it doesn't use down

sample image because after decomposition of low resolution input image and sub band images are same size. The input image is decomposed into different sub band images such as LL, LH, HL and HH. The three high frequency sub band images and low resolution input image are interpolated with factor alpha. The inverse stationary wavelet transform (ISWT) is applied to combine the interpolated high frequency sub band and input image to enhance the image. It is conclude that PSNR is very low and RMSE is high compared to other methods.

B. Discrete Wavelet Transform (DWT)

DWT preserved the high frequency components. DWT used down sample image. This method provides four sub band images after decomposition of the input mage. The four sub band images are low-low, low-high, high-low, and high-high (LL.LH, HL, HH) .Bi-cubic interpolation with factor 2 is used on all four band images. Intermediate stage is provided through the difference between interpolated LL sub band image and the low resolution input image. The intermediate stage corrects the expected high frequency components. The variation image is get by low resolution input image and the interpolated sub band image. The interpolated high frequency sub band images are added with difference image to achieve the high frequency estimated images such as LH, HL and HH sub band images. The estimated sub band images and low resolution input image are resized with Bi-cubic interpolation with factor $\alpha/2$ .The Inverse DWT is used to generate the high resolution image. The main advantage of intermediary stage in high frequency sub band interpolation process is to preserve additional edge information. Thus, provides sharp image containing more edge information. Hence, the quality of the image is improved automatically by this method in terms of the sharpness of image. The DWT method gives sharper image but loses high frequency contents.
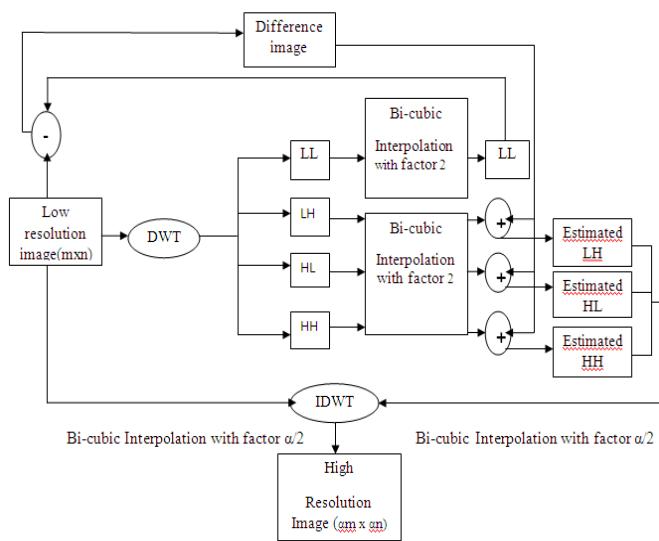
Fig.2.Block diagram discrete wavelets transform

C. Integer Wavelet Transform (IWT)

It is similar to SWT method but does not used down sample image. The low resolution input is decomposed into different sub band images with size half of the input image. The four sub band images are LL, LH, HL and HH. Three high frequency sub band images are interpolated with factor 2 for resizing sub band images. The estimated images are determined with mean and all the estimated images and low resolution input image is interpolated with alpha/2. Combine all the images using Inverse Lifting Wavelet Transform (ILWT) to enhance the satellite image. The advantage of IWT is to generate integer coefficient. The perfect reconstruction is providing due to integer coefficients of image. The PSNR is improved compared to other methods.
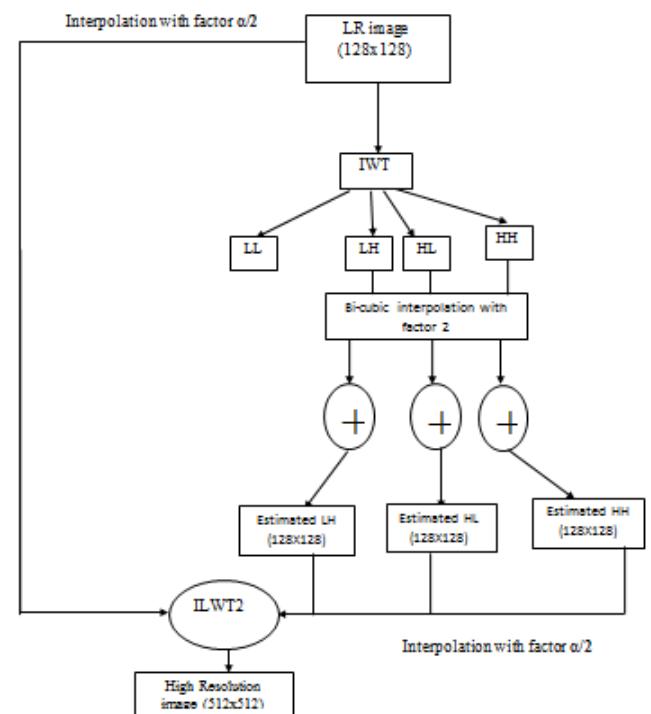
Fig.3.Block diagram Integer Wavelets Transform (IWT)

IV. EVALUATION METHODS FOR RESOLUTION ENHANCEMENT TECHNIQUES

Different evaluation methods are used to determine the performance of implemented algorithms. In this paper, the DWT transform methods are applied for determining their supremacy. The parameters which are considered for evaluating the resolution enhancement method are Peak-Signal to Noise Ratio (PSNR), Root Mean Square Error (RMSE), Root Mean Square Error (RMSE) and Mean Absolute Error (MAE).All the frequency domain methods are compared with these parameters to show the superiority of the methods over satellite image.

Mean Square Error (MSE): MSE formula is measuring the MSE between the input image (I) and the original image (O).

$$MSE = \frac{\sum_{i,j}(I\ in\ (i,j) - I\ org(i,j))^2}{M \times N}$$

Where M, and N, are the size of the images.

Root Mean Square Error (RMSE): RMSE is another method for evaluation of method. The euquivalent pixels in the reference image and the obtained high resolution image (Hr) is calculated by Root Mean Squqre Error(RMSE) formula .The better quality image will always have less RMSE value. Root Mean Square Error is calculated with following equation.

$$RMSE = \sqrt{\frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}\left(H_r(i,j) - H(i,j)\right)^2}$$

Mean Absolute Error (MAE): Quantitative result is also measured in terms of Mean Absolute Error (MAE) .MAE calculates the difference between equivalent pixels in reference image and high resolution image (Hr).

$$MAE = \frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}|H_r(i,j) - H(i,j)|$$

Peak Signal to Noise Ratio (PSNR): PSNR determine the ratio between original image and reconstructed image. The high PSNR indicate better quality of the image. The PSNR values are determined by using this equation. R is the maximum fluctuation of input image. The maximum fluctuation of input image is R.

$$PSNR = 10\ \log_{10}\left(\frac{R^2}{MSE}\right)$$

The result and Discussion

Today different satellite images are suffering with the resolution. Some of transform domain methods have implemented to resolve the resolution problem for satellite images. The important transform methods are considered i.e. SWT, DWT and IWT to increase the resolution. The methods are compared with different categories of satellite images such as LANDSAT8, LANDSAT7 and IKONOS. The performance evaluation parameters PSNR, RMSE, MAE and MSE show the supremacy of the methods. Figures.4, 5, 6 show the low resolution and enhanced images of LANDSAT8, LANDSAT7 and IKONOS satellite images. The Table 1 and Table 2 show the result obtained for particular methods.

a   b   c   d
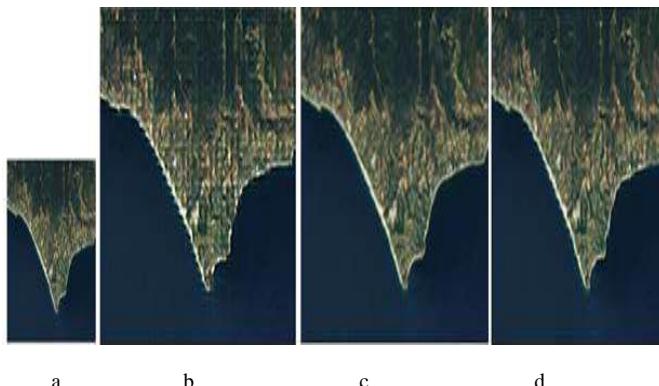
Fig.4. (a) Landsat8 satellite low resolution image (b) Enhanced image using SWT (c) Enhanced image using DWT (d) Enhanced image using proposed method (IWT) .

a   b   c   d

Fig.5. (a) Landsat7 satellite low resolution image (b) Enhanced image using SWT (c) Enhanced image using DWT (d) Enhanced image using proposed method (IWT) .

a   b   c   d
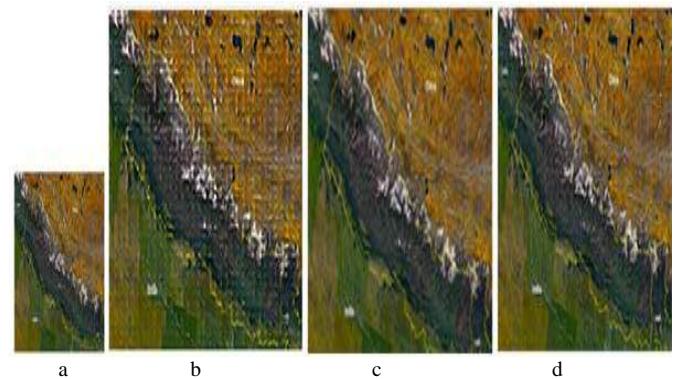
Fig.5. (a) Landsat7 satellite low resolution image (b) Enhanced image using SWT (c) Enhanced image using DWT (d) Enhanced image using proposed method (IWT) .

The Table 1 and Table 2 show the results obtained by SWT, DWT and IWT and comparison of various evaluation parameters such as PSNR, RMSE, MAE and MSE. The resolution is enhanced from 128x128 to 512x 512 (α=4).

Table.1.show the PSNR and RMSE result for Landsat8, Landsat7 and IKONOS satellite images

Methods/ Evaluation parameters	Landsats8 satellite image		Landsat7 satellite image		Ikonos satellite image	
	PSNR	RMSE	PSNR	RMSE	PSNR	RMSE
SWT	41.41	34.80	38.31	49.70	36.49	61.32
DWT	47.65	16.96	40.56	38.39	43.17	28.42
Proposed method(IWT)	49.26	14.14	42.91	29.27	45.06	22.86

Table.2. show the MAE and MSE result for Landsat8, Landsat7 and IKONOS satellite images

Methods/ Evaluation parameters	Landsats8 satellite image		Landsat7 satellite image		Ikonos satellite image	
	MAE	MSE	MAE	MSE	MAE	MSE
SWT	28.01	1211.61	38.09	2470.20	49.17	3760.59
DWT	8.30	287.88	25.81	1474.46	15.95	807.99
Proposed method(IWT)	7.12	198.67	20.03	857.05	13.21	522.93
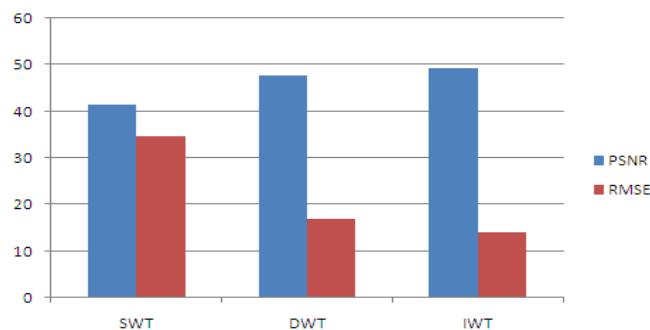
Fig.6. Graph of PSNR and RMSE for landsat8 satellite
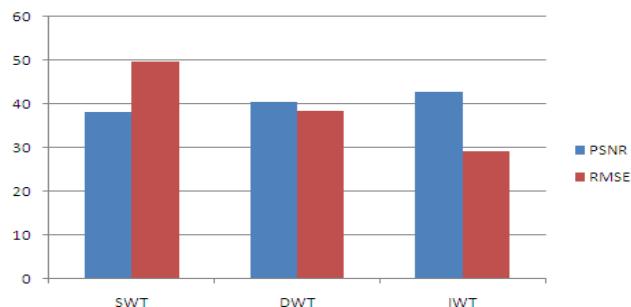
Fig.7. Graph of PSNR and RMSE for landsat7 satellite
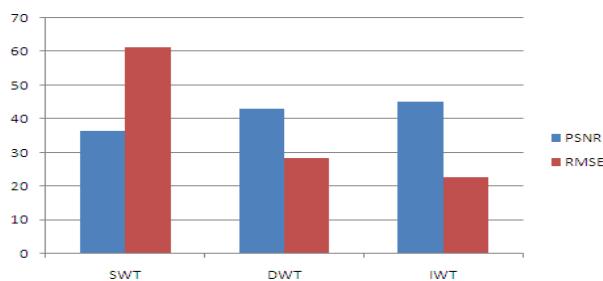
Fig.8. Graph of PSNR and RMSE for IKONOS satellite

VI. CONCLUSION

The resolution enhancement of Satellite images have been implemented by using transform domain methods such as SWT, DWT and IWT and compared in terms of evaluation parameters such as PSNR, RMSE, MAE and MSE. The resulting parameters determine superiority of methods. It is concluded that the resultant image obtained by using proposed method gives sharper image than other methods. Table1 and table2 shows the results of PSNR, RMSE, MAE and MSE. It is concluded that the proposed method is increased PSNR and decreased RMSE values. MATLAB is used for implementation, because easy to process image and video. But it need large amount of memory.

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Closed Loop Buck Converter Using Non Linear Controller (Fuzzy Logic Controller)

Shrutika Jantre, Sushil Labde
Department of Electronics Engineering,
Ramrao Adik Institute of Technology, Nerul, Navi Mumbai, India
shrutika.jantre6@gmail.com,   smlrait@gmail.com

Abstract—DC voltage conversion from one voltage level to another desired voltage level using chopper (electronic switch) is called as DC-DC converter. It has its requirements in various applications such as safety and power match conditions, domestic appliances as well as in small and big industrial applications. But error detection and correction of such converters is a vital task for which various controlling mechanisms are required. These controlling mechanisms can either be linear or non-linear. In linear controllers the error tracking and correction is a difficult task as it fails to react to the transient conditions. On the contrary non-linear controllers are more efficient in such conditions because of their advantage to react faster. Thus the non-linear type of controller to control buck converter used is fuzzy logic controller. Benefits of fuzzy logic controller are its simplicity and flexibility which helps in achieving the goal of constant voltage irrespective of variation in circuit parameters. In this paper buck converter using fuzzy logic controller is simulated in MATLAB/SIMULINK environment. The proposed strategy is then implemented on buck converter hardware set up such that for an input of 35Volts we get the desired output for variable references.

Keywords— *DC–DC converters, Fuzzy logic controller (FLC), Buck Converter, Pulse with Modulation (PWM), MATLAB (SIMULINK).*

I. Introduction

Now a days the requirements for lower voltage but higher currents and vice versa are very common. This is a challenge for modern designer in addition to economic feasibility and reliability. Power converters can be classified as, ac-ac converters, ac-dc converters , dc-ac converters, dc-dc converters. linear system design techniques like PID, Sliding mode, dead beat controllers etc. are used to design DC-DC converter. But drawback of these methods is fixed set of parameters and noise sensitivity. Therefore digital control methods which are non linear are used so as to get large-signal stability. Fuzzy controllers are suitable for non-linear time variant systems because of its simplicity of design & implementation. Mathematical model is not required for fuzzy controllers. The design of buck converter with fuzzy logic is presented in this paper.

Methodology of proposed strategy is discussed in Section II. Section III gives fundamental analysis of fuzzy controller used for the simulation. Results of simulation are presented in section IV and section V discusses hardware details.

II. Methodology
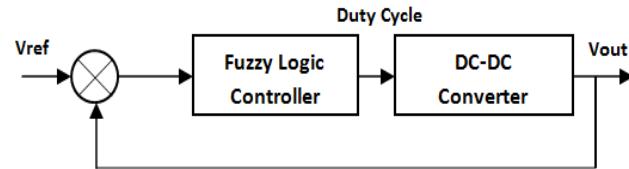
Fig.1 Block Diagram for Buck Converter Using Fuzzy Logic.

The goal of this system is to keep output voltage constant even if there are variations in the load and power supply. Here difference in the output voltage and desired voltage (Vref) is considered. This difference value is called error(e) and then along with change in error (ee) that is derivative of error will be applied to FLC through multiplexer. FLC gives variations in the values of duty cycle as the data changes. These values are compared and scaled using gain. This output is applied to the power switch of buck converter through PWM generator. Thus a desired output voltage will be obtained.

A. Algorithm:

Figure 2 shows the flowchart for algorithm. Using the research and observation (literature survey) as the guide for mathematical model of buck converter, a mathematical model is designed in order to verify whether appropriate output is achieved using MATLAB Simulink. Initially the performance of the system for different membership functions is evaluated in simulation. The most optimized membership function is then taken for the implementation.
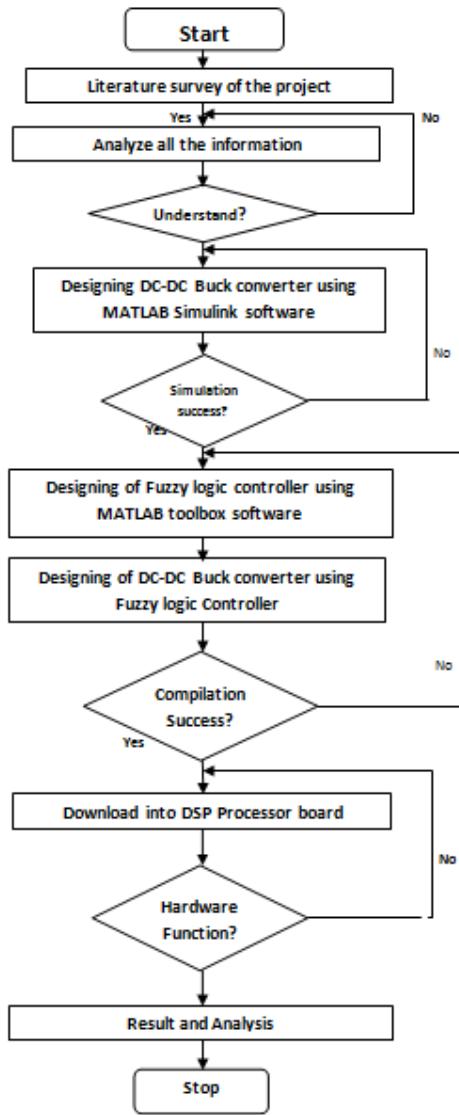
Fig.2 Flow chart of the project.

MODELLING OF BUCK CONVERTER

Figure 3 shows a buck converter. Here the switch is controlled by duty cycle coming from the controller.
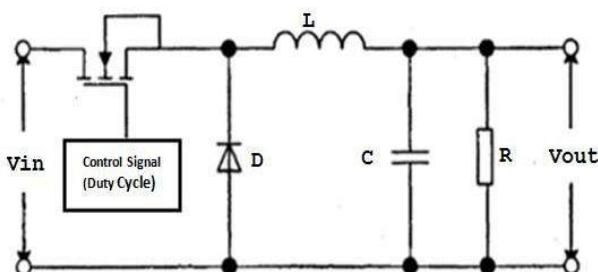
Fig.3 Circuit Diagram of Buck Converter.

Where V_{in}= Supply voltage, V_{out}= Output voltage of buck converter. Two modes of operation of buck converter are discussed here.

Mode 1 (Switch Closed): Conduction does not take place as the diode gets reverse biased due to the closing of the switch. Voltage across inductor is $V_S - V_o$., the rising current in the inductor is according to the following equation$(V_S - V_o)/L$ [1].

Mode 2 (Switch Opened): In this mode the inductor polarity reverses but current still flows in same direction. As a result current still flows through the inductor and into the load. Diode gets forward biased due to the inductor's changed reversed polarity and the required output voltage and current through the inductor decreases with a slope equal to $-V_o/L$ [1].

III. FUZZY LOGIC CONTROLLER

Fuzzy logic is an computing logic based on "degree of truth" rather than the usual "true or false" . Fuzzy logic includes various states in between 0 and 1 instead of only 0 and 1 (i.e extreme cases of truth). Fuzzy logic aggregates data and form a number of partial truths which it aggregate further into higher truths which in turn, when certain thresholds are exceeded, cause certain further results [2]. Simplicity of control, low cost, design without mathematical model are few advantages of FLC over other controllers. Fuzzy logic is used in various industrial and household applications.

A. Fuzzy Logic Block Diagram

Figure 4 shows Fuzzy logic controller.
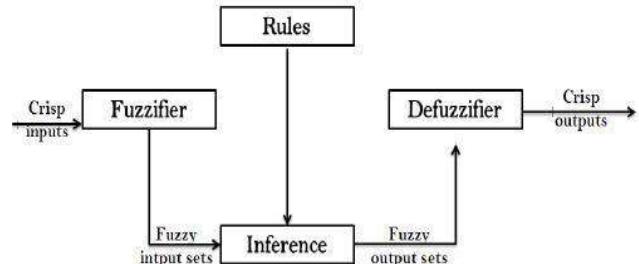
Fig.4 Fuzzy Logic Controller block Diagram.

Input: The inputs are crisp measured values.

Fuzzification: Each input data is mapped to the degree of membership function. This matching is done as per the conditions given by the rule base. For each linguistic term which applies to the input variable a degree of membership exists.

Rule base: Rule base is nothing but a set of rules. The rules used in fuzzy logic are generally "if and then" statements where the if stands for condition and then stands for conclusions. For the designed system depending on the

measured inputs i.e.; error (e) and change in error (de) computer executes these rules and give a control signal. Even for an inexpert user it is easy to understand the implementation of rule base.

Inference mechanism: This mechanism decides the control rule that is suitable for the particular situation and respectively gives the input to the plant.

Defuzzification: The combination of all the decisions (that are been taken) into a single non fuzzy output signal is called defuzzification process. Various defuzzification methods are used for this purpose.

B. The Fuzzy Algorithm for Buck Converter

Using fuzzy toolbox in SIMULINK two inputs and one output to and from fuzzy controller tool box are mapped in universe (-1 to 1) and *.fis* file in MATLAB SIMULINK is obtained.
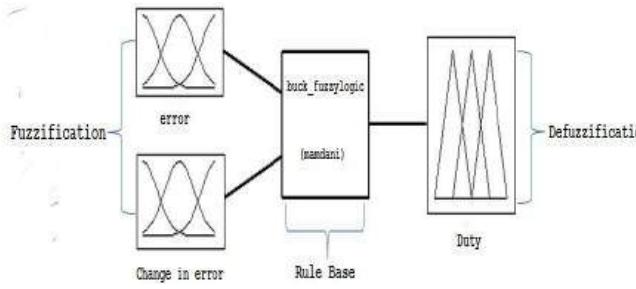
Fig.5 *.fis* File of MATLAB.

The basic fuzzy algorithm below is represented for buck converter. Fuzzy Logic Control configuration for buck converter is shown in figure 1 and same method is used in implementation.

Figure 5 shows three sections of fuzzy control algorithm

Fuzzification:

Here the two inputs which are to be converted into fuzzy values are error (e) and change in error (ee). The error voltage is calculated by taking the difference between reference voltage (V_{ref}) and the actual voltage (V_o) whereas the change in error is calculated by taking difference between obtained error (e) and the previous error (E previous) [5].

The error and change in error are given by[5]:

$$e = V_{ref} - V_o \tag{1}$$

$$ee = e - E_{previous} \tag{2}$$

Rule Base:

The rules for fuzzy control are based on common knowledge about the system. That is what decision should be taken if system output increases or decreases. This decision is based on the following conditions.

- Duty cycle should decrease when the output voltage of converter is higher than the reference voltage.

- Duty cycle should increase when the output voltage of converter is lower than theVref.

The logical operator used for Rule base is AND operator. Following are the six linguistic variables used for error and change in error.

- NB (Negatively Big)
- NM (Negatively Medium)
- NS (Negatively Small)
- Z (Zero), PB (Positively Big)
- PM (Positively Medium)
- PS (Positively Small)

TABLE I: RULE BASE FOR BUCK CONVERTER USING FUZZY LOGIC.

(e) / (ee)	NB	NM	NS	ZE	PS	PM	PB
NB	NB	NB	NB	NB	NM	NS	ZE
NM	NB	NB	NB	NM	NS	ZE	PS
NS	NB	NB	NM	NS	ZE	PS	PM
ZE	NB	NM	NS	ZE	PS	PM	PB
PS	NM	NS	ZE	PS	PM	PB	PB
PM	NS	ZE	PS	PM	PB	PB	PB
PB	ZE	PS	PM	PB	PB	PB	PB

A single level is given to each input and output. That is each input and output is given a membership grade to every fuzzy set [2]. To reduce the complexity in calculations, triangular and Trapezoidal type of membership functions are used. Figure 6 to 8 shows normalized values of error and change in error.
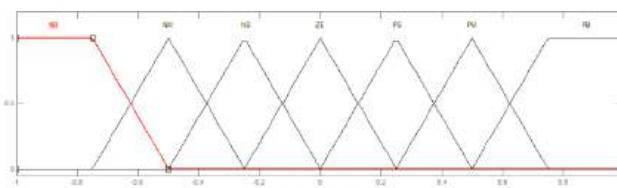
Fig.6 Membership Function for Input error.
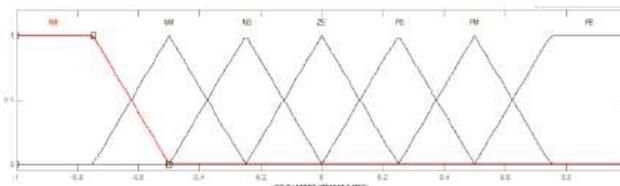
Fig.7 Membership Function for Input change in error.
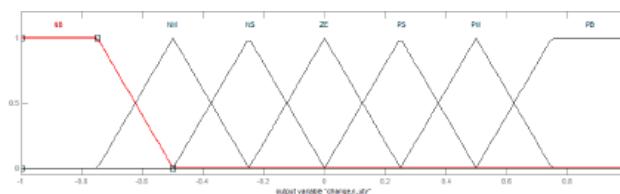
Fig.8 Membership Function for Output Change in Duty Cycle.

Defuzzification method:

Defuzzification is the last step of fuzzy inference process. Single scalar quantity is obtained at the output from aggregation process. This method does the opposite of fuzzification and gives a accurate quantity out of the range of fuzzy sets. The different fuzzification methods are Smallest of Max, Largest of Max, Centroid of Max, Bisector of Max, Mean of Max as shown in the fig. below. Amongst these defuzzification methods, the *Centroid Method* for defuzzification process is implemented.[4]
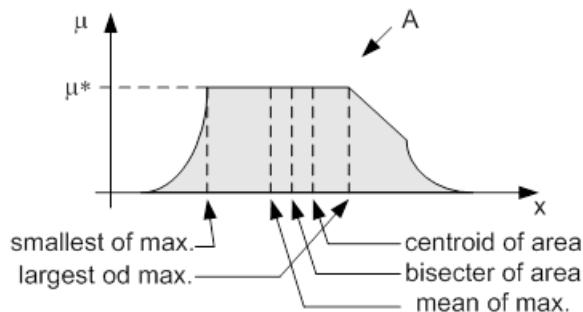
Fig. 9 Centroid Defuzzification Method.

The de-fuzzified output of the Fuzzy control algorithm is change in duty cycle which is scaled and compared to de-normalize. This calculated value will be of duty cycle which is forwarded to the PWM generator. PWM generator gives the switching pattern to control the switch in the buck converter.

IV. SIMULATION RESULTS

Implementation of proposed strategy is done in MATLAB environment. The parameters for simulation were varied and corresponding changes were observed. The tables below show the results. Fig. 10 shows the MATLAB simulation structure and Fig. 11. Shows architecture of fuzzy control for simulation
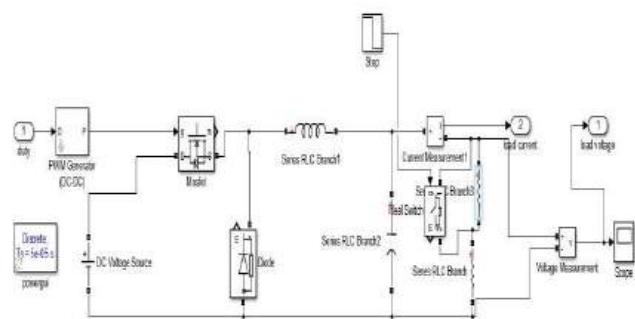
Fig.10 Simulation circuit diagram for Buck Converter.

TABLE II: BUCK CONVERTER PARAMETERS.

Parameter	Value
Inductor	4mH
Capacitor	2500uF
PWM Frequency	15KHz
Input Voltage	35 Volts
Output Voltage	17 Volts
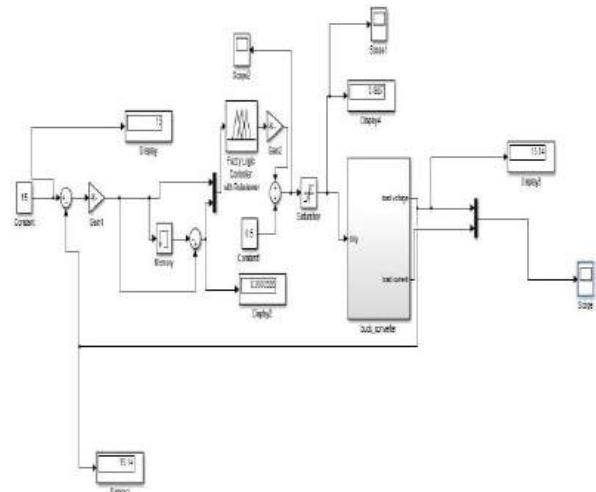
Fig.11 Simulation circuit diagram for Buck Converter using Fuzzy Logic.
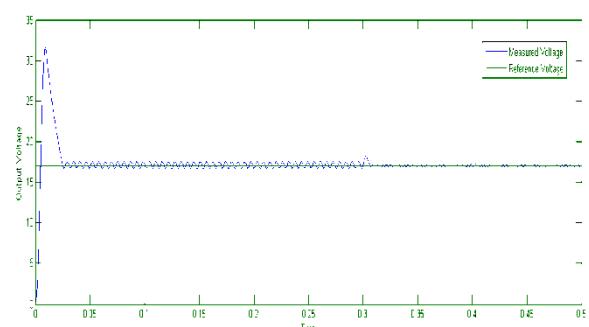
Fig.12 Simulation output of Buck Converter for input voltage variation

Fig 12. Shows that the system is tracking the change in input supplied to the buck converter by changing the output with respect to the refernce.
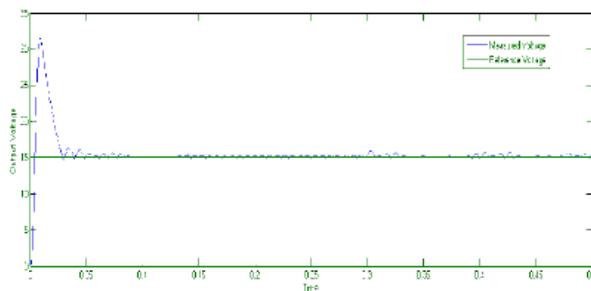
Fig.13 Simulation output of Buck Converter for reference voltage variation

The above figure shows linear relationship is observed between the refence voltage and otput voltage. Ie; when the refernce voltage is varied the output voltage is also varied respectively.
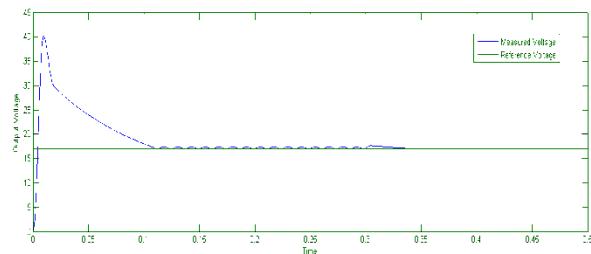
Fig.14 Simulation output of Buck Converter for load variation

By varying the load resistance the ripples observed in the output graph gradually reduces without changing the output voltage.
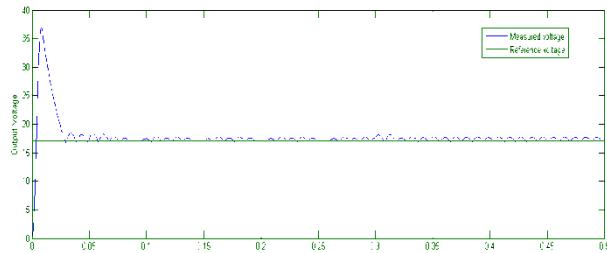
Fig.15 Simulation output of Buck Converter for inductor variation.

The effect of change in inductor value on the output voltage is that it starts increasing along with the increase in ripple content.
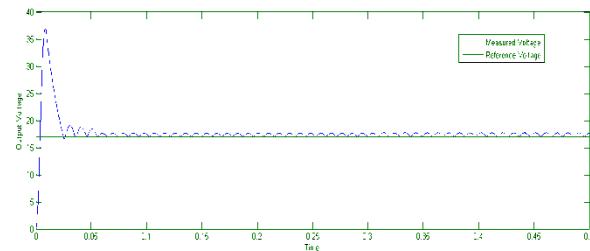
Fig.16 Simulation output of Buck Converter for capacitor variation.

When the value of the capacitor is increased variation in output voltage is observed ie; there is slight variation in the output voltage along with the increase in ripples.

V. HARDWARE IMPLEMENTATION

The Fig.13 depicts the hardware implementation setup of Buck converter using Arduino. A PWM signal is generated using an Arduino for triggering the MOSFET. The frequency of PWM signal is same as that of simulation value. The controller takes voltage as feedback and calculates error and change of error. The fuzzy logic is coded in embedded controller such that it follows the rule base designed in the simulation.

Fig.13 Hardware implementation of Buck Converter using Arduino.

VI. CONCLUSION AND FUTURE IMPROVEMENT

The simulation and hardware implementation process of DC-DC buck converter using fuzzy logic converter is discussed in this paper. The outcome justifies that a constant DC voltage is achieved at the output of buck converter irrespective of the variation in circuit parameter. Thus fuzzy logic controller proves to be an adaptive controlling method unlike linear controlling methods such as PWM voltage mode control, PWM linear mode control with Proportional Controller, Proportional Integral Controller, Proportional Integral Derivative Controller etc. as they are based on precise system equations and are generally unable to handle non-linearities and disturbances in the system. Whereas on the other hand Fuzzy controllers (which are non-linear controllers) are able to handle these effects and non-linearities in the

system efficiently and thereby improving the performance of the system and saves development time and costs [8].

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Surface Texture Detection
Calculating Area of Crack using Image Processing

Paromita Chakraborty
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
paromita.c@somaiya.edu

Kunjal Khuman
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
kunjal.k@somaiya.edu,

Krupal Patel
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
krupal.patel@somaiya.edu

Jay Patel
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
jay.kp@somaiya.edu

Sejal Shah
Faculty, KJSIEIT, Mumbai
University of Mumbai, India
sshah@somaiya.edu

Abstract—**The main objective of this approach is to enhance and detect defects on an image of a surface using digital image processing technique. Enhancement of the image using morphological operations and image segmentation techniques enables differentiation between defects and background. This perspective of texture detection incorporates functions to validate the two-dimensional properties such as area of a defect using '*regionprops*' operation. Thus, these operations helps in accurately evaluating a surface using MATLAB software.**

Keywords—image enhancement; Morphology; regionprops

I. INTRODUCTION

Image enhancement and texture detection using image processing is an important phenomenon to solve many preliminary problems such as dissension and reference accuracy. Therefore, surface attributes and geography has been the research topic for years.[1,2]. Many systems have been developed, from the simple comparator to complex optical instruments for measuring surface attributes [3]. Recently, image analysis has been made easier and more flexible by the occurrence of digital computers and vision systems [4,5]. The term surface texture analysis is a basic issue in image processing and computer vision; therefore, this is a topic which has been researched for last few years. [6,10]. Basically, the texture detection approaches can be divided as: direct and indirect contact methods. Direct contact method uses stylus instruments; the surface which is to be investigated is made a direct contact with the instrument to give surface topology. Stylus instruments have limited adjustability to measure different geometrical surface[10,11].Other limitation of the stylus instrument is it is slow. In contrast, the indirect method uses optical instruments which do not require any contact with the surface. In this paper, an indirect method using digital image processing for examining surface irregularities has been developed and its capability is investigated experimentally. Detection of surface irregularity is an initial step towards precise evaluation of surface texture.

Further it is preceded by quantitative analysis of two-dimensional parameters of a specific surface defect. This is done by using morphological operations like opening and closing operations, and functions like '*regionprops*' which accurately measures properties like area, centroid and perimeter of a defect in an image in "pixels" [12,13]. This may be then inferred according to the user's need.

II. METHODOLOGY

After referring to the various theories the following methodology can be used to accurately measure two dimensional properties of a surface defect.
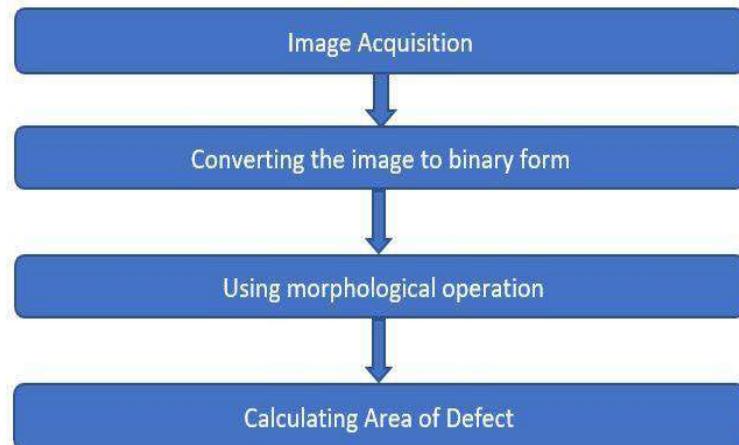
Image Acquisition

To continue the analysis, the image obtained is converted into binary using the MATLAB software.
"BW = im2bw(I, level)"
BW = im2bw(I, level) converts the grayscale image I to a binary image. The output image BW replaces all pixels in the input image with luminance greater than level with the value 1 (white) and replaces all other pixels with the value 0 (black).

A. *Applying the Morphological Operation*

Morphological operation is applied on an image, where the image is considered as a subset and a predefined template known as Structuring element. The center of the structuring element is held on every pixel of an image and check whether they are same or not. If they are equal the pixel under the center element is turned into a black pixel this procedure is operated on an entire image.The dimension of the structuring element may vary according to the input image. As a result, all the defects in an image is obtained and area of the defect is calculated.

B. *Closing operation used in this method*

Closing is a morphological operation in image processing. Closing is similar to dilation operation in which it enlarges the boundaries of foreground (bright) regions (and reduces background color holes in such regions),but it does not harm on original boundary shape.The morphological operation is determined by a structuring element. The structuring element is used to sustain the background region which is replica of the structuring element,or which contain the structuring element completely, while removing all other background pixels.

C. *Calculating Area of defect*

The area of a crack in the image is calculated using the matlab function "regionprops".

"stats =regionprops(BW,properties)"

returns measurements for the set of properties specified by properties for each 8-connected component (object) in the binary image, BW. "stats" is struct array containing a struct for each object in the image. Regionprops can be used on contiguous regions and discontiguous regions. The area is calculated using the argument 'Area' in place of properties in regionprops.

III.   RESULTS AND DISCUSSION

From the observation the following can be inferred:

- Result has been obtained keeping in mind the requirements f o r precisely measuring the two-dimensional properties of particular defect or crack present at the focus.
- The output image shows the enhanced crack present on the surface.The mathematically calculated output is shown by the variable 'Area' which is in structural form, the area of the crack can be converted into an array of pixels.
- This can be converted in square millimeter using the formula1 millimeter^2 = 0.001479 * No. of Pixels.
  The maximum area in the output gives the area of the longest crack.
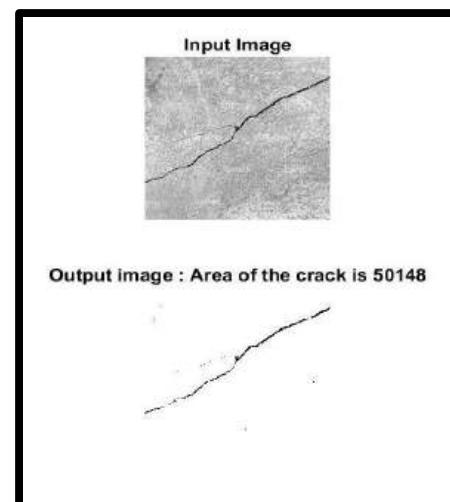
Fig 1 : Detection of single crack
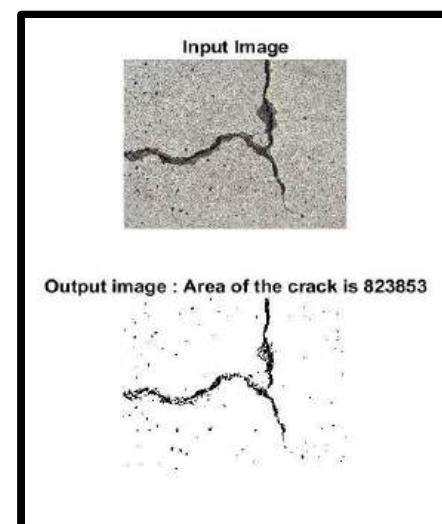
Fig 2 : Area of crack is given by maximum value

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Smart car parking using firebird V

Sneha Bobade
UG Student, KJSIEIT, Mumbai

University of Mumbai, India.

sneha.bobade@somaiya.edu

Priyanka Mali
UG Student, KJSIEIT, Mumbai

University of Mumbai,India.

India.priyanka.mali@somaiya.edu

Shaila Jadhav
UG Student, KJSIEIT, Mumbai

University of Mumbai, India.

shaila.j@somaiya.edu

Chirag Rathod
UG Student, KJSIEIT, Mumbai

University of Mumbai, India.

C.Rathode@somaiya.edu

Sarika Mane
Faculty,KJSIEIT,Mumbai
University of Mumbai,India.

sarika@somaiya.edu

Abstract—**This paper reports design of an automatic smart car parking for finding vacant space in parking lot. Here we use firebird and zigbee to design parking management. RFID is used to detect the IR Sensor and transmit the particular signal using Zigbee module to communicate with uc Atmega 89s52 and display the vacant space on LCD.**

Keywords:ucAtmega(Microcontroller),RFID(Radiofrequency identification),IR(infrared),Firebird Robot RTC(Real time clock)

I. INTRODUCTION

With the rapid increase in availability of vehicle and usage in recent years, finding a vacant car parking space has become difficult, resulting in a number of practical dispute. Parking problems are becoming global and ever growing at an alarming rate in every city. Wide usage of wireless applications for parking, show that digital data distribution could be the key to solve emerging parking problems.

In this proposed system, we present an effective path finding algorithm for mobile robot navigation. The algorithm stem is to perform minimum-cost path navigation with the added obstacles avoidance capability. A set of passive RFID tags placed which are used for location identification. During navigation, the RFID reader attached on the mobile robot receives its nearby RFID tags' ID to determine the robot's current position, and use it to formulate the minimum-cost path that goes from the present location to the target point. The devised path is a set of connected RFID tags computed by the algorithm. The proposed improved algorithm explored a heuristic search of the minimal cost navigation path that taking into consideration of the presence of obstacles so that the devised optimal path would not collide with the obstacles. Passive RFID tags have the advantages of low cost, providing unequivocal coordinate information, fast computation and easy deployment.

II. Literature survey

Various authors have looked at developing sensor-based technological solutions to improve the use of parking spaces. Pineda [3] studied the costs generated by the extra distance vehicles have to travel to find a parking space in the cities of Madrid and Barcelona. The costs in consumption for the extra distance and time spent on the road are approximately 347 million and 268 million Euros per year, respectively. Public transport authorities and the operators of parking spaces are evaluating various solutions to improve parking space management. Solutions based on infrastructure investment are expensive and implementation is slow. Technology-based solutions have been proposed as an alternative with lower costs and faster implementation. Benson [5] proposed a network-based wireless sensor system. A communication link is established by ZigBee and the electromagnetic sensors were developed specifically for this system. Lin [6] proposed a vision-based parking management system to manage an outdoor car park using cameras set up around the parking space, sending information, including real-time display, to the ITS centre database. A scientific solution based on a GPS-based vehicle navigation system and the past and current status of the car

park was proposed by Pullola [7], who modeled the availability of a car park using the Poisson process. The author also proposed an intelligent algorithm which helps the driver choose the parking space with the highest probability of being vacant.

III. TYPICAL DESIGN CONSIDERATIONS FOR A Car parking system

A. Firebird

The firebird V robot is the 5th in the firebird series of the robots. First two versions of the robots were designed for the embedded Real-time system. All the firebird V series robots share the same main board and other accessories. Different family of microcontroller and be added by simply changing top microcontroller adaptor board

Fig 1:Firebird V
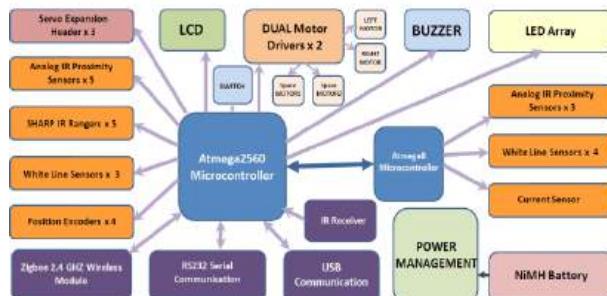
Fig 1.1: Firebird Block Diagram

B. IR Sensor

In this proposed system we were used IR module as sensing node because of its simplicity, low cost, rugged operation. Infrared transmitter is one type of LED which emits infrared rays generally called as IR transmitter. Similarly, IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important points is both IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes The IR rays to receiver
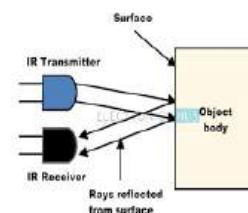
Fig 2:IR Sensor

C. Zigbee

ZigBee is an energy saving communication standard designed for low-power short range communication between wireless devices. ZigBee is low power radio frequency band. The UART interface can connect directly from microcontroller to pin of ZigBee module, Using UART interface. Communication between wireless device and microcontroller can be done. ZigBee module is used to implement on this project due to its low cost and low power consumption as well its long range data integrity can sense up to 30 m in indoors and up to 100 m in outdoor. It is a new wireless data transmission technology that currently being use in many applications and various fields, The GUI displays that design in this project is to display the availability of each parking lot that put under monitor whereas as can be seen in the GUI display is to shows the reception of the user request for lot reservation
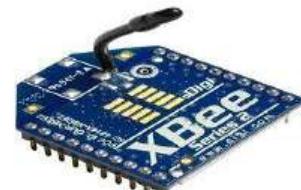
Fig 3:Zigbee

D. RFID sensor

The RFID consists of a reader, and RFID tags. The RFID tag proceeding a unique ID and fixed information. The tag triggered when it approaches the RFID reader will pass the signal into the digital and computing content. In the proposed RFID Parking system the RFID reader is deployed at the gate; In addition, the RFID tags are place in the car. Considering the probability, the RFID system should overcome the accuracy affection of weather and sunshade-pester of the car, and the RFID tag type. When an RFID Parking Management System user's car approaches the gate, the induction and communication between RFID tag inside the car and antenna of RFID System translates the signal information to the digital content. Presents the work flowchart of the parking system

Fig 4:RFID Reader

E. MOTOR DRIVE

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 centre pins connected together and used for heat sinking The L293DD is assembled in a 20 lead surface mount which has 8 centre pins connected together and used for heat sinking.

F. MICROCONTROLLER

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

IV. Block diagram and description
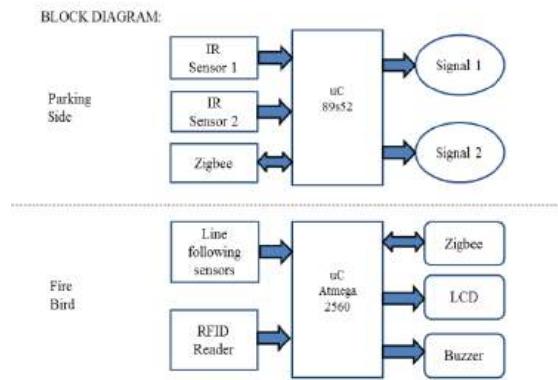
Fig5:Parking Side & Fire Bird Block Diagram

This block diagram is about the parking of vehicles automatically using line following technique combined with RFID. Here the main control unit is the uC 89s52 which keeps record of all the parked units and there is an RFID reader installed in each car. At first when the car arrives at the entrance, main control unit checks for the availability of parking slot using infrared sensors at each slot , if available then it sends parking slot allotment to the car. Now for automatic parking we use line following technique with number of nodes (RFID tag) at each branch to make decisions for a particular parking slot. After crossing the main entrance of the gate then it gets checked at each node of the RFID tag and makes decisions for its allotted slot.

A.Technical details about block diagram

The inputs to the main controller are the infrared sensors at each slot of parking for continuous sensing as shown in block diagram and zigbee is connected for serial communication and also for wireless transmission /reception. The signal 1 and signal 2 in the bock diagram is used for indication of slot empty(Green LED) and all slots full(Red LED).The uC Atmega 2560(Fire Bird) has line following sensors for sensing the lines and keep the car in line ,also it has an RFID reader which reads the RFID tag at each node and each tag has a unique identity .It also has zigbee to communicate with the zigbee connected to the main controller for sensing purpose and an LCD and Buzzer is there for displaying of status and for alert purpose.

B.Flowchart of parking system

Fig 6: Firebird side

Fig 7: Parking side Circuit Diagram

V.CONCLUSION

Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can. Yet robots cannot perform every job. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potential

VI. FUTURE SCOPE

Automated multistoried car parking system has a vast scope in the future because of the following reasons given for Demo we have used DC motor in future it can be implemented With hydraulic motor using which the car can be lifted quickly When compared to the DC motor. It can also be implemented With the RTC (Real time clock) which can be used for billing Purpose. It keeps the record of the entry and exit time of the Car. In order to increase the number of the number of slots Higher version of microcontroller can be used. And infrared Sensors can be used for each and every slot in order is to slot is

Free to park or it is full. Here to provide security we are using Verification code scheme, in future it can be improved further.

VII. ACKNOWELEDGEMENT

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Fig 6.1: parking side

C. Circuit diagram

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Hand Gesture Recognition for Deaf and Dumb using MATLAB

Yuvraj Singh Thakur,
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
yuvraj.t @somaiya.edu

Dhavit Vaghela,
UG Student, KJSIEIT, Mumbai
University of Mumbai, India.
dhavit.v @somaiya.edu

Satish Yadav
UG Student, KJSIEIT, Mumbai.
University of Mumbai, India.
satish.yadav @somaiya.edu

Shreyas Vaidya
UG Student, KJSIEIT, Mumbai
University of Mumbai, India
shreyas.v @somaiya.edu

Sejal Shah
Faculty, KJSIEIT, Mumbai
University of Mumbai, India.
sshah@somaiya.edu

Abstract— **With the advent of image processing and computer vision techniques, there has been huge research going on in the field of biometric classification and identification. On combining these techniques with machine learning, not only efficient but also smart applications can be developed. Biometric refers to measurement of various human body parts such as hands, fingers, face, etc. to distinctive features such as fingerprints, iris scan, etc. A sub branch of this field is hand gesture recognition which deals with classification of hand movements and signs. This paper shows how to classify those hand gestures using Computer Vision and Machine Learning algorithms and convert them into text and voice to facilitate communication between the hearing deficient and normal people.**

Keywords: KNN, Gray scaling, GUI, HSI, SURF,

I. INTRODUCTION

The field of computer vision is growing day by day with constant research in the fields such as object detection[1], face detection[2], biometric authentication[3][4] and much more. Computer vision combines the human visual perception with speed of computing to draw accurate results from an image or a video feed. Machine learning helps in finding patterns in each set of training data and provide accurate results for a test data by learning from those patterns. Combining this characteristic of computer vision and machine learning can lead to smart, efficient and reliable image classification systems. Image classification is a process of classifying/finding a match for an input image matching its features with the features of previous training sets.As the problem uses to computer vision the first step is to capture an image using a camera. While traditionally low resolution cameras are used for image capturing, Bay,

Herbert [5] approach uses Kinect. Kinect senses the depth at which the hand is located and thus helps in proper segmentation of and from the background. While webcam do not help in segmenting the image but the most important property they possess is, that they are cheap while Kinect are really expensive. Various image segmentation approaches such as blob detection, background subtraction etc can be used. Next step is to define various feature descriptors various feature descriptors based on edge information or using feature description methods such Harris methods [11] can be used. Mikolajczyk and Schmid[12] show comparison of such local descriptors For learning from these features, there are various methods such as Neural Networks, Machine learning, template matching etc.

II. SYSTEM DESIGN

The overall design and workflow process is divided into the block diagram shown in fig1.

A. Image Acquisition

In Image Acquisition, the test image of hand sign is captured using a webcam. A webcam is a digital video camera used for basic image and video capturing and functions. Other methods for image acquisition include using an depth sensing camera which is used to segments out the object with least depth[5].
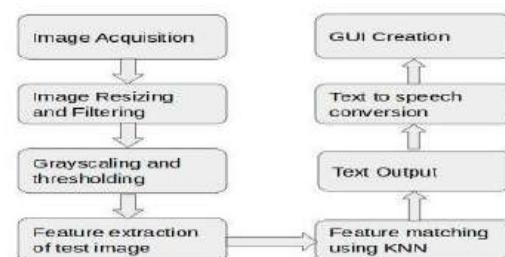
Fig.1 System Design Steps

B. Grayscaling and Thresholding

The test image taken is converted into a grayscale image and then thresholded to differentiate the hand sign from the background. For thresholding the image we are use Otsu's method[5]. Thresholding is used for segmenting out the hand from the background. Thresholding can only be used for applications where there is uniform background. If a non-uniform background is used, then other methods should be implemented such as skin colour detection by converting the image into YCbCr[9][10] format. From the given two the latter is most preferred. The reason behind this is that while for different colours of skin Y component varies but the Cb and Cr component show the least variation.

C. Image Resizing and Filtering

For faster computation of the hand signs, image resizing is done and the noise present in the image is removed by applying median filters to the image. Median filtering[6] is used for removing salt and pepper noise from any grayscale image. The median filter maintains the sharpness of the image while removing its noise[7].

D. Feature Extraction from Test Image

Feature extraction is a method of finding various distinctive features in the image. Here first the SURF[1] algorithm is applied on the image, this algorithm provides us with various feature descriptive features. The SURF algorithm is scale and orientation independent. SURF identifies the features in a image which show least effect of scale and orientation using Laplacian of Gaussian and 2x2 Hessian matrix on the input image.

Fig.2 SURF features descriptors

E. Feature Matching Using KNN

KNN is one of the most used machine learning algorithm in the field of Statistical pattern recognition. The working of KNN is quite simple, the feature vectors of the training set are first trained to produce a classifier. Once a classifier has been produced then the feature vectors from a test image are extracted and given to the classifier. The classifier looks for K nearest feature vectors for the given test feature vectors. This is done by finding the distance between the test and trained feature vectors. Various distance functions[13] such as Hamming distance, Euclidean distance, city block distance can be used to find the nearest neighbouring feature vectors.

Consider the test image in fig(2), the image has two families of features: squares and triangles. Their houses are shown in the feature space. Consider a new feature creates a house in the feature space shown in the black circle. this house should be assigned to one of this feature family i.e. square/triangle. This process is called Classification. From the image, it is very easy to determine that square is the nearest neighbour to the new feature. But if many triangles are near to it, then it is not sufficient to find the nearest neighbour of the image. Instead we check some K nearest families of the image and assign the majority in them to the new feature in the space. In the image, supposes K = 5, which means 5 nearest neighbours need to be checked. He has three triangles and two squares, so now the new feature should be assigned to the triangles family. This is the method to calculate the k nearest neighbours. The value always changes with the change in the value of k. A database of the hand gestures representing numbers 0 to 9 was prepared as training examples.
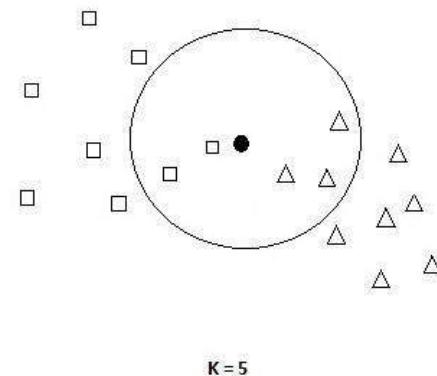
Fig.3 KNN visualization

F. GUI creation

A GUI (Graphical user interface) is created using MATLAB GUIDE app to make the project user friendly. GUI contains an option to convert the detected symbol from text to speech. For Text to speech we will be using text2speech - tts file from the MATLAB file exchange[15].

III. RESULT

The classifier is trained using the *bagoffeatures()* function of MATLAB for feature dimension independent classification. Bag of features converts the features into 500 visual words based on their occurrence in the images. Below is the confusion matrix for the above trained classifier.

Fig.4 Confusion Matrix

While the confusion matrix indicates that efficiency of 89% was achieved after running the classifier on images captured through webcam while testing indicate the efficiency of around 72.4%. Below are the images indicationg various hand signs.
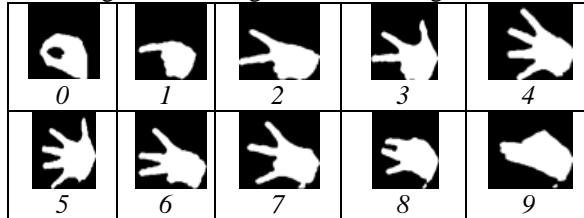
Fig.5 Hand Signs from 1 to 10

The number is:1

Fig.6 Output of classifier for above image

IV. CONCLUSION

An hand gesture classification method was developed using SURF feature description method. The classifier gave an efficiency of about 72.4% and was run on a number of text images. The downside of the method is the local features which depend on overlapping fingers could not be identified because the edges of overlapping figures gets filled due to image thresholding.

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System Requerements:.NET or Microsoft SAPI (Speech SDK 5.1, Visual C++ 2005 or 2008) .

Bomb Disposal Robot

Sheetal Jagtap
Assistant Professor
Electronics(KJSIEIT),Sion
Email: sheetaljagtap@somaiya.edu

Mayank Patel	**Shrutika Patil**	**Sneha Yadav**
BE-Electronics (KJSIEIT),Sion	BE-Electronics (KJSIEIT),Sion	BE-Electronics (KJSIEIT),Sion
Email:mayank.vp@somaiya.edu	Email:shrutika.patil@somaiya.edu	Email:sneha.ry@somaiya.edu

Abstract— This paper represents the bomb disposal robot to improve the defense of our nation from, help suicide bombers and perform various activities that a normal man can't perform without risking his life. The Bomb Disposal Robot can be controlled by the bomb technician, at the user end to control the robot remotely. The user transmits a signal over an RF link to the Robot, where it is received, identified by the robot and given to the appropriate module. The Robot consists of a base, a robotic Arm. We have used servo motors movement of robotic Arm. The main objective of the project is to provide safety to the bomb disposal squad by providing an extra line of defense.

Keywords— RF module; Robotic Arm;

I. INTRODUCTION

The word robot was first used by a Czechoslovakian dramatist, Karel Capek, in his 1921 play "Rossum's Universal Robots". Robot in Czech is a word for worker or servant. The Merriam - Webster Dictionary defines robot as a machine that looks and acts like a human being, an automatic apparatus, something guided by automatic controls. According to scientists, the robots of today have the intelligence equal to that of a cockroach, which does not seem very bright. But it is being said that in the next twenty years, robots will have knowledge equal to that of a rat. This shows how much research is being done in this field.

The robot we are making is command and control robot. The robot is controlled using a control application at the user end. The bomb technician controls the robot using this application. The user sends a signal that is transmitted serially over an RF link to the Robot, where it is received, identified by the Bot and performs the required action. Sensitivity variation of parameters in data logger, it can be replaced human job to measure parameter in a high-risk situation. Furthermore, this system is equipped by real-time information as well as capture historical data.

II. TYPICAL DESIGN CONSIDERATIONS FOR BOMB DISPOSAL ROBOT

Microcontroller: A microcontroller is a single chip, which consists of on chip CPU, RAM, EPROM/PROM/ROM, I/O– serial and parallel, timers, interrupt controller. For example, Intel 8051 is 8-bit microcontroller and Intel 8096 is 16-bitmicrocontroller. 89C51 microcontroller has 4KB of Flash programmable and erasable read only memory and 128 bytes of RAM. There are 40 pins which are divided into four ports named as P_1, P_2, P_3 and P_0. All the ports of microcontroller are 8-bit bi-directional ports, and can be used as both input and output ports.

All the ports of microcontroller have external pull ups except P_0 which needs external pull-ups. When 1s are written to these port pins, they are pulled high by the internal pull-ups and can be used as inputs. All the ports are bit addressable and their bits can be retrieved individually. Two ports i.e. Port P_0 and P_2 provide low byte and high byte addresses, when connected to an external memory. Port 3 of the microcontroller can be used as I/O ports as well as it can perform different alternative functions. If the corresponding latch is written to '1' then different alternative functions can be performed. To use the port as input port, '1' should be written to the latch. This port also has internal pull up and limited current driving capability. AT89C51 has an inbuilt UART for serial communication. There are six interrupts which includes two timers and hardware interrupts that can be programmed to operate at different baud rates.

Fig.1.1 IC

LCD Display Module:
The 16x2 LCD Display is used for the user interface. The LCD is directly controlled by the MCU. The LCD used is a 16x2 (16 characters by two lines) format type, driven by Hitachi or equivalent driver controller. The LCD module can display all alphabets and symbols as per ASCII format, and can store eight custom characters.

RF transmitter module: The RF433MHz transmitter module is for ASK modulation using an RF transmitter an RF transmitter tuned to 433MHz frequency. It features an in-build crystal oscillator and can be used to send bit-wise transmission. Orders given by the customer are encoded and sent wirelessly through this transmitter. The power supply can vary from 4V to 12V, depending on the range and power required. Data pin of the transmitter module is connected to TXD pin of IC2 through transistor T1 and resister R2. An antenna of 15cm to 20cmlength is desirable for long-range communication. Message on LCD at transmitter unit.

RF receiver module: The RF433MHz receiver module can work in sync with RF433MHz transmitter. It receives signals sent by the transmitter. Receiver data pin of IC4 through transistor T2. The receiver only needs 5V supply

and an external antenna. This module is ideal for short-range remote-controlled applications, where cost is the primary concern. Message is received at receiver unit.

Power supply: The system requires a regulated voltage of +5V for the MCU, LCD and RF modules. The battery voltage is converted to 5V, required for both transmitter and receiver units using IC 7805 regulator. Capacitors are used in the input and output of IC 7805 to have more stability and to bypass transient signals. An LED in series with a current-limiting resister acts as a power-on indicator.

Magnetic sensor: Magnetic sensor is a Digital Sensor, It gives TTL based output that means 0V and 5V .It acts as a switch that can be normally Open (NO) or Normally Closed (NC). Magnetic Sensor is of two chips; one is having magnetic part and another one having switching part.

Fig.2.1 Magnetic Sensor

IR sensor: The basic idea of IR sensor is easy to build, easy to calibrate and still provide a detection range of 10- 30 cm. This sensor can be used for most indoor applications where no important ambient light is present. An infrared sensor is an electronic device that emits an infrared light which is not visible by the naked eye. These radiations then detect the objects that appear in front of the sensor.

Fig.2.2 IR Sensor

Temperature sensor: The LM35 is a temperature detector sensor integrated-circuit with an output Voltage linearly-proportional to the temperature.

The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Here, LM35 sensor is used for fire detection so as to prevent the BOT from any flammable condition.

Fig.2.3 Temperature Sensor

Motor driver: L293D is a Quadrable high current half edge driver. L293 is design to provide bidirectional drive currents of up to 1 Amp at voltages 4.5 to 36V and input current for the motor driver is 2 Amp/channel and output is 1amp/channel.

L293 are used to drive loads such as relays, solenoids and bipolar stepper motors.

Fig. 2.4 L293

III. BLOCK DIAGRAM
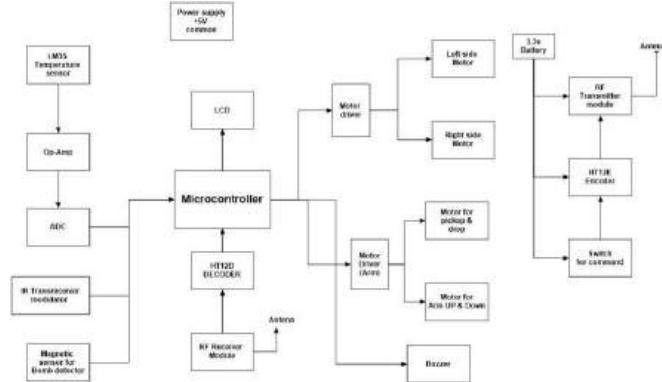
Starting from the digital sensors, the IR transreceiver module act as an object detector, initially IR sends a signal with a frequency of 38KHz.If any object is detected a signal is received at the IR transreceiver. By default it gives logic 1 to the microcontroller if any object is detected, the logic changes and the microcontroller gets logic 0 and if no object is detected, then it gives logic 0. If IR transreceiver signal is 0, then the LCD displays that an object is detected.

Now we come to the magnetic sensor, it is basically a read switch or open switch. Microcontroller has internal pull up register, because of this it's default value is 1.So the north and South Pole should attract and act as a closed circuit. The desired command is given to the microcontroller, and then the BOT receives the signal that the bomb is detected.

LM35 sensor is a analog sensor and generally used for domestic purpose and can be easily interfaced, it can sense up to 150 degree Celsius. For 0 degree the sensor gives 10mV whereas for 150 degree it gives 1.5V. The output of the LM35 is given to the Op-Amp. Here a non-inverting Op-Amp is used in this BOT to amplify the weak signals because LM35 cannot provide the sufficient voltage to the microcontroller i.e.5V. ADC is a analog to digital converter and is given to microcontroller by using SPI protocol. ADC has a count of 4095. The output of the sensors used is shown on LCD in the digital form.

RF transmitter and receiver have 433MHz Carrier frequency and cover a distance up to 10m and have ISM band used for domestic purpose.

IV. SOFTWARE

Programming a Microcontroller:
Programming of a microcontroller can be done by transferring the data from the compiler to the memory. A compiler is software which provides a user to write, test and debug a program. The program for a microcontroller is generally written in C or assembly language. The hex file which is generated by the compiler contains the machine language instruction by which a microcontroller is programmed using a burner. The hex file is transferred to the memory of

the microcontroller. Once a program is transferred or written in the memory, it then works in accordance with the program.

A microcontroller burner is device which is used to load a program to the microcontroller that is used to transfer the machine language code to the microcontroller from the PC. The compiler converts the code written in languages like assembly, C, java etc to machine language code and stores it in a hex file. A microcontroller programmer acts as an interface between the PC and the controller. The software of the programmer reads data from the hex file stored on the PC and sends it into the controller's memory. The controller on which the program needs to be burned is placed on the programmer using a ZIP socket. The software transfers the data from the PC to the hardware using serial, parallel or USB port.

Fig. 3.1 Mircrocontroller

For the software part we have used Keil MicroVision4. We had the basic knowledge of how to use microcontroller and are familiar with instruction set of our specified microcontroller.

The keil development tools offer numerous features and advantages that help you to develop embedded applications quickly and successfully. They are easy to use and are guaranteed to help you achieve your design goals in a timely manner. First, we initialized port P1 for the moment of the robot, P3.2 is use for the robot to move left, P3.3 is used to move forward, P3.4 is used for the robot to move right, P3.5 is used to move reverse. For robotic Arm to open P2.1 is used, for closing the robotic Arm P2.0 is used, P2.2 is used for the arm to move UP, P2.3 is used for the Arm to move down, P1.2 is used for the magnetic sensor, P2.4 is used for the buzzer and the LCD is initialized to Port P0. For the application of fire detection if the temperature goes above 40 degree the sensor senses the fire and the buzzer beeps indicating that fire is detected.

V. APPLICATION

The robot is basically designed as an assistant to the bomb disposal squad but there are also other applications of this robot.

1. Can work as an object detector to detect the nearby objects.
2. It can be used as a fire detector robot.
3. In military, robot acts as a soldier.

VI. FUTURE SCOPE

The system that we have built is working prototype of a robot, which should be compact, fast and accurate. This prototype may not have the features and reliability of the original design. It is only being developed to ensure that the design is feasible, not impractical and can be implemented on a much larger scale in a more efficient way. Thus the further applications can be implemented using following mechanism.

1. **Step climbing mechanism:** The bot can be used to climb several heights using MSRox motion system which will help the user to move from one floor to other in a case of step climbing.

2. **Wireless video transmission:** For the safety of the user the wireless video transmission can be used to keep them away from the bomb site.

3. **Compact Design:** Accuracy and efficiency are the result of the faster motion because of the compact design. Therefore the bot can be enhanced to be much smaller size for faster and accurate operation. Hence a compact robot will easily do the job.

4. **Improve Reliability:** The robot can be improved to be more reliable and accurate by installing stepper instead of the DC motors, which are more accurate and also have the feature of the holding torque, which enables the movement of heavy object with ease.

5. **Removable Gripper/Multi-Gripper Robotic Arm:** We can attach the gripper to the robotic Arm which will be fixed at the moment and will work only with specific shape of objects. We can place a gripper that can be removed and replaced by the gripper or multi gripper robotic Arm for different type of materials and for different shaped objects.

6. **Night Vision Camera:** The robot which will be used with a wireless camera and is not useful in situations where the visibility is very low. Night vision is most widely available in security cameras. Some work only at night, while others switch modes based on user input or ambient light.

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Cloud Based Smart Ration Card System Using RFID

Akash Patil[1], Prof. Subhasini Shukla[2], Anurag Gaonkar[3], Ashutosh Yadav[4]

Department of Electronics & Telecommunication Engineering
St. John College of Engineering & Management
Palghar, Mumbai University

Abstract- **Ration card is an important document which provides information related to a consumer. The purpose of ration card is to provide ration to poor families as allocated by the government at low cost. The ration products include rice, wheat, sugar, kerosene, etc. It can also be used to apply for gas connection. In this paper, Radio Frequency Identification (RFID) tags are used to replace the current ration card. A unique RFID tag is allocated to every consumer, it will help in authentication of consumer information. The information of the consumer is stored in a database which is connected to Amazon Web Services (AWS). To achieve a more secure authentication, a One Time Password (OTP) is used. When a purchase request is initiated on the system, an OTP is received by the consumer on their registered mobile number. After consumer enters the received OTP, the system sends it to the database for authentication. If the OTP entered by the consumer is correct, the system accepts the request and then ration content is allocated to the consumer. After the allocation, the ration the system updates the database. The consumer will also receive an SMS regarding the ration purchase.**

Keywords- RFID; SRC; AWS; OTP

I. INTRODUCTION

Ration card plays an important role for every citizen of India. It includes personal information about the consumer and it acts as address and identity proof. Ration card is based on the economic condition of the family and they come in various colors. Food security system developed by the Government of India subsidizes food and fuel for the poor. It includes distribution of food grains like wheat, rice, salt, sugar, oil and kerosene from the ration shop. The ration is allocated to the consumer on a monthly basis. The current ration card has many disadvantages and drawbacks. A shopkeeper can sell the products on the black market to gain profits as the government doesn't have any track record of the products. The shopkeeper can even hike the price of the product. The shopkeeper can even make a fake entries in order to deceive the government. Sometimes the consumers may not be aware of the products available at the ration shop. In order to eliminate these errors we are implementing Cloud based Smart Ration Card System using RFID. It will help us to reduce the security issues present in current manual ration card system. It ensures better management of public distribution system.

II. BACKGROUND

A. Arduino

Fig. 1. Arduino Mega 2560R3

Arduino is a hardware prototyping platform. It is a microcontroller board which processes inputs and send outputs. Arduino Mega2560R3 as shown in fig.1 is based on ATmega 2560 microcontroller. 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 [1]. It works on 12V DC power supply. It can be programmed using arduino IDE.

B. EM-18 RFID Reader

Fig. 2. EM-18 RFID Reader

The EM-18 RFID reader module is based on radio frequency identification technique. It is shown in fig.2. It operates on 125 KHz frequency band. It can scan a passive RFID tag from a distance of upto 10cm. It can be connected to any microcontroller using either UART or RS232 port. It requires 12V DC power supply for operation.

C. *ESP8266 Wi-Fi Module*

Fig. 3. ESP8266 Wi-Fi Module

Fig 3. Shows ESP8266 Wi-Fi module. It is a microchip which makes use of Wi-Fi 802.11 standards. It is used to connect the microcontroller boards to internet using Wi-Fi technology. It requires 3.3V DC power supply.

D. *AWS*

Amazon Web Services (AWS) is a subsidiary of Amazon.com. A paid subscription of AWS allows you to access various cloud computing platforms. AWS offers huge range of virtual computers and processing power. AWS supports various operating systems and networking platforms. Subscribers can connect their system to AWS using any modern browser. This virtual window allow subscribers to configure their system, change settings, etc. AWS offers a wide range of cloud computing services.

E. *MongoDB*

Mongodb is a NoSQL database program. It is free and open source. Mongodb supports many operating systems such as windows, linux, mac, etc. It is document oriented database program. It saves database in a document format. JSON (Java Script Object Notation) is used to make the mongodb database. Mongodb makes the task of adding new entries in old databases very simple.

F. *Robomongo*

The visual tool used to create and manage Mongodb database is called robomongo. It is a free and open source software. It supports all major operating systems such as windows, linux and mac.

G. *PuTTY*

Putty is a Secure Shell Access (SSH) client. To securely connect to a remote server or remote computer putty is used. It allows you to perform a certain command or set of commands on your computer and have another computer execute the actions.

III. LITERATURE REVIEW

Ration distribution is one of the widely controversial issue that involves wrong entries in stock register of shop containing wrong stock information of the products that is supplied to the public, Rajesh C. Pingle et.al. Suggested a ration system using RFID and GSM Module to Prevent Irregularities, in this automated system conventional ration card is replaced by smartcard in which all the details about users are provided including their AADHAR number which is used for user authentication [2].

Now day's ration card is very important for every home and used for various field such as family members details, to get gas connection, it act as address proof for various purposes etc. But this system is having two draw backs, first one is weight of the material may be inaccurate due to human mistakes and secondly, if consumers do not buy the materials at the end of the month, they will sale to others without any intimation to the government and customers. So Ms. T. Sheela et.al. proposed a new system. To get the materials in ration shops need to show the RFID tag into the RFID reader, then controller check the customer codes and details of amounts in the card. After verification, these systems show the amount details. Then customer need to enter they required materials by using keyboard, after receiving materials controller send the information to government office and customer through GSM technology. In this system provides the materials automatically without help of humans [3].

Huge amount of Govt. money get wasted due to corruption in the conventional Ration Distribution System. So the system proposed in this paper implements a simple PDA device (personal data assistant) with RFID tag used as an e-ration card in place of a conventional ration card. This PDA device is similar to the ticketing machine used by bus conductor or bank pigmy agent and the e-ration card is similar to swipe card. The Subscriber has to use this card instead of a traditional ration card to get ration from the dealer [4].

The current PDS involves corruption and illegal smuggling of goods because of manual work. So the system proposed in this paper includes the automation of the Ration system using Arm7. The distribution is done automatically using mechanical devices. The Arm7 work as the central processing unit for the system. So, this paper provides a way to automatically distribute the contents using microcontroller, but it does not provide any way to monitor the PDS efficiently [5].

IV. PROPOSED SYSTEM

A. BLOCK DIAGRAM
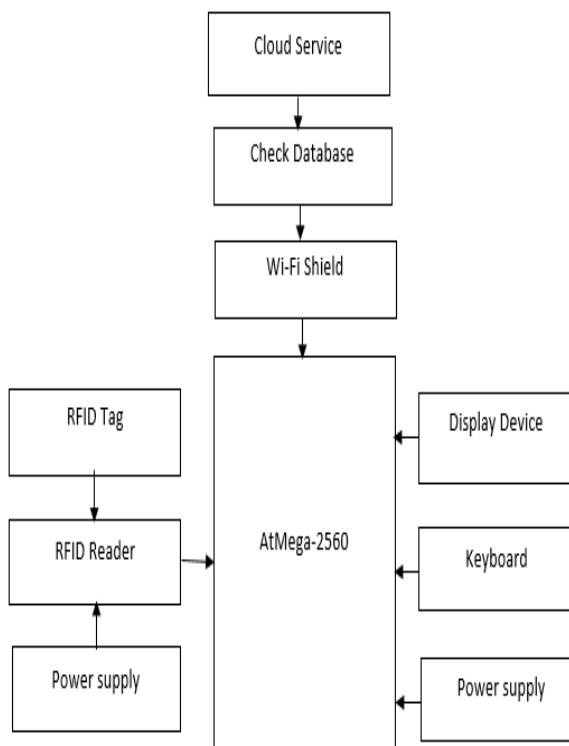
Fig. 4. Block diagram of Cloud based Ration Card System using RFID

The block diagram of smart ration card system is shown in fig. 4. The block diagram of smart ration card is shown in figure. In this system, we use an arduino mega microcontroller, Power supply, RFID reader, RFID tag, Wi-Fi module (ESP8266), 20*4 LCD display, 4*4 alphanumeric keypad and Database.

RFID reader is connected to the arduino by connecting a transmitting pin of reader to the receiving pin of arduino. Similarly the connection for the Wi-Fi Shield, a transmitter pin of Wi-Fi shield is connected to the receiver pin of arduino respectively. Wi-Fi is used to connect to the cloud services. The LCD display shows information related to the consumer and ration to be allocated to them. Keyboard is used to enter the OTP to confirm the identity of the consumer or to enter the data when needed. RFID tag act as a ration card which is used to place on the RFID reader. A 12v supply is provided to the reader using an adapter. Arduino also requires 12v dc power supply.

B. FLOW CHART
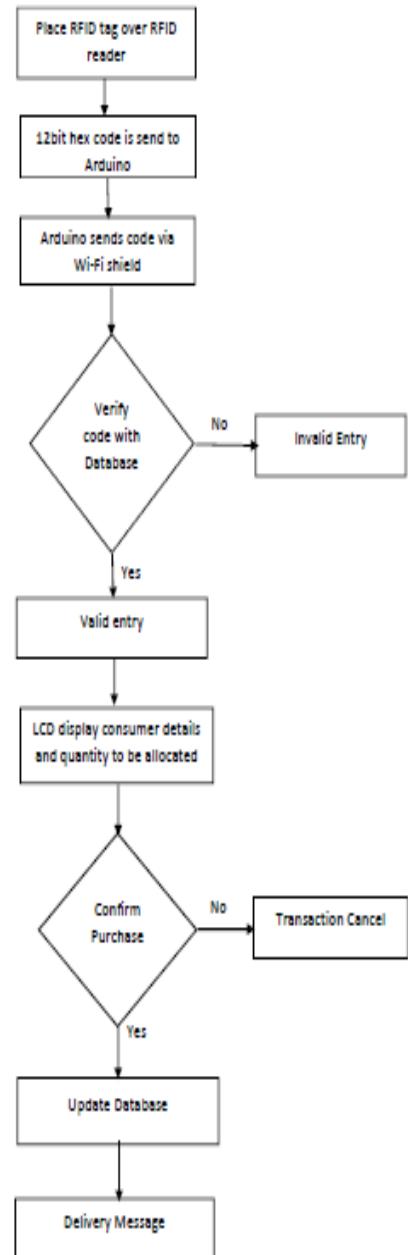
Fig. 5. Flow Chart of Cloud based Ration Card System using RFID

When RFID tag is placed on the RFID reader, it reads 12bit hex code from the tag. Then this hex code is sent to arduino. Arduino checks this code with cloud database. . If the entry is valid then only next step is performed. After confirmation the consumer details are displayed on the LCD screen and ration allocated to the consumer. To confirm the authentication of consumer microcontroller sends a verification code to the consumer's registered mobile number. The consumer receives the code which is entered using the keypad. After successful purchase, database is updated and a delivery message is delivered on consumer's registered mobile number.

V. WORKING

A. Database

A consumer database is created using the mongodb and robomongo software's. The database objects are written in json format. The database consists of all the information of the

consumer such as consumer ID, mobile number, quantity of ration allocated, etc.

B. Cloud Services

An account is created on AWS with paid subscription to cloud services. Using required configurations and putty, the database created in mongodb is uploaded on AWS cloud. So it can be accessed anywhere, anytime.

C. Input

First the consumers have to swipe the RFID tag provided to them over the RFID reader module. The input to the system is in form of 12bit hex code which is scanned using EM-18 RFID reader module. This hex code is then sent to the arduino microcontroller board.

D. Processing

Atmel atmega2560 microcontroller present on the arduino takes care of processing work. The hex code sent by the rfid reader module is matched with the database. The arduino is connected to the internet via a Wi-Fi hotspot using esp8266 Wi-Fi module. Arduino also fetches the consumer informer from the AWS cloud servers.

E. Displaying Information

For displaying the information to the consumer a 20*4 LCD module is used. The ration items and quantity available to the consumer with their rate is displayed on the LCD display if the consumer is found to be authentic.

F. Data Input

For proving data input to the system a 4*4 keypad is used. The consumer have to enter the OTP received on their registered mobile number using this keypad. In the final step the purchase is confirmed using the keypad.

VI. EXPERIMENTAL RESULTS

Fig. 6. Welcome Screen

The Cloud Smart Ration Card System using RFID is shown in fig. 6. We have successfully interfaced 20x4 LCD, RFID reader, Keypad and Wi-Fi module with microcontroller.
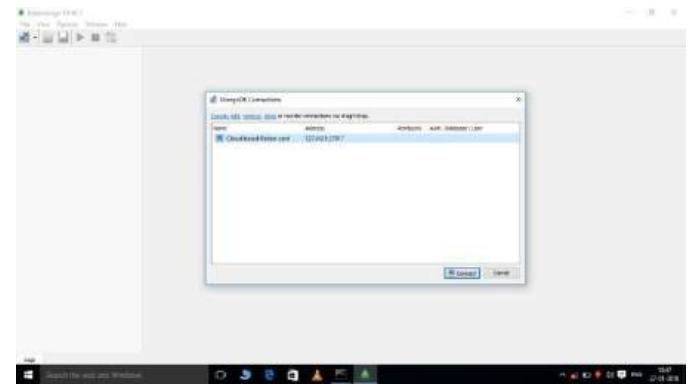
Fig. 7. Robomongo Connection Interface

The fig. 7 shows the robomongo interface with a database named as Cloud Based Ration Card. The robomongo will connect us to the database in mongodb.
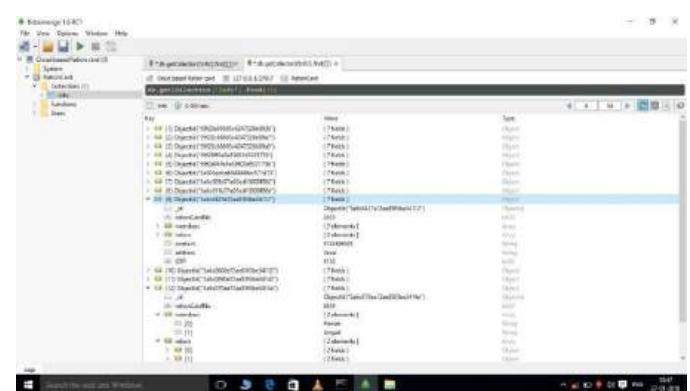
Fig. 8. Mongodb Database

The actual mongodb database is shown in fig. 8. The robomongo is used to create this database in mongodb. The database contains various fields such as consumer name, mobile number, ID, ration content sanctioned, etc.
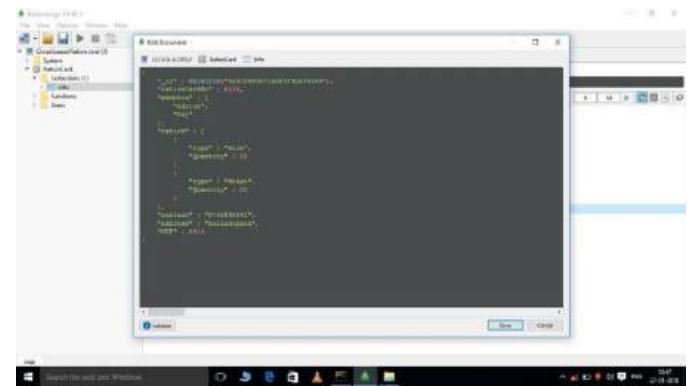
Fig. 9. JSON format objects

Fig. 9 shows the screenshot of RoboMongo interface with JSON objects created for the database. The document format is used to represent entities in JSON.

Fig. 10. OTP Verification

After the RFID tag is swiped over the system the user authentication is done. Fig. 10 shows the message for entering OTP received by the consumer on his registered mobile number.

Fig. 11. OTP Verified Message

After the correct OTP is entered into the system the consumer is verified. It is shown in fig. 11. The consumers name is also shown on the display.

Fig. 12. Allotted ration

The ration content allotted to the consumer is displayed on the LCD screen. It is shown in fig. 12. The consumer will get the message on his mobile mentioning the transaction details. Also the database will be updated stating that consumer has consumed the ration content for that month.

VIII.   CONCLUSION

The traditional ration distribution system faces many problems. Also it is very difficult for the government to manage such a vast system. So our system aims at using the technology available today to make the ration system smart. The Cloud Based Ration System Using RFID will revolutionize the ration system. It will be easy and secure for the user to get the much needed ration content. Government will be able to keep track of all the transactions and malpractices and corruption will be minimized.

IX.   FUTURE WORK

Although our system is smart, it can be further modified. We can add extra security by linking AADHAR number of consumer to the ration card. By doing so we can enable fingerprint verification using fingerprint readers. It will become more secure than our current system.

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Shielding Effectiveness Measurement and Comparison of Different Shielding Materials

[1]PRAJAKTA JOSHI
Dept. of Electronics and
Telecommunication
Fr. C. Rodrigues Institute of
Technology, Vashi.
prajaktasjoshi911@gmail.com

[2]YOGESH CHANDURKAR
Dept. of Electronics and
Telecommunication
Fr. C. Rodrigues Institute of
Technology, Vashi.
yogesh.c@fcrit.ac.in

[3]GYANENDRA VERMA
Scientist E & Head of ESS Division
Division- EMI/EMC,
SAMEER, IIT Bombay Campus,
Powai
gyanv@sameer.gov.in

Abstract—The shielding performance of enclosure is an essential factor in equipment design since there is rapid growth in digitization of industries, the speed of electrical/electronic devices increases and Electromagnetic interference(EMI) reduction is very important. This paper presents the measurement of shielding effectiveness of the enclosure, made-up of different materials and their comparison. Which can be observed by an intensity of the leaked field from the enclosure under test. Its results have been studied with help of simulation software Computer Simulation Technology (CST) software.

Keywords— Shielding effectiveness, CST-MW studio, shielding enclosure, Electromagnetic interference.

I. INTRODUCTION

With a rapid growth in technology and digitization of industries where the speed of electronic devices increases we need to measure an emission factor of each device whether its emission is harmful to other devices and living organism. Thus, the shielding performance of an enclosure has become an essential factor in equipment design.

The ratio of the signal received from the transmitter without the shield, to the signal received inside the shield is termed as shielding effectiveness; the insertion loss when the shield is placed between the transmitting and receiving antenna [1]. Electrical noise is reduced by using shield and reduces its impact on other signals and lowers electromagnetic radiation. To prevent the effects on the data transmitted from electromagnetic interference (EMI) communication cables are shielded. Communication cables are paired and individually shielded to prevent further cross-talk and coupling. We perform a shielding effectiveness test to reduce this EMI.

II. SHIELDING ENCLOSURES AND BLOCK DIAGRAM

A. Shielding Enclosures

Loss of information due to electromagnetic waves radiated from the electrical equipment has become a problem in recent years. Even the attack of electromagnetic waves on electronic equipment is also increasing. One effective method to solve these problems is to use electromagnetically shielded enclosures and equally important to evaluate the effectiveness of shields in an accurate manner [2]. A structure that prevents the effect of an exterior electric or magnetic field and noise from its interior, or conversely protects the surrounding environment from the effect of an interior electric or magnetic field. Shielding is a technique used to control EMI by preventing transmission of noise signals from the sources to the receiver. Shields can be located at the transmitter or at the receiver or anywhere in between. A high-performance shielding enclosure is generally capable of reducing the effect of electric and magnetic field strength by one to seven orders of magnitude depending upon frequency. An enclosure is generally constructed of good conductive material or metal for providing continuous electrical contact between adjoining panels, including doors. Following figures show the structure of shielded enclosures.

Figure 2.1 External view of Shielding Enclosure [3]

Figure 2.2 Internal view of Shielding Enclosure [3]

B.   Shielding Effectiveness Measurment
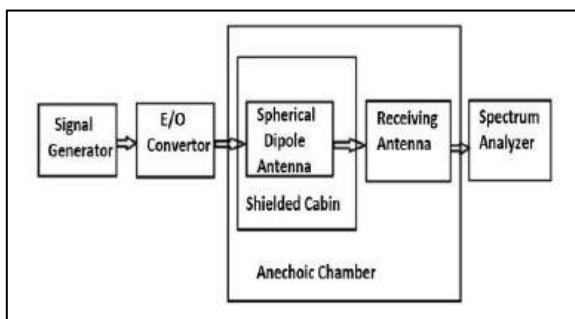
Figure 2.3 Block diagram of Setup

The block diagram consists of following blocks:

Signal generator/Function generator: Device which produces simple repetitive waveforms of desired frequency, which is feed to transmitting antenna through electrical to optical converter.

E/O Converter: Converts electrical signal to optical signal.

Spherical dipole antenna: Used as the radiation source to measure shielding of small cabins.

Shielded cabin: Device under test for measurement of shielding effectiveness also called as a shielded chamber.

Anechoic chamber: Room designed for completely absorb reflections of sound or electromagnetic waves.

Receiving antenna: The antenna used for radiation reception which   is   transmitted   from   source   antenna.

Spectrum analyzer: It measures and display the magnitude of input signal versus frequency within the full frequency range of the instrument.

<div align="center">III.   ACTUAL SETUP FOR MEASURMENT</div>

A.   Setup

Figures shown below show various steps involved in shielding effectiveness measurement of the enclosures. In figures shown below measurement is performed inside the anechoic chamber. Anechoic chamber prevents reflection of EM wave and sound wave; hence they are absorbed by the walls of the chamber. There are two principle mechanisms present in all shields, and these are reflection and absorption. When an electromagnetic wave traveling through space encounters shield two things happen. First, most of the energy is reflected and then second some of the energy that is not reflected is then absorbed by the shield; only the residual energy emerges from the other side of the shield. These two effects of reflection and independent from each other, but when they combine, they produce the overall shields true effectiveness.

In figure 3.1, the spherical dipole antenna is placed under the shielded enclosure under test. The electric field obtained from both the measurements is referred to as E1 and E2 respectively.

E1: electric field measured by the antenna with the door open.
E2: electric field measured by the antenna with enclosure.
Step:1
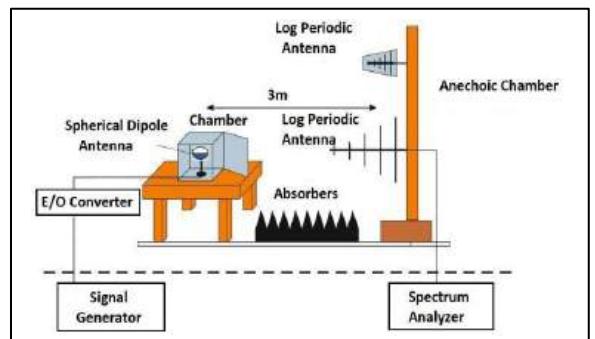
Figure 3.1 Electric field obtained with door open (E1)

Step 2:
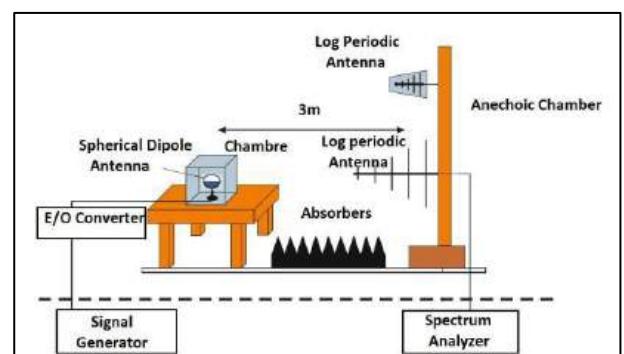
Figure 3.2 Electric field obtained with shielded enclosure (E2)

We can easily calculate the shielding effectiveness by following expression:

Shielding effectiveness: $E - E$ V/m   (1)

OR $20 \log \frac{E1}{E2}$ dB   (2) [4]

B. Materials used for shielding effectiveness

Materials that can be used for manufacturing shielded cabins are conductive materials like metals which can absorb or reflect the electromagnetic energy. Shielding is the function of important properties of shielding material like its thickness, conductivity and, continuity. Non-magnetic metal such as aluminum is used for high-frequency RF shields, and metals like Iron, Nickel are used for lower frequency RF shields.

The conductivity between the lid and the box must be close to zero, to get good shielding at high frequencies, and the joint between the lid and box should have an obstruct to prevent leakage. A conductive plastic enclosure will provide shielding if a metallic box is not feasible. Earlier people used conductive paint, an interior of the box is coated with a nickel filled acrylic paint. This method works and is still the best method for some of our enclosures, it has some drawbacks like aesthetics, flaking, and consistency, concerns and hidden features will not be coated, and leakage can result.

IV. SIMULATION RESULTS

Simulation is carried out using CST software and result obtained for various shielding materials which are discussed below:

A. Material Aluminum

(1) Electric Field Measured With Door Open:
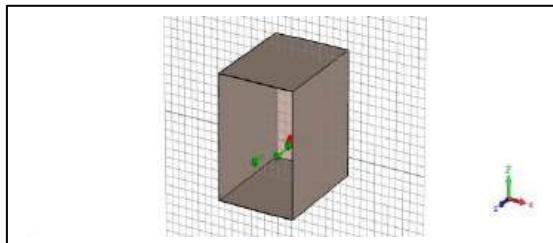
Figure 4a (1) Aluminum box with door open
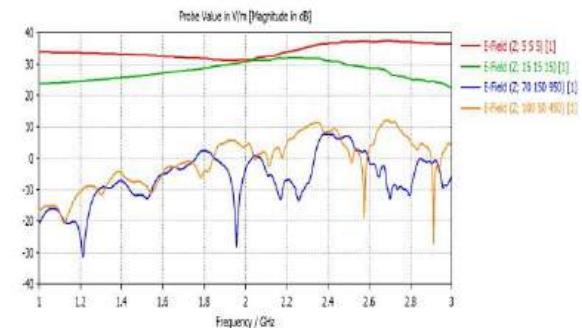
Figure 4a (2) Electric field measured in dB

Figure 4a (2) shows simulation results when the antenna is placed inside the shielding box which made up of aluminum material and electromagnetic radiations are measured without placing shield in between the antenna and receiving probes. From the graph magnitude of the electric field tends to 35 dB in the near field and -9 dB in the far field.

(2) Electric Field Measured with Shield:
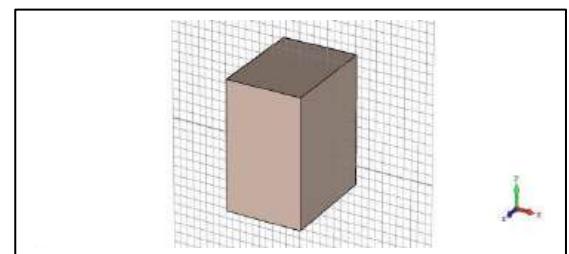
Figure 4a (3) Aluminum box with shield
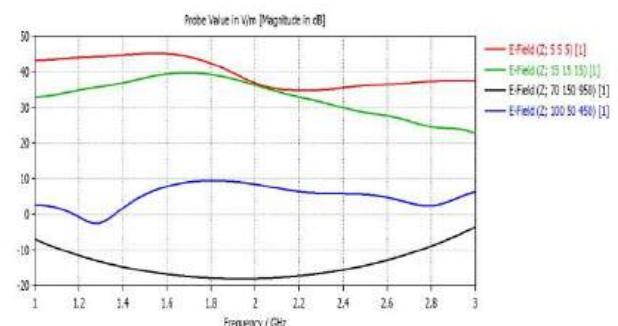
Figure 4a (4) Electric field measured in dB

Figure 4a (4) shows simulation results when the antenna is placed inside the shielding box and electromagnetic radiations are measured with the shield in between the antenna and receiving probes. From the graph magnitude of the electric field tends to 42 dB in the near field and -17 dB in the far field.

B. *Material Iron*

(1) Electric Field Measured with Door Open:
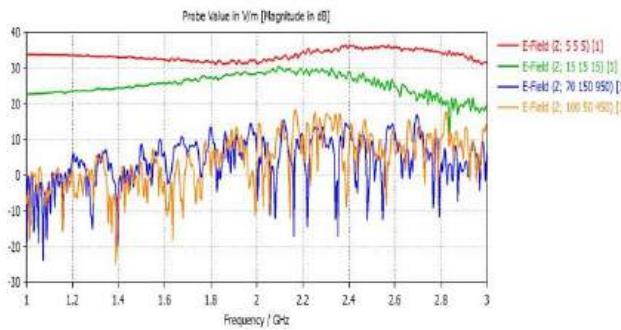
Figure 4b (1) Electric field measured in dB

Figure 4b (1) shows simulation results with the shielding box which made up of iron material and electromagnetic radiations are measured without placing the shield in between the antenna and receiving probes. From the graph the magnitude of the electric field tends to 35 dB in the near field and -10 dB in the far field.

(2) Electric Field Measured with Shield:
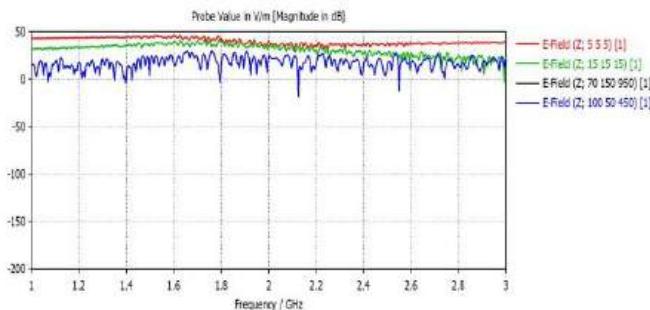
Figure 4b (2) Electric field measured in dB

Figure 4b (2) shows simulation results when electromagnetic radiations are measured with shield in between the antenna and receiving probes. From the graph magnitude of the electric field tends to 48 dB in the near field and -2000 dB in the far field. This represents very good shielding effect compared to aluminum shielding box.

C. *Material Copper*

(1) *Electric Field Measured with Door Open:*
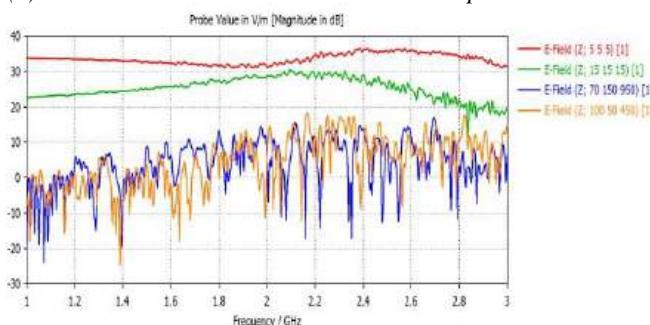
Figure 4c (1) Electric field measured in dB

Figure 4c (1) shows simulation results with the shielding copper box without the shield. From the graph magnitude of the electric field tends to 35 dB in the near field and -10 dB in the far field.

(2) Electric Field Measured with Shield:
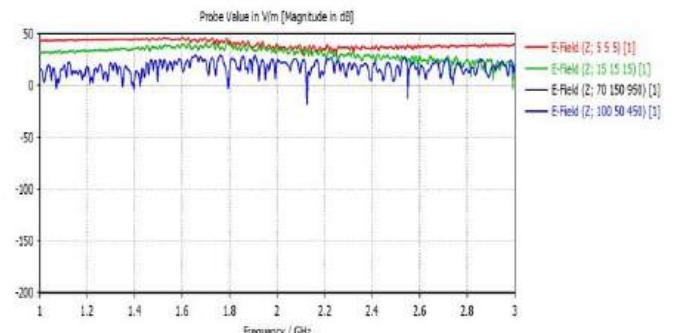
Figure 4c (2) Electric field measured in dB

Figure 4c (2) shows simulation results when electromagnetic radiations are measured by shielding. Results observed from graph are the magnitude of the electric field tends to 46 dB in the near field and -2000 dB in the far field.

D. *Material Teflon*

(1) *Electric Field Measured with Door Open:*
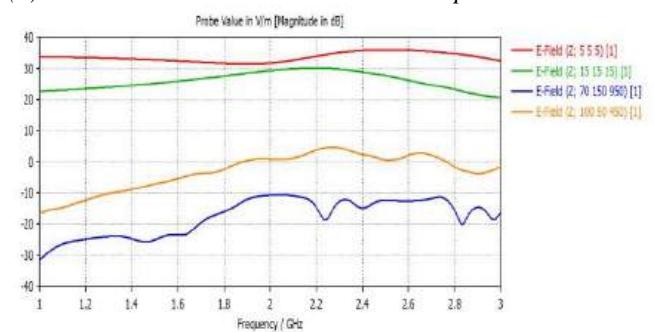
Figure 4d (1) Electric field measured in dB

Figure 4d (1) shows simulation results with the shielding teflon box without the shield. Results observed from graph are the magnitude of the electric field tends to 35 dB in the near field and -25 dB in the far field.

(2) *Electric Field Measured with Shield*
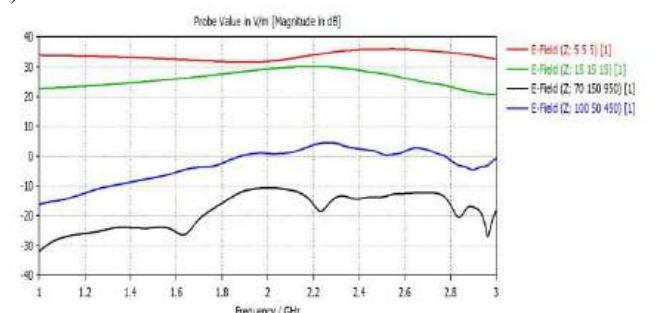
Figure 4d (2) Electric field measured in dB

Figure 4d (2) shows simulation results when Teflon shielding is present, from the graph the magnitude of the electric field tends to 35 dB in the near field and-30 dB in the far field.

V. CONCLUSION

Shielding effectiveness (SE) measured in decibel (dB) and converted to percentage (%) by using following formula:

$$dB = 10\log (1+X) \qquad (3)$$

From the table of comparison, we can observe that shielding effectiveness of the iron and copper is very high and better than that of aluminum and plastic material teflon. As best materials are giving more than of 90% of shielding effect they are able to effectively protect the surrounding from the interior and vice-versa.

Table 5.1 comparison of all materials

Material	E-Field Without shield (E_1)	E-Field With shield(E_2)	SE (dB)	SE (%)
Aluminium	-9(dB)	-17(dB)	5.52	71
Iron	-10(dB)	-200(dB)	26.02	99.74
Copper	-10(dB)	-200(dB)	26.02	99.74
Teflon	-25(dB)	-28(dB)	0.984	20.27

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Speaking aid for dumb and deaf using Flex Sensors

Nivedita Chaudhari
Student of KJSIEIT, Mumbai
n.chaudhari@somaiya.edu

Kajol Gangar
Student of KJSIEIT, Mumbai
kajol.gangar@somaiya.edu

Shivani Gonkar
Student of KJSIEIT, Mumbai
shivani.gaonkar@somaiya.edu

Divya Shinde
Student of KJSIEIT, Mumbai
divya.shinde@somaiya.edu

Faculty: Prof.Devanand Bathe
KJSIEIT,Mumbai
devanandkb@somaiya.edu

Abstract—The most difficult task faced by mute people is that they cannot freely communicate with others. Therefore, a model named speaking aid for deaf and dumb using flex sensors has been presented by us[1]. A data glove is used in this model which will be worn by the user[3]. The data glove is a simple glove which will be fitted with flex sensors along each finger and accelerometer along the wrist[2]. Movements of user's fingers will be detected by the sensors and will be converted into audio output when specific gesture has been made. Moreover, this model includes visual output of the gestures to provide hassle free communication.

Keywords—Flex sensors, Accelerometer, ADC(Analog to Digital convertor), Data-glove, MAX 232, LCD (Liquid Crystal Display)

I.   INTRODUCTION

Communication is the act of conveying intended meanings from one entity or group to another through the use of mutually understood signs and semiotic rules. People incapable to speak use hand gestures as a mode to convey information. In India around 2% of people have speaking disability that is around 1.2 billion of population is of deaf and dumb. Such people who are specifically abled are not always given equal opportunities just because we have trouble communicating with them. This problem can be solved by appointing a translator who is physically present. However, it is always not possible to have one around to translate each and everything. Our model is a substitute to a physical human translator which uses hand gestures to produce outputs in natural language[1]. The model comprises of a data glove which is basically a normal glove with flex sensors attached along the fingers to sense their movement. Furthermore, the use of accelerometer gives the tilt of the hand. The hand gesture is realized by combining the measurement of flex sensor and accelerometer together. Microcontroller is used to process the inputs from the sensors to fetch the string of audio to be played. In order to aid conversation we have incorporated LCD display to the output in visual format.

The main aim of this paper is to make communication easier by using simple gestures to interact with each other[5]. The model consists of portable embedded system products.
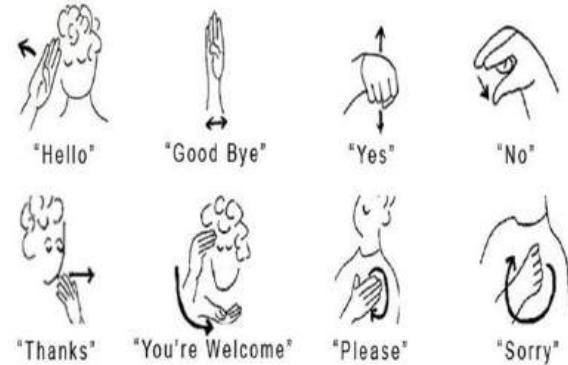
Fig.1. Different hand gestures used by mute people[1].

II.   METHODOLOGY

A. BLOCK DIAGRAM:

The system basically is a data glove which includes sensors, a microcontroller and an audio and visual output block.
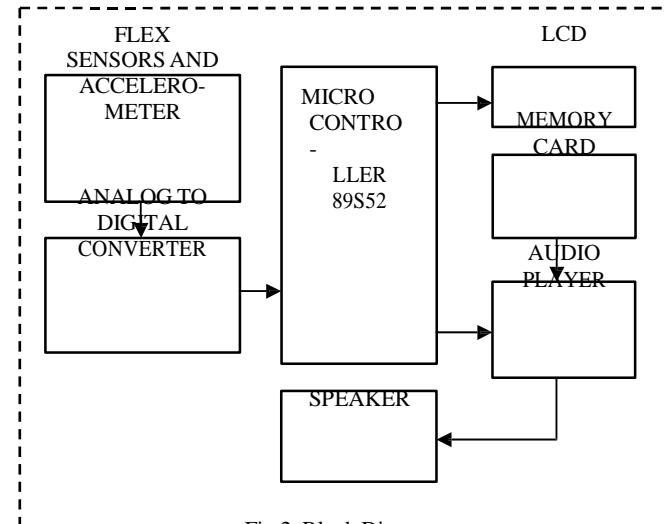
Fig.2. Block Diagram

Working of the project is divided into three parts. In the first part, input is taken from the sensors. Sensors part includes five flex sensors along each finger and two accelerometers. Flex sensors are used to detect the bending and Accelerometers are used for tilt detection. The input taken from these sensors are in analog form. Thus in the second part, this analog inputs are converted into digital form using 12bit ADC. After the conversion, digital output from ADC is given to microcontroller where sign identification takes place.

Now in the third part the sign identified corresponding to the sensor inputs, is converted into text form to display it on LCD. And audio file for the same is fetched from the memory card and played using speaker.

B.   FLOW DIAGRAM:
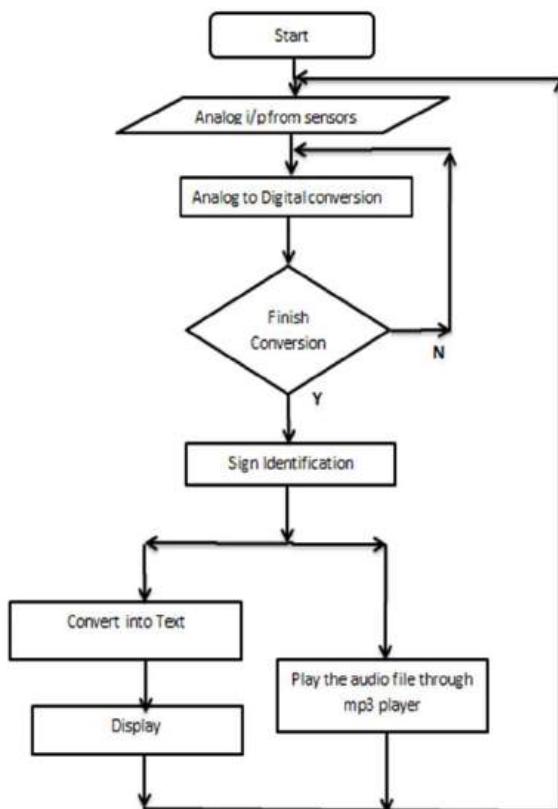
As soon as the user defines the gestures and their meanings, the prototype will be ready to use. Once the user conducts a hand movement the sensors hooked on the glove will provide some reading as per their specifications. These readings obtained in the form of analog type will be converted to digital signal as shown by the A/D conversion box in the flowchart. The next block consists of the algorithm which will be carried out by the Microprocessor in order to recognize the gesture. Once this step is over the next step is to provide outputs and they are shown in two ways, one is through audio and the other is visual display. After the completion of one gesture recognition the program searches for the next input rather than going into idle mode. The search goes on until next gesture is realized, therefore the Stop block has been discarded from the flowchart.

C.   COMPONENTS:

1) FLEX SENSOR:

A Flex sensor is also called as Bend sensor. This sensor is used to measure the amount of bend of fingers. Basically, it is stuck on the surface of the data glove in order to vary it's resistance by bending the surface[6]. The flex sensor can be used in robotics, Gaming, Medical devices, Computer peripherals etc. They provide a flat resistance of 25K Ohms. The resistance tolerance of flex sensors is around +30% to -30%. Bend resistance range is given as 45K to 125k Ohms which depends on the bend radius. Power rating is 0.50 Watts continuous , 1 Watt peak.
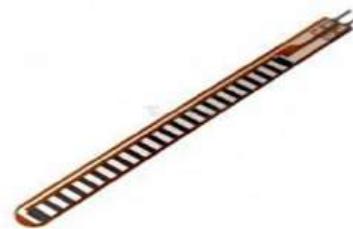
Fig.3.Flex Sensor.

The resistance of the flex sensor is directly proportional to the amount of bend it undergoes. Combinations of static resistors with each of four flex sensors go on to create a voltage divider which produces a variable voltage that is read by the analog-to-digital converter.
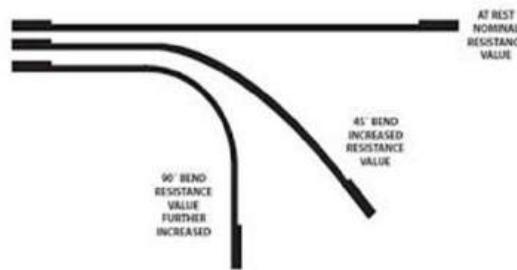
Fig.4.Resistance at various angles.

2) ACCELEROMETER:

The prototype uses ADXL335 as a 3-axis acceleration measurement system. This device has a measurement range of +3g to -3g minimum. The output signals of ADXL335 are analog which are proportional to acceleration. The static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from shock or variations can be noted[4].
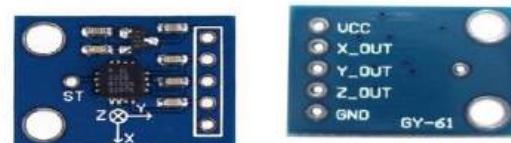
Fig.4. ADXL 335

A single structure is used for sensing the X, Y, and Z axes in the ADXL335. Therefore, these three axes sense directions that are highly orthogonal and have less cross-axis sensitivity. These accelerometers will be put to use for sensing the tilt of hand to realize hand gestures.
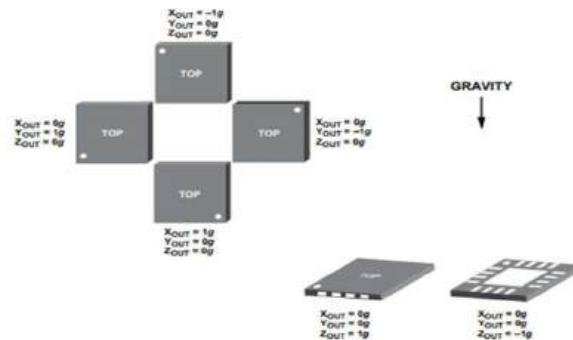
Fig.5. Output Response vs. Orientation to Gravity

3) ANALOG TO DIGITAL CONVERTER:

The inputs from flex sensor's and accelerometer are received in analog form. For these signals to produce appropriate output we need to convert them into digital form. In order to transform analog signals to digital one's we have incorporated MCP3208 ADC. The microcontroller also provide in-built ADC converter but for more resolution and precision the MCP 3208 is used as it is a 12 bit analog to digital converter IC. This IC provides us with 16 pin DIP. Microchip is the manufacturer of MCP3208. This IC has on-board sample and hold circuitry. This ADC converter is programmable which provided two pseudo-differential input differential pairs or eight single-ended inputs from which 7 inputs are used in this project to accept inputs from sensor and accelerometer Moreover, this IC goes on to provide 12 bit resolution ADC. The error range is +1LSB to -1LSB max DNL. It operates at 2.7V to 5.5V.

Communication with devices is done by serial interface compatible with SPI Protocol. This IC is capable of conversion rates of up to 100 kbps. The MCP3208 A/D converter provides two grounds which are DGND to connect Digital ground connection to internal digital circuitry and AGND for analog ground connection to internal analog circuitry. Serial Data Input (Din) is used to load channel configuration data in the device. Serial Data Output (Dout) shifts out the results of A/D conversion.

4) ATMEL 89S52

The microcontroller used in the project is AT89s52which is manufactured by Atmel. It's high-density nonvolatile memorytechnology is used to manufacture this device. Due to it'son-chip Flash, the program memory can be reprogrammed in-system. The Atmel 89S52 serves as a highly flexible and cost-effective production our model becauseof its versatile 8 bit

CPU with in-system programmable Flash with additionalwatchdog timer for real time analysis. Atmel 82S59 is a 40 pin IC and has four different ports; each port consist of 8 bidirectionalinput/output lines. Port 0 will be given digitalinputs fetched from A/C converter i.e. readings from flexsensors and

accelerometer. Port 1 pins are used to interfacemicrocontroller with Audio player. Port 3 serves the functionsof special features of AT89s52. It is compatible with standard80C51 pinout and instruction set.

5) FN RM01 MP3 Player:

FN-RM01 is a high-quality 24 pin MP3 audio Recorder and player module designed by Flyron Technology. It supports max 32GBmicro SD card and USB flash drive. It consists of flexible audio recording modes including MIC recording, Line-in recording and stereo 2-channel Aux-in recording. Various output commands from controller are used to play respective sound files by file name in the root of the storage device (SD card). Pin 13, 14 connected to speaker for expected audio output.

Fig.6.MP3 Player

6) LCD:

A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. This module is preferred over multi segment LEDs because it is economical; easily programmable; have no limitation of displaying special & even custom characters and animations. It can display 16 characters per line and there are 2 such lines.

III.   CONCLUSION

Therefore, with the use of this prototype the communication gap between specially abled and the rest of us can be narrowed down . One of the important advantages of this device is that it is handy and therefore can be carried around easily. Furthermore, the user can define his/her own gesture and its meaning according to their convenience. Another highlight of this model is that it not only serves users who are disabled but also patients who are partially paralyzed. The patients can perform certain doable hand moments and convey the message.

IV.   FUTURE SCOPE

This prototype is developed to aid mute people to communicate in hassle free manner. In addition to hand gestures we can also incorporate GPS in order to track the user's location. We can also make use of Machine Learning to make the device smarter. In this prototype the user specifies the gestures; if we use ML algorithms then the prototype will be able to recognize unspecified gestures with the help of specified one's[7]. Apart from this, the model can be used for Virtual Reality Applications in which we can replace jog sticks with this data glove. At remote sensitive sites, robot control system can regulate machine activity by using the data glove[6].

VI. LIMITATIONS

The model suggested for helping the mute people works on user defined gestures and their meanings. This places a barrier in the potential of the model as it restricts the use of additional and undefined gestures. Moreover, this model provides solution to basic communication problems and cannot support advance communication such as two way communication as well as undefined gesture recognition.

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Enhanacement of Speed for Template and Stability Bound Generation using GPU

Pallavi D. Pawar
Dept. of Electronics and Telecom
Ramrao Adik Institute of Technology
Navi Mumbai, India
pawarpallavi216@gmail.com

Mukesh D. Patil
Dept. of Electronics and Telecom
Ramrao Adik Institute of Technology
Navi Mumbai, India
mukesh.rait@gmail.com

Vishwesh A. Vyawahare
Dept. of Electronics
Ramrao Adik Institute of Technology
Navi Mumbai, India
vishwesh.vyawahare@rait.ac.in

Abstract—**Quantitative Feedback Theory developed by Issac Horowitz in Control theory. Different methods are available to generate the QFT bounds. But it is observed that method takes a lot of time for the design of the controller. The bound generation takes more time which affects the design of controller online. In this paper, GPU based approach is proposed to speedup the generation of template and stability bounds. we are attempting to speedup bound generation process by using MATLAB parallel computing toolbox. This paper exhibits the parallel computing power of the GPU (Graphics Processing Unit) in the area of QFT. In this paper, GPU based approach is proposed to speedup the computation of template and stability bound. To accomplished the speedup of QFT bound generation, NVIDIA GPU with the help of MATLAB parallel computing toolbox is used. In this paper, GPU based approach is used for speedup in the computation of template and stability bounds. it is observed that GPU provides more speedup as compared to CPU.**

Index Terms—**QFT Toolbox, QFT bounds, Graphic Processing Unit(GPU),**

I. INTRODUCTION

Quantitative Feedback Theory developed by Issac Horowitz in Control theory (Horowitz, 1963; Horowitz and Sidi, 1972). QFT is dedicated to the actual design of feedback control system. It can cross over any barrier amongst theory and this present reality control design issue that is used. Achieving an effective robust outlined includes different steps: particular of the control issue, plant demonstrates data, usage of the

theoretical plan, reproduction, and system under real working conditions. In facing the technological issues of the future, it is essential that engineers of the future must have the capacity to overcome any issues. This overcoming any issues must be routed to better set up the architects for the 21st century [1].

It is a frequency domain technique utilizing the Nichols chart (NC) in order to achieve a desired robust design over a specified region of plant uncertainty. Time domain specifications are converted into frequency domain specifications, which creates bounds (or constraints) on the loop transmission function [2].

Fig.1. shows the block diagram of two degrees-of-freedom multi-inputl/single-output feedback system. In general following specifications are considered in QFT:
The open loop transmission function is defined as
L(s) = G(s)P(s)
and the nominal open loop transmission function is

Fig. 1. A two degrees-of-freedom multi-inputl/single-output feedback system [3].

$$Lo(s) = G(s)Po(s)$$

Close-loop performance problem are given as [4-6]
1) Robust stability margin

$$\frac{L(j\omega)}{1 + L(j\omega)} \leq W_S \qquad (1)$$

Where W_S is the stability margin specification.
2) Robust tracking performance

$$|T_L(j\omega)| \leq \frac{F(j\omega)L(j\omega)}{1 + L(j\omega)} \leq |T_U(j\omega)| \qquad (2)$$

Where T_L is lower tracking performance and T_U is upper tracking performance specifications.
3) Robust input disturbance rejection performance

$$\frac{P(j\omega)}{1 + L(j\omega)} \leq Wd_i(\omega) \qquad (3)$$

Where Wd_i is output rejection performance specifications.
4) Output disturbance rejection performance

$$\frac{1}{1 + L(j\omega)} \leq Wd_o(\omega) \qquad (4)$$

Where Wd_o is input rejection performance specifications.

The algorithms developed by Chait and Yaniv [7], Borghe-sani [6], and Zheng and Rodrigues, Chai, and Hollot [8] solve quadratic inequalities generated from plant template points to compute the bound at a fixed frequency and controller phase [4-6].

In 1981, IBM invented the first graphics processor called Color Graphics Adapter (CGA). After one and a half many years of change, the graphic processor turns out to be all the more capable and is utilized as 3D increasing speed on PC desktop [9]. At that point in 1999 with the introduction of the world's first GPU-GeForce256" by Nvidia introduced the concept of Graphical Processing Unit. From that on, look into in the areas of physics, medical imaging and so on started began to take advantages of GPU to accelerate their applications. This was the start of General Purpose GPU(GPGPU) registering. The GPU was not first created for computing, researchers needed to utilize graphics programming language like OpenGL to program the GPU. Engineer needed to delineate logical applications to "graphics applications". That was truly a major test and constrained the availability and execution of the GPU for scientific computing. Seeing the enormous market in GPU processing, Nvidia changed their GPU and made it more programmable. Moreover, another GPU programming model CUDA was presented by Nvidia in 2007 [5]. From that point onward, the designer can without much of a stretch program the GPU utilizing CUDA, which is only an expansion of C Language.

particular, GPUs seem to have a very good price/performance-ratio compared to CPUs. The focus of this work is the analysis of utilizing the highly parallel nature of GPUs to accelerate QFT.

This paper is outlined as follows:
Section 2 contains details of GPU computing using MATLAB. Chapter 3 mainly focus on the whole designing process of Quantitative Feedback Theory. Chapter 4 introduce steps for CPU to GPU conversion. Chapter 5 explains the design methodology implemented for this work. Chapter 6 presents conclusion based on the obtained results.

II. GPU COMPUTING WITH MATLAB

CPUs and GPUs are designed with different objectives in mind. CPUs are great for complex problems. They have a large instruction set and a high clock rate. A GPU can do a lot of simple similar tasks in parallel which can be much faster than the same task on the CPU, especially when the problems are large. The working of GPU acceleration as shown in Fig. 2. and modern GPU is not only powerful graphics engine but also highly parallel programmable processor featuring peak arithmetic and memory bandwidth that significantly out paces its CPU counterpart.
Properties of CPU and GPU:

TABLE I
PROPERTIES OF CPU AND GPU

GPU	CPU
Latency optimized	Throughput Optimized
Large caches	Small caches
Advanced control: Branch prediction and data forwarding	Little control
Powerful ALU for fast operation execution	Many low power ALUs

Fig. 2. CPU and GPU Theoretical Floating Point Performance [14].

Fig. 3. Architecture of GPU and CPU [11].

Fig. 2. shows a comparison of the theoretical processing power between modern CPUs and GPUs. The advent of dedicated GPU languages and rapid performance increases due to innovations in chip design opened the way for using GPUs in the scientific world. Since then, many significant speed-ups (10x - 100x) in various fields have been reported through the use of GPUs [4]. It seems that GPUs are a promising way to boost numerical performance at a reasonable cost. In

This effect in general purpose computing on the GPU, also known as GPU computing, GPU accelerated applications like image processing etc. architecture of CPU and GPU as shown in Fig. 4. GPUs with their highly parallel structure provide much faster processing of large data blocks and applications such as image and video processing, in comparison to normal

(a) GPU Architecture   (b) CPU Architecture
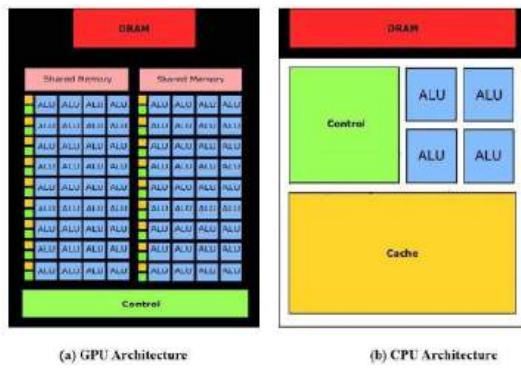
Fig. 4. Architecture of GPU and CPU [11].

CPUs. A Graphics Processing Unit (GPU) is a unique purpose processor, improved for multiple and faster figurings. It can on a fundamental level do any calculation, yet not really in an ideal mold for any given calculation. GPU has a large number of cores to process parallel workloads gainfully [11].

A GPU has array of streaming multiprocessors with numerous arrays of processor each. Each streaming Processors contain instruction unit, 15 constant caches and texture cache with one multiprocessor. Each streaming processor has its own particular enlist to store some oftentimes utilized information. They are little on-chip memory with low get to latency. There is additionally a piece of on-chip low access latency memory indicated shared memory and is used for communication among processors [14].

III. QUANTITATIVE FEEDBACK THEORY DESIGN PROCEDURE

Steps for designing of QFT bound generation.

- Converting time domain specification into frequency domain.
- Obtain plant sets.
- Determine plant templates.
- Generating the stability bounds.
- Obtain tracking bounds
- Intersection of bounds
- Loop shaping and Pre-filter designing

- Plant Template: Fig.5. shows the plant Templates for $P(s) = \frac{k(s+a)}{s(s+b)}$ for different frequencies. Templates are magnitude Vs phase plot for different plant sets [15].
- Stability bounds: Given the plant template, QFT converts the closed loop magnitude specification into magnitude and phase constrains. These constrain are call QFT bounds [11]. Fig. 6. shows the stability bound for $P(s) = \frac{k(s+a)}{s(s+b)}$ for different frequencies.
- Tracking Bounds: Upper limit and lower limit tracking bounds are produced at different frequencies and for different plant sets. Tracking bounds are obtained by using QFT MATLAB toolbox.

- Loop shaping: It is a next designing step and it consist of finding a controller such that loop transfer function fulfilled the desired shape. The changes are made using the Matlab QFT Toolbox, moving the loop curves vertically and horizontally on the Magnitude-Phase plane.

IV. CPU TO GPU CONVERSION USING PARALLEL COMPUTING TOOLBOX (PCT)

It consists of much function Toolboxes and very useful in solving system simulation and calculations. Although MATLAB is slow and has less computing PCT [12]. This makes MATLAB computing faster. MATLAB is used for serial calculations that it is run on a normal CPU computer. Thus, the problem is divided into a number of sequential instructions. Parallel computing is the execution of many processes simultaneously.

The main reasons to consider parallel computing are to

- Save time by distributing tasks and executing these simultaneously.
- Solve big data problems by distributing data.
- Take advantages of your desktop computer resources and cloud computing.

Parallel Computing Toolbox offers:

- Parallel pool: A parallel pool of MATLAB workers can be created using parpool.
- Speed up: Accelerate our code by running on multiple MATLAB workers, using distributed arrays and mapreduce.
- Asynchronous processing: Use parfeval to execute a computing task without waiting for it to complete.
- Scale up: Partition your big data across multiple MATLAB workers, using gpuArray and gather.

Designing processor of QFT bound generation are described in this section are evaluated on NVIDIA GeForce 940M GPU and compared its performance with CPU. Parallel Computing Toolbox (PCT) of MATLAB is used for QFT bound generation on GPU. This toolbox allows us to convert the parallelize MATLAB code easily into GPU code. This section explains the way of converting parallelize MATLAB code into GPU using PCT.

- **Step 1**: Sequential code is written to generate the bounds on CPU.
- **Step 2**: Writing vectorized code on CPU. Vectorizing is more or less the art of getting rid of for loops. The vectorized code executes parallel on different cores.
- **Step 3**: After that the vectorized code is transferred into GPU code using PCT. Due to parallel computation of GPU, GPU code requires less execution time compare to vectorized code.
- **Step 4**: The last step is to calculate the speedup of GPU algorithm. Speedup refers to how much execution of the algorithm on GPU is faster than corresponding execution on CPU. Thus speedup can be defined as:

$$Speedup = \frac{Vectorized\ time}{GPU\ time}$$

The specifications of GPU and CPU are listed in Table II.

TABLE II
GPU AND CPU SPECIFICATION

Parameter	GPU	CPU
Model	NVIDIA Geforce 940M	Intel,i5-5200U
Total Graphics Memory	2048 MB	3 MB
No. of cores	384	2
Clock Rate	1071 MHz	2.2GHz

V. DESIGN METHODOLOGY

The QFT bound generation are used to meet the real-time applications like process control system, welding control system, the design of robot controllers and operational amplifier control system etc. This section presents the results for QFT bound generation on CPU as well as GPU and their performance comparison.

Consider the transfer function,

$$P(s) = \frac{k(s+a)}{s(s+b)} \qquad (5)$$

where $1 \le k \le 10$, $1 \le a \le 10$ and $1 \le b \le 10$

Desired tracking specification

- Upper tracking specification
  Rise time 0.4 sec and no overshoot
- Lower Tracking specification
  Rise time 0.6 sec and overdamped

Synthesizing Tracking specification

- Upper tracking Model

$$T_{RU} = \frac{1.7223s^2 + 68.8900}{s^2 + 16.6000s + 68.8900} \qquad (6)$$

- Lower tracking model

$$T_{RL} = \frac{916.2522}{s^3 + 39.7600s^2 + 354.8864s + 916.2522} \qquad (7)$$

Fig. 4. shows the template for $P(s) = \frac{k(s+a)}{s(s+b)}$. In the Fig. 4. at approximately $\omega=120$ rad/sec, the template shape becomes fixed,a vertical line.

From the Table IV, we can observe that, when we consider less number of the frequencies(i.e. ω_1 and ω_2), that time GPU gives the better result than ω_3 and $\omega$the information between the two frequencies are lost. As we increase the number of plant set will get more information with the speedup of 4.1872.

The stability bound for frequency set ω_3 is shown in Fig. 5. At frequency set ω_1, it is observed that GPU gives the better

TABLE III
FREQUENCY RESPONCE SET

Number of Frequency	Frequency array	Number of plant set
ω_1	[0.1 1 10 20 50 100]	750
ω_2	[0.1 0.5 1 5 10 20 30 50 70 100]	1250
ω_3	[0.1 0.5 1 7 10 50 70 80 100 120 140 160 170 180 200]	1875
ω_4	[0.1 0.5 1 5 10 30 40 50 70 80 90 100 120 140 150 170 180 200 220 240]	2500
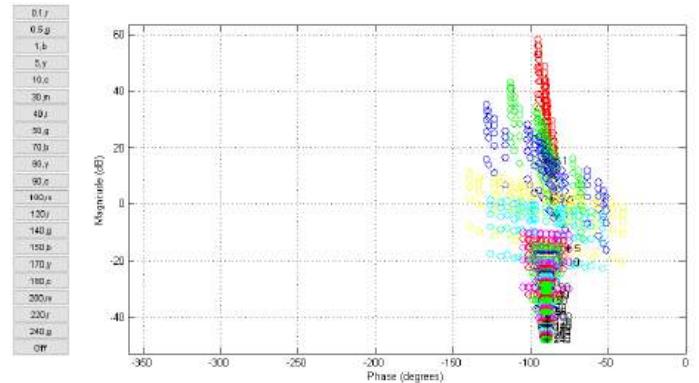
Fig. 5. Template for $P(s) = \frac{k(s+a)}{s(s+b)}$.

TABLE IV
CPU AND GPU PERFORMANCE OF TEMPLATE FOR $P(s) = \frac{k(s+a)}{s(s+b)}$

No. of Frequency	CPU Time (sec)		GPU Time(sec)	Speedup= Vectorized/GPU
	Sequential	Vectorized		
ω_1	0.3808	0.3651	0.0756	4.8231
ω_2	0.4021	0.3753	0.0826	4.5441
ω_3	0.4301	0.4262	0.1061	4.0168
ω_4	0.5012	0.4843	0.1157	4.1872

TABLE V
CPU AND GPU PERFORMANCE OF STABILITY BOUNDS FOR
$P(s) = \frac{k(s+a)}{s(s+b)}$

No. of Frequency	CPU Time (sec)		GPU Time(sec)	Speedup= Vectorized/GPU
	Sequential	Vectorized		
ω_1	0.7840	0.7572	0.2207	3.4301
ω_2	0.8519	0.7929	0.2480	3.1975
ω_3	0.9113	0.8023	0.2889	2.7772
ω_4	0.9334	0.8743	0.3034	2.8817

result with the speedup of 3.4301. But as we consider the less number of frequency, the information between the two frequencies are lost. Table V shows the speedup for different
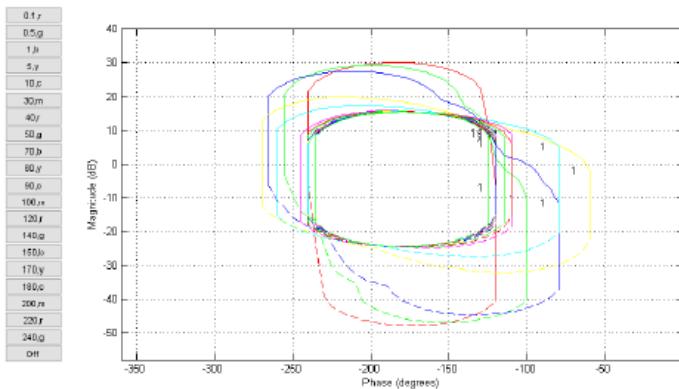
Fig. 6. Stability bounds for $P(s) = \frac{k(s+a)}{s(s+b)}$.

plant set. From Table VI, we can see that GPU offers 2.8817 speedup for 2500 plant set. If we further increase the plant sets, GPU gives the more speedup.

VI. CONCLUSION

In this paper, both CPU and GPU execution of template and stability bound generation for QFT bound generation was presented. Among which GPU implementation has proved to be considerably faster than the serial form which run on central processing unit. CPU and GPU performance for template and stability bounds as shown in table IV and V respectively. we can conclude that for ω_1 and ω_2 GPU gives the more speedup. However, as we considered less number of a frequency so that that the information between two frequencies are lost. Afterward, as we increase the quantity of plant set the time required for GPU isn't as much as CPU. For the large number of plant set GPU provides better execution speedup as compare to CPU for the QFT bound generation.

From the results, we can conclude that computation of bound generation using QFT on GPU speeds up the execution.

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Recent Trends in 3D Print Organs

Priyanka A. Bhamare
Dept.Electronics and Telecom
Ramrao Adik Institute Of Technology
Navi Mumbai India
priyadeore17@gmail.com

Dr.Ashwini Naik
Dept.Electronics and Telecom Ramrao
Adik Institute Of Technology
Navi Mumbai India
ashwini.parwatikar@gmail.com

Bhushan S. Deore
Dept.Electronics and Telecom Ramrao
Adik Institute Of Technology
Navi Mumbai India
bsdeore10@gmail.com

Abstract—**3D printing is the process of being able to print any object layer by layer. Three dimensional bioprinting is an emerging and promising technology to construct organ and tissue for implantation. Tissue engineering has been promising field research and bridging the gap between organ shortages. The current generation of 3d printers typically requires input from a CAD program in the form of an STL file and which defines a shape. Organ printing used to take advantage of rapid prototyping (RP) technology to print cells, biomaterials, and cell laden biomaterials, individually, layer-by-layer and directly connecting 3D tissue like structures. 3D bioprinting, the process of using a bioink composed of tissue or human cells.**

Index Terms—**Bioink, organ fabrication,3D Bio-printer.**

I. INTRODUCTION

The some of new technologies we have ever seen but one of new idea about 3D Printing trends and technologies. The making of three-dimensional solid object is the process of 3d printing is almost any shape with a digital system model. The 3D printing is a skill that is used in an additive process, But the successive layers of material are cut down in different shapes. In the subtractive processes 3D printing is defined as the form traditional machining techniques, which is totally depend on the removal of material by using a cutting or drilling .

Rapid prototyping is used for 3D printing in which the system sends a Computer Aided Design (CAD) file to the printer then it will be cut by a program and the printed using a material with successive layer until the full shape is formed. The Rapid prototyping does not regenerate any models with the same quality and same resolution of the conventional prototyping methods. This might not be the case in the future as more and more industries and sectors are adopting this technology and is being performed on various technologies in 3D printing. Also for the industries that are design conscious and have the time constraints 3D printing is a better choice. A three dimensional print organ is constructed by an artificially device using 3D printing techniques designed for organ replacement. The transplantation is in primary purpose of printable organs. The rapid prototyping (RP) is also called as three-dimensional (3D) printing. It can be used as a model and fabricate a 3D object layer by layer based techniques. This technique is involving computer based or software aided design program and the printer can be transferring the signals one into another signals transfer using inkjet materials to fabricate the desired items. [1]

Additive printing is used in 3D technology to print the 3D objects as par the requirement. The printer can print 3D models by adding materials like metals, plastics or polymers layer by layer and formed as per the requirement of the shape to form. The printers can be print with an accurate range of 0.1 mm or more to print. The designs should be formed as par the giving the technology to print actual designs with resolution. The 3D printing has adopted by industries like aerospace, healthcare, automobile and defence. There is the fastest growing consumer market for home based 3D printers.

The simulating and reconstructing of some hard tissues are mainly used in 3D Bioprinting to delivery systems of drug in the medical area. The realisable of the 3D structures fabrication with living cells and bioactive are divided into device to device. Fabrication of organs and complex tissues is still at the investigate stage. The summarization of the development of three dimensional bio-printing and its actual capacity in medical applications, as well as the current challenges faced by 3D bio-printing.

The artificial kidney, heart, liver and their structures, also major organs are currently a new research area. The heart is more complicated organs, and smaller constructs such as heart valves. It should be new subject of research.

II. BASICS OF 3D BIO-PRINTING

The name of 3D printing is also known as Additive Manufacturing (AM), Solid Freeform Fabrication (SFF), Layered Manufacturing (LM) and Rapid Prototyping (RP), is a group of three dimensional technologies that using computer aided design (CAD) models can produce solid objects layer-by-layer. 3D printing technologies are often experienced, automated and flexible, also compared with traditional tissue engineering approaches. The manufacturing procedures can be greatly simplified by the use of 3D printers.

In the year ago many industry are used to create permeable building for hard and organ tissue engineering. But some of the treatment for tissue and organ manufacturing has very increased in three dimensional printers. The main purpose of 3D printing technologies in the hard tissue and organ engineering are ability to produce any computer model in

three dimensional objects very fast with internal and external structures. [1]

The difficult three dimensional objects are preamble tissue engineering structure homogeneous tissues, cell fusion and multiple tissues contained organs as shown in figure.1
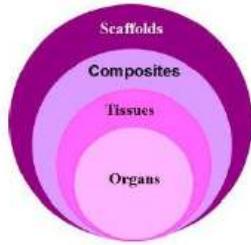
Fig. 1. Application of 3D printing technologies in regenerative medicine [2]

The rock in 3D scaffolds can be implanted after printing. In large tissue engineering autogenously cells to serve as osteoconductive (bone grows on surface) templates. In the formation of scaffolds the tissues are slowly reduce in the body.

The biomaterial materials can be used in glass or in within the living for the large hard tissue organ for the purpose of research. The large hard tissue defect repair is used in homogeneous tissues, but it contain various tissue materials can be useful for the organ engineering. Recently, in the three dimensional process can be use large range of materials.[3]

For example, in three dimensional printing the metal hip joints are lighter. It created by the basic methods in which the implantation can be vary with other techniques due to three dimensional printed bones with their hosting materials. Increasing the repair effects and the hard tissues can generate through the proper medium.[4] In generally, the scaffolds are based in synthetic polymer with their basic materials properties. In the advantages of X-ray machine synthetic scaffolds are used. But the implantation of the X-ray is getting the assist to scaffolds. In the jaw or ear regeneration the possible way is exactly large tissue and organ shape images are used. The images consisting magnetic resonance imaging (MRI) or computerized tomography (CT). It is the impacts of organ repairs and their hard tissue through the proper channels.[2]

During the last three decades, large replacement of long bone graft is the main solution of various metal implants. In 3D printing metal powder are used. These metal powder consist of Titanium aluminides, aluminium alloys, stainless steel, titanium, nickel-based alloys, tantalum, and their combination. To make titanium scaffolds using 3D techniques have porosity of 17%58% and the preamble size of scaffolds is 800 m. The scaffold are improved the clinical performance of the metal substances. In the target location of the titanium

scaffold was implanted, migration of osteoblasts into the go-through channels, secreted ECMs and proliferated, the gradually degraded metal scaffold to reconstruction of the damaged bone. However, causes of metal implants have many syndromes or vice reactions for organ regeneration and hard tissue.

As stated above, organs and hard tissues have structural characteristics and unique material give to strength. The advantage of three dimensional Bioprinting over traditional tissue engineering is the ability to show the fabrication processes for hard tissue and organ engineering which include internal and external elements. [2]

Mostly, the hard organs of the soft tissues such as bone marrow in the bones and pulp in the teeth that are usually used in the traditional tissue engineering field to fabricate hard tissues. Then we conclude that the very few tissues and organ engineering for the creative in three dimensional technologies printing to their every functions through their materials, also the internal and external structures of the organ.

III. 3D PRINTING TECHNOLOGY

In the year of 1980s first 3D printing technology was developed. In that 3D printer referring the CAD files to regenerate the different types of the original manufacturing objects. The main principles are to placing a fix number of layers into each other to develop the any 3D object. The computer aided manufacturing and its including the various quality procedures for digital manufacturing. Any digital model deals with the CAD file is rapidly develop the model and processing technology is applied through the organ engineering and hard tissue.

IV. THREE MAIN 3D BIOPRINTING TECHNOLOGIES

A. Inkjet-Based 3D Bioprinting

A non-contact image reconstruction technology in inkjet-based 3D bioprinting involves thermal, piezoelectric and acoustic conductivity nozzles as shown in Figure.2 Generally, to form desired object, the inkjet 3D bioprinting techniques are directly obtain from commercially available 2D printers and recruit ink binding starting materials i.e. polymer solutions.[5] The different nozzles with one or several ink chambers are in inkjet printer and include thermal, piezoelectric or acoustic actuating units. In electrical current of a short pulse is needed to operate the units. Before printing, in solid platform to permit droplets deposition of starting materials need to be liquefied. During the printing process, continually spray in a fixed volume of fluid onto the platform through the acoustic, thermal or piezoelectric actuating units and through the ink droplets again pre-designed signals on the platform. A droplet is added before the next layer, the droplets must be solidified into the pre-defined geometry. The Deposition rates changing from 1 to 10,000 droplets per second with deposited droplet size can be modulated from 1 to 300 pL. Cells are normally
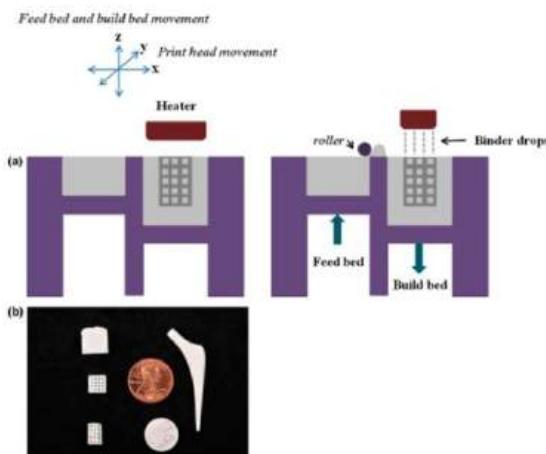
Fig. 2. (a) Schematic of 3D printing using inkjet printing system (b) Using a 3D printer the 3D printed calcium phosphate (CaP) sintered (porous mass by means of heating) structures fabricated [5]

printed in suspensions or low concentration of polymer solutions.

The advantages of hard tissue and organ engineering in inkjet based bioprinting technology are cheap, fast, readily available and high resolution. The deposition resolution can be adjusted to about the size of one cell ($10m$) and the printing accuracy can be well cut to less than $100m$.

B. Laser-Based 3D Bioprinting

A group of printing methods are used in coordinate of starting (base) biomaterials or laser energy to transfer in Laser-based 3D bioprinting technology as shown in Figure.3 [6] Typically, the cell patterning is nozzle free high precision
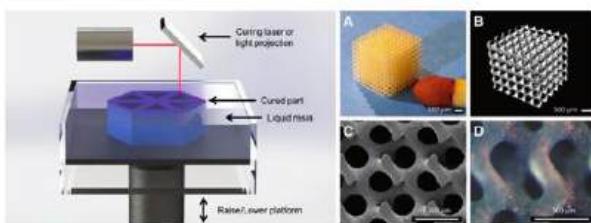
Fig. 3. Schematic of stereolithographic (SLA) printing technique of laser based 3D bioprinter; and (AD) exemplary tissue engineering scaffold composed of poly(D-L lactic acid) (PDLLA) that showcases the resolution and detail of SLA (A) photograph; (B) micro computed tomography (mCT); and (C,D) scanning electron microscope (SEM). Scale bar is 500 mm. [6]

methods are in group of 3D bioprinting technologies. Cell suspensions or Single cells can be placed onto a platform in a controlled manner. A wide range of viscosities of high cell number can be printed with cell-laden polymer solutions. Nonetheless, on the types of the polymer solutions are extremely high restrictions in most of these 3D bioprinting technologies. The large tissue and organ printing applications

is the process of a time-consuming. Prominent limitations of these techniques are as the following: the damages of the laser to cells, metal contaminants and cell distributing accurate. This group of 3D bioprinting technologies is still limited to some simple constructs arranged with a thin layer of cells.[6]

C. Extrusion-Based 3D Bioprinting

The starting materials are totally distributed by force through a nozzle, syringe or orifice while croud processes are in extrusion-based 3D bioprinting technology as shown in Figure.4 and Figure.5 According to the printing temperature i.e., high, ambient and low-temperature are the three broad categories used in group of 3D bioprinting technology. For starting material, the melting extrusion is one of the most popular processes with a very high working temperature, such as (FDM) fused deposition modelling. Some specific plastics, such as poly lactice acid (PLA) and acrylonitrile-butadiene-styrene (ABS) that melting about 200 C, are the most suitable printing materials as nonbiodegadable hard tissue and organ engineering scaffolds. Recently, to create solid 3D scaffolds is one of the least expensive methods with go-through channels.[7]
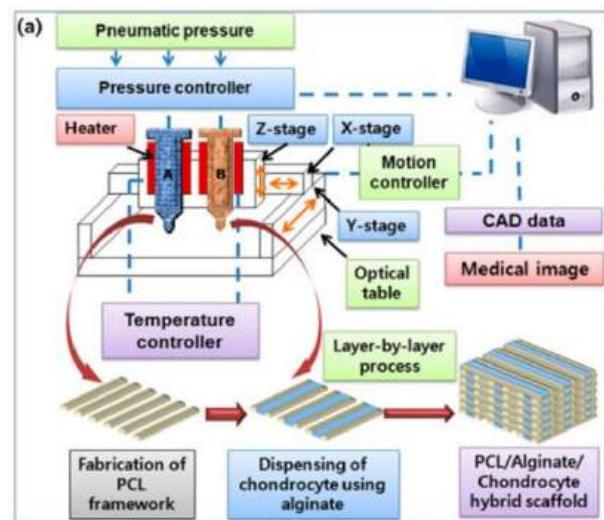
Fig. 4. (a) Schematics of the fabrication process of cell-printed 3D poly-caprolactone (PCL)alginate gel hybrid scaffold using a multihead deposition system [7]

In the research group, in bioprinting, cells were first encapsulated into hydrogel. Natural polymer hydrogel mimic ECMs to provide the cells with suitable conditions to migrate, proliferate, grow, and differentiate. In tissue and organ formation and maturation are the significant effects on hydrogel concentration and cell density. Many ingredients, It can be added in the natural polymer hydrogel is growth factors, polymers. Utilizing suitable polymer focuses, oxygen and supplements can maximally diffuse into the typified cells. The spout and condition can be controlled in the temperature
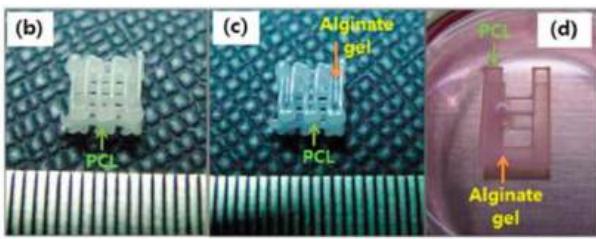
Fig. 5. Photo-images of: (b) fabricated porous 3D PCL scaffold; (c) chondrocyte-printed 3D PCLalginate gel hybrid scaffold for in vivo experiments; and (d) simplified 2D hybrid scaffold for in vitro experiments. [7]

of the working stage, which permits an extensive variety of biomaterials can be printed. To a great degree high cell densities and viabilities have been accomplished. In view of the benefits of these two gatherings of 3D bioprinting innovations, inserts for understanding particular (or altered) hard tissue and organ recovery are currently accessible and turned out to be increasingly appealing.[7]

V. Bioprinting towards Organ Fabrication

The future field of research is the tissue engineering. It should be offer to needs for the bridging gap between transplantation and organ shortage.the vascularized organs remain the main technological barrier to be overcome in 3D building. The computer aided additive biofabrication of 3-D cellular tissue can be constructs in the organ printing.

An increase in willing donors the organ shortage has become more difficult. So that the solution to this problem, as with the solutions to other major engineering challenges and manufacturing living organs from a persons own cells it requires long-term solutions building.

A multidisciplinary field appear in tissue engineering and it involving engineers, scientists, and physicians. For the purpose of in order to native tissue to replace damaged tissues or restore malfunctioning organ, these are creating biological substitutes.

VI. Bioink

The physical extrusion of an ink can refers by the term 3D biomaterial printing that any variety of mechanisms can rapidly stabilizes upon deposition via and is perform layer-by-layer to produce a construct conscious to involved directly with biology i.e. organisms, tissues, cells. The living cells may or may not contain biomaterial inks. After referred to cell encapsulating inks, or a cellular inks and bioinks respectively. [8]

The sodium alginate (NaAlg) solutions is in particular 1% (w/v) for inkjet printing and 8% (w/v) for laser printing and were prepared in deionized (DI) water as bioinks which formed a hydrogel during printing of alginate-only constructs. For cell printing, NIH 3T3 mouse fibroblasts (ATCC, Rockville, MD) were mixed with a sodium alginate solution prepared in Dulbeccos Modified Eagles Medium (DMEM; SigmaAldrich, St. Louis, MO) to produce bioinks

with final concentrations of 2 % (w/v) sodium alginate and 5106 cells/mL for laser printing and 1% (w/v) sodium alginate and 5106 cells/mL for inkjet printing.

VII. Future Trends

The bioprinting of complex organs is the most developed 3D printing application. It has been evaluated that we are less than 20 years from a completely working printable heart. Because of difficulties the advance that has been made is promising in printing vascular systems, the truth of printed organs is still some way off. As the innovation progresses, it is normal that complex heterogeneous tissues, for example, manufacture of kidney and liver tissues will be effectively. Printed tissue and organ models for use in tranquilize revelation and additionally it will open the way to making practicable live embeds.[9]

VIII. Conclusion

In this era of 3D printing, new idea about 3D Bioprinting organ technology is discussed. The 3D Bioprinting of organs is fabricated for the use of re-transplantation in human body. In developing countries like Germany, China, and European countries this technology is already used for printing organs like human brain, heart, kidney, lumps, liver, ear etc. This Bioprinter is mainly based on three main technologies, Inkjet, Laser-based, Extrusion-based bioprinter technology to fabricate artificial human organ. These technologies use Bioink to print the organ. Some of the hydrogels, alginate solutions are specially used in making of Bioink. The needy patients body will get adjusted with the printed organ than the transplanted from other humans body. Some of interested researchers are still working on it, so that this technology of 3D organ printing can reach every patient in future.

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Design and Development of Face Recognition algorithms– A Comparison

Shubha. P
Dept. of Instrumentation Technology,
Dr.Ambedkar Institute Of Technology,
Banglaore-560056, India,
shubhajagi@gmail.com

Dr. M. Meenakshi
Dept. of Instrumentation Technology,
Dr. Ambedkar Institute Of Technology,
Bangalore-560056, India,
Meenakshi_mbhat@yahoo.com

Abstract: This paper presents an efficient method for face detection applied for various applications. Here, the essential features needed for the face recognition is extracted using two different algorithms i,e Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). The necessary algorithms for the implementation of PCA and LDA are developed using MATLAB and its performance is tested by inputting several images captured using camera apart from those from the standard database.
The performance of both PCA and LDA are studied experimentally for various situations including change in the pose of captured image with respect to that of database. For this condition experimental results proved the outperformance only while applying PCA compared to that of LDA.

Keywords: Face detection, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), MATLAB

Introduction:

Face recognition is an automated method to recognize a person in an image or videos. We can recognize a number of faces learned throughout our lifespan and identify those faces even after years. It involves recognizing individuals with their inbuilt facial characteristic. Verification and identification are the two modes of face recognition. One-to-one matching is found in Face verification system. Face identification system involves one-to-many matching against all image templates in face database [1]. Face recognition is a primary part of biometrics. In biometrics basic character of human is matched to the existing data and depending on result of matching identification of a human being is traced. In order to perform the above work, face recognition algorithms are implemented. These algorithms can be applied in security control, crime investigation, and entrance control in buildings, access control at ATM's, passport verification, identifying the faces, staff attendance system in a given databases [2-3]**.**

Face recognition techniques are strongly affected by variations in pose and illumination, accessories on face and aging effects.

The face recognition algorithms typically extract features and compare with the database to find the best match. Visual face recognition system is one of the multimodal biometric systems. The system automatically recognizes or identifies the faces, based on facial information. The face must be registered in the database so that the biometric template or reference can be captured [4-5]. Depending on the situation, visual recognition system can operate in recognition mode. The algorithms are used to design the above system are Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA).
Number of work has been carried out in the literature for face recognition for various applications. In ref[4] the color based approach is utilized to detect face. The area of skin is divided and sent to the process of recognition as its input. Principal component analysis is utilized for feature extraction and face recognition. Color of images will change because of the changes in surrounding light and shadow. Color of an image will blur due to the movements of object.
The HAAR classifier [5] creates few false positives by detecting an object as face. Eigenface approach is utilized for face recognition. In this method, chances of false face recognition is more, hence a manual approach is needed to crop the area of interest to increase the efficiency.
In reference [6], Viola-Jones algorithm and correlation techniques are used to detect and recognize the face. This method also requires the area of interest to be cropped manually so that it can be compared with current database. The efficiency of face recognition is very low when the various faces are captured in an image with different or same sequence.
As mentioned above, the work carried out in the literature has its own drawbacks. To address the above issues, needs more mathematical approaches for face detection. Based on this consideration PCA and LDA algorithms are designed to overcome the above draw backs. The developed algorithm is tested for its performance using MATLAB by inputting

several images captured through webcam and few images are taken from standard database. Comparison of the above two algorithms is carried out, the results are presented.

The organization of this paper is as follows: The functioning of face recognition system is given in section II. Next, the algorithms for face Recognition using PCA and LDA techniques are given in section III. Section IV gives the experimental results and discussions followed by conclusions drawn in section V.

II. Face Recognition system

The block diagram of the face recognition system is illustrated in the Fig 1. This includes Image capture, face detection, pre-processing, database, feature extraction and face recognition.
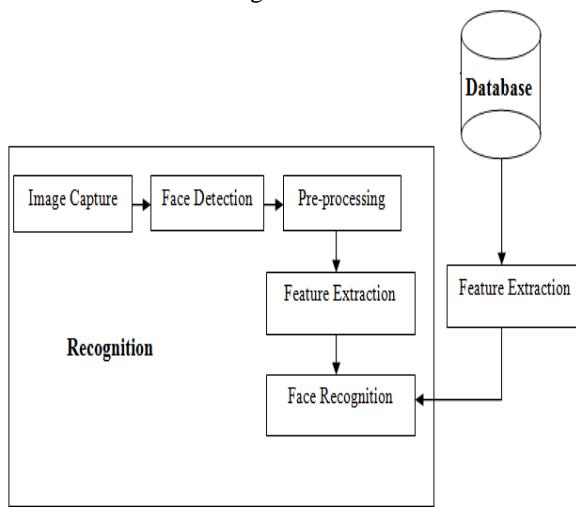
Fig 1 Block diagram representation of Face Recognition system

The first step of face recognition system is capturing of an image. This is carried out using high resolution camera. The dimension of the captured image is 640x480 and is normalized to a dimension of 200x200 to avoid pixel reduction.

In face detection process facial area is detected and separated from the rest of the background images. The locateface function in the Image processing toolbox is used to detect the facial area [6].

The essential part of the face recognition systems is Image preprocessing techniques. The main aim of these techniques is an improvement of the image data which enhances some image features important for further processing. Here, Grayscale Conversion and Histogram Equalization methods are used as Image preprocessing techniques.

a. Grayscale Conversion

Here, the image is converted from RGB to gray scale image, because RGB images will give poor performance. Pixels in grayscale images are stored as 8 bit integer to represent color into black and white

b. Histogram Equalization

An image histogram is a graphical representation of the tonal distribution in a digital image. This is one of the techniques for adjusting image intensities to enhance the contrast. This allows for those areas of lower local contrast to gain a higher contrast. This can be accomplished by effectively spreading the most frequent intensity values. Hence results in a histogram approximately constant for all gray values [7].
Fig. 2 illustrates the image histogram before and after equalization.
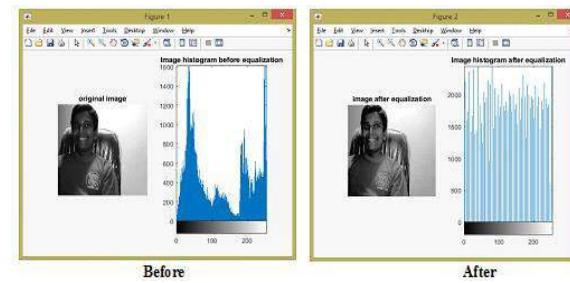
Fig. 2 Image histogram before and after equalization

The database creating segment consists of capturing images, feature extraction of faces, enhancing the image by means of pre-processing and storing within database. It is preferred to store the multiple images of an individual in database for the better performance. All the images in the database are of same size and the images are taken in same environmental conditions.

Feature extraction is a method for extracting significant feature from the face image, this results in effective information which is helpful to distinguish between faces of different individuals. In this method a biometric template which is a mathematical representation of original image is generated and then the extracted features are utilized for recognition.

After the feature extraction, the next step is to categorize and recognize the images. Classifications techniques proposed in this work are PCA and LDA face recognition algorithms. Features are extracted from the images within database and test image will undergo recognition steps by using one of these techniques and based on matching of features of

database image and test image, face of an individual is recognized.

III. FACE RECOGNITION TECHNIQUES

a. Principal Components Analysis

PCA is an approach in face recognition by which number of variables can be reduced statistically. The highly relevant features in the face are extracted by this algorithm. In the training sets all images are symbolized as a linear combination of weighted eigen-vectors and eigenfaces [8][9]. Each face minus the mean in the training database is represented as a linear combination of the best Eigen vectors. The covariance matrix of images in training database provide the eigen-vectors known as basic function and its weight is determined by choosing a set of highly relevant eigenfaces. The recognition rate can be increased by increasing the number of eigenvalues. The recognition rate is increased as a result of increase in number of images and varieties of sample images in the covariance matrix. Pose and expression has lesser effect on the rate of recognition but noisy image and lighting conditions has more effect on recognition accuracy.

The following are the basic steps of PCA algorithm at Training database

1. Setup training database
2. Represent every image as vector
3. Compute the average face vector
4. Subtract the mean face from step 2 & 3
5. Compute the covariance matrix
6. Compute Eigen vecors
7. Retain K Eigen vectors which corresponds to the K largest Eigen values.

The image of unknown face (test image) is centered and considered with a same size as the training database. The following are the recognition procedure using Eigen faces.

1. Normalize test (unknown) image.
2. Project on the Eigen face
3. Represent step 2 as a vector
4. Calculate the Euclidean distances
5. Unknown image is recognized when the Euclidean distance from step4 is minimum between test image and its matched image in the training database.

b. Linear Discriminant Analysis

This algorithm will find the vectors in the underlying space which is best discriminant among classes. For all samples of all the classes between class scatter

matrix (SB) and within class scatter matrix (SW) are defined. The differences between classes are found. LDA increases the ratio of determinant of projected samples between class scatter matrixes to determinant of projected samples within class scatter matrix [10].

The following are the basic steps of LDA algorithm at Training database
1. Set up the database.
2. Compute mean vector for the different classes from the database.
3 .Compute class scatter matrix and the between class scatter matrix
4. Compute eigenvector and eigenvalues for step 3
5. Sort the eigenvectors by decreasing eigenvalues to form $d \times k$ dimensional matrix.
6. The fisher faces are generated for step 5

The recognition procedure at the Test database is

1. A test image is read and a column vector is generated.
2. The deviation between mean and original face are determined.
3. Projected fisher test image is found.
4. Euclidean distance is calculated from step 3 and fisher faces.
5. Unknown image is recognized when the Euclidean distance from step4 is minimum between test image and its matched image in the training database.

IV. Experimental Results and Discussion

The PCA and LDA algorithms given in section III are developed using MATLAB R2013a and its performance is tested for different test images. Figure 3 shows the set of images stored in the training database which are used while running algorithm to recognize the face selected from the test database.

Fig. 3 Input Images in the Training database

While experimenting, the test image is compared with the input image. Figure 4 gives the extracted Eigen faces for the images in the database using PCA algorithm as explained in section 3.Eigen faces appeared as light and dark areas which are arranged in a specific pattern. Each Eigen face has Eigen values which indicates the deviation of its corresponding images in the training database from the mean image in the data base.
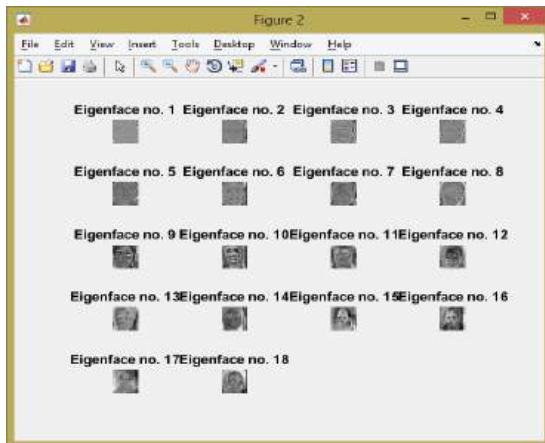
Fig. 4 shows the corresponding Eigen faces using PCA

Figure 5 shows the fisher faces of application of LDA algorithm to process the images given in figures 3.
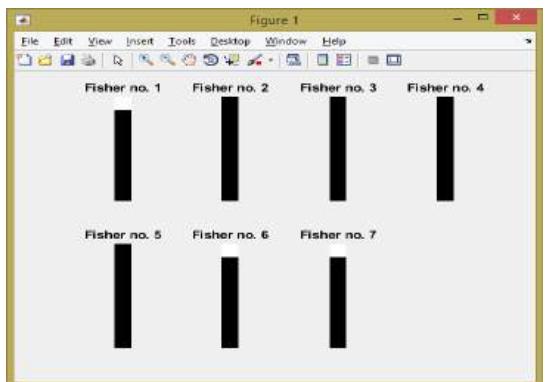
Fig.5 shows the corresponding Fisher faces using LDA

Fig. 6a, 6b and 6c shows the results of application of PCA and LDA to the test image under two different conditions, i.e in the same pose and at different pose. Fig. 6a shows the results of image recognition by applying PCA and LDA with the same pose and was found correct. Similarly, results clearly show the recognition of the image properly in fig. 6b though the pose is differed from that of the training database with PCA. Again the same test image in fig. 6b is tested by applying LDA and the results are recorded

as in fig. 6c. In Fig 6c, the recognized image is differed from the actual image applied for testing. This clearly demonstrates that, LDA can perform better face recognition for a single input image and it does not consider multiple train images.
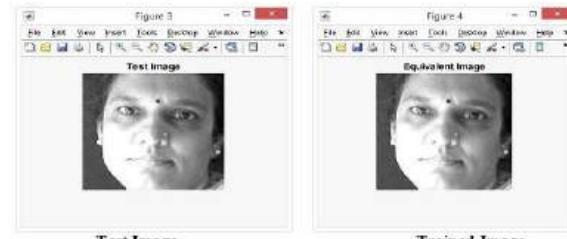
Fig.6a The Recognition of Individual Images having Same Pose using PCA and LDA

Fig.6b The Recognition of Individual Images having different Pose using PCA
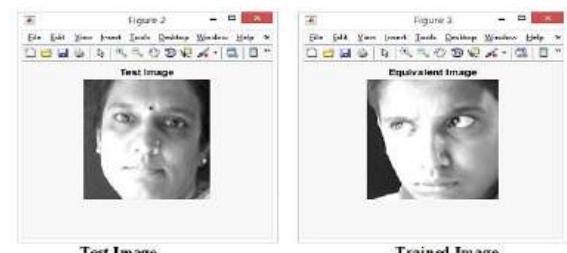
Fig.6c The Recognition of Individual Images having different Pose using LDA

The performance of both PCA and LDA is tested again with one more image and the results are given in fig. 8a, b & c respectively
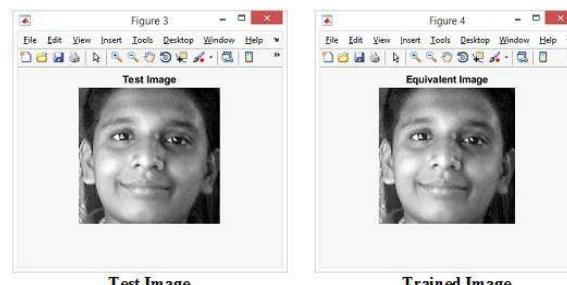
Fig.7a The Recognition of Individual Images having same Pose using PCA and LDA
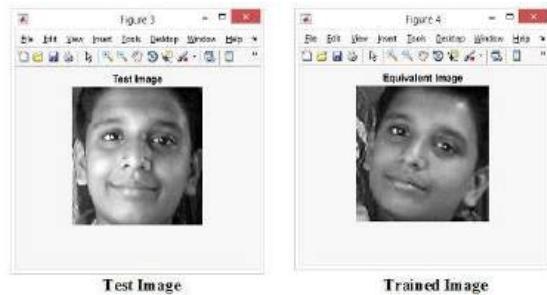
Fig.7b The Recognition of Individual Images having different Pose using PCA
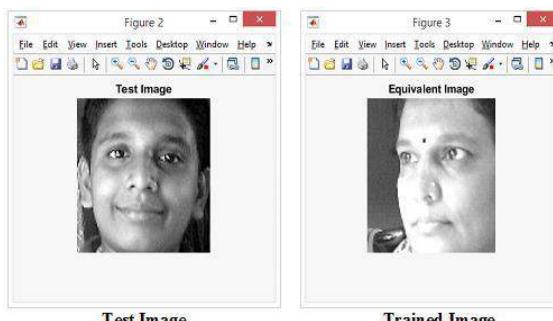
Fig.7c The Recognition of Individual Images having different Pose using LDA

V. Conclusion

In this research work, the design and implementation of the face recognition based on PCA and LDA algorithm are proposed. From the obtained results it is concluded that PCA algorithm outperforms LDA algorithm for small training database and it gives 100% recognition rate at specific dimension and for the captured images at different poses. This is because LDA can perform better only for a single input image pose. Also, Eigen values needed for the analysis can be computed easily in PCA. But in LDA, within-class scatter matrix and between-class scatter matrix need to be computed to obtain the Eigen values, which requires more time than PCA to extract features.

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A REVIEW ON VIDEO SEGMENTATION

Madhura Bonde
PG Student
bondemadhura@gmail.com

Bhagyashree Ingle
PG Student
bhagyashree.ingle09@gmail.com

Dr. Milind Nemade
Head OF Department, ETRX
mnemade@somaiya.edu

Abstract:

There are wide variety of video applications like Military and Navy. For these applications, it is necessary to store the video information. Hence for such applications, proper indexing and retrieval method should be present so that the stored information will be useful. To achieve these methods, we need to use video segmentation. In video segmentation it is necessary to detect motion and estimation. This paper contains different methods of tracking and video segmentation methods. When shape and location of object in each frame is required then tracking is used. In this paper, various algorithms used for video segmentation are taken for study and also the comparison of segmentation techniques is shown.

I. Introduction

In segmentation process, there are data groups which are having identical features. These features are used for pattern recognition, computer vision and digital multimedia processing.

Video segmentation is a process of converting the video data into meaningful parts that are related to real world in the video data. This video data is covered in set of segments of the same video. A video signal is temporal as well as static in nature since it contains temporal information that includes camera motion and object motion. Figure 1 shows the block diagram of video segmentation. Video segmentation categories are as follows:

1) According to source of attributes:
   This classification is based on the features of the video data. These methods include pixel based methods, region based methods, edge based methods, etc.

2) According to model employed:
   There are different models such as Gaussian model, Bayesian model, stochastic modeling etc. All these models can be used for video segmentation. For example, using Gaussian model, noise present in the video can be removed.

3) According to strategic involved:
   In this type, video segmentation is based on clustering in which extraction of trajectories of point of interest is taken.
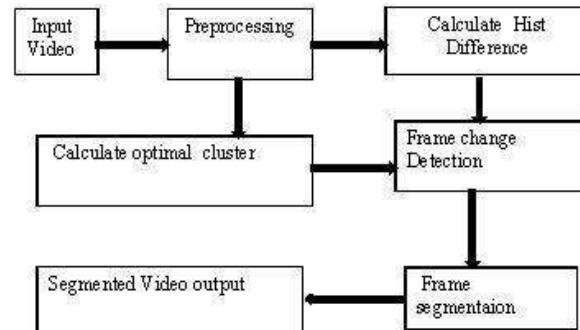
Fig. 1: Block Diagram of Video Segmentation

II. Literature Review

In recent years, there were many researchers who worked on video segmentation and object motion. Many of them had tried to improve the methods which were previously available. All these papers are reviewed in this paper and comparison is also given at the end. In 2012, to find moving objects in a video, background subtraction is used.

For example, vehicle driving on a thruway. A rough approximation to the task of classifying each pixel on the frame of present image, locate

slow moving objects or video having poor image qualities and distinguish shadows from dynamic objects by using modified background subtraction method. [1]

In 2013, author proposed video segmentation method called a novel cluster number adaptive fuzzy c-means image segmentation(CNAFCM). This method is useful when cluster number is not clear beforehand which performs grouping of pixels naturally into different homogeneous regions. cluster number is calculated at image block level using GLCM(Grey Level Co-occurrence Matrix) feature[2].In 2013,One more method used for video segmentation which is skillful fuzzy c-means algorithm. This method improved the noise robustness using spatial probability of nearby pixel. Before segmentation process, the medical images are denoised using effective algorithms [3].

In 2013, to reduce the noise and to get the edges between brain and tissues MRIs are pre-processed with bilateral filtering. With the help of k-means algorithm 5 to 6 clusters of image are formed [4].

In 2013, one method is proposed in which dynamic object segmentation based on fuzzy clustering is combined with adaptive background model in HSV color space to extract dynamic objects from frame. Using the description of HSV color space adaptive background model is capable of restoring the background and dynamic object segmentation based on fuzzy clustering distinguishes the noise area and moving area [5].

In 2014, background modeling is used in which simplified mean shift filter and k-means clustering is used. The background modeling includes Gaussian modeling, kernel density estimation, etc [6].

In 2014, fuzzy color histogram and morphological processing is used as motion recognition system. Unwanted pixels are removed using morphological process and filtering from the background of dynamic texture scenes. Fuzzy color histogram

algorithm is used to attenuate the color variation generated by background motion [7]. In 2015, for medical image segmentation new algorithm is proposed. This algorithm combines Gaussian kernels based fuzzy c-means algorithm and mean and peak and valley filtering. This mean and peak and valley filtering is used to remove the noise and Gaussian kernels based fuzzy c means algorithm is used on the processed images [8].

In 2016, a novel approach to video segmentation which operate in bilateral space. To solve design of new energy on the vertices of regularly sampled spatio-temporal bilateral grid here standard graph cut label assignment used. In this method energy will minimize implicitly approximate long range,spatio-temporal connection between pixels although contain only small number of variable and only local graph edges.[9]

In 2016, for real time and accurate application event segmentation system is needed which will be possible by fast and simple computer vision algorithm. In this system the optical flow estimation and flow segmentation algorithm estimated by camera planning. Convolutional Neural Network is used to recognize shot classes and clock digits.[10]

In2016, video segmentation of moving object, deforming shapes is to difficult which is overcome by object flow , that means object segmentation and optical flow . for segmentation multi-scale ,spatial-temporal objective function uses optical flow to propagate information between frame.[11]

In 2016. Multi view video segmentation of dynamic scene is possible. This method is relay on geometric calibration to impose spatial shape constraints in two view point. the system gives the competitive segmentation to identify co-instances of object.
This method is fully automated method that can

segment subject without any particular preprocessing state.[12]

In 2017, performance analysis of different algorithms is done. The different algorithms present for segmentation are k means algorithm, region growing algorithm, means shift algorithm and watershed algorithm. All these algorithms are compared based on Quality Matrix parameters Gray Level Energy, Discrete Entropy, etc. According to comparison, authors conclude that Region Growing algorithm provides the best possible segmentation results for entertainment, sports and scenery videos[13].

In 2017, for spatial and temporal dependencies from a sequence of frames one architecture is developed called as two stream deep architecture for robust video segmentation. In this architecture, a frame stream is prepared on pixel level with 2D FCN followed by ConvLSTM through which long term information is explored. On voxel level, fusion of predictions of two streams improved the precision of segmentation [14].

In 2017, one more method for video segmentation is proposed in which temporal data is included. The network used for this is completely convolutional network that works on the sliding window of temporal data. This method works in online manner instead of operating on whole batch of video frames. This method improved the performance of segmentation to a great extent[15].

In 2017, video segmentation is used in a system that generates laparoscopic and robot assisted procedures using minimal computational resources. SVM and HMM is used in combination along with feature space. This helps to capture the variabilities of video frames without analysis of nonrigid variable environment. The basic aim of this design is to improve the phase prediction accuracy which is achieved to certain extent[16].

Ref. no. & Year	Technology used	conclusion
[1]2012	Modified Background Subtraction	Slow moving object perfectly handle and quality of video image is poor
[2]2013	CNAFCM	With minimum time cost cluster number is estimated
[3]2013	Histogram based FCM algorithm and spatial prob.	For noisy image segmentation is improved
[4]2013	Clustering and enhancement methods	From MRI image extraction and detection of brain tumor is possible
[5]2013	Optimizing motion detection algorithm	The effect of noise is suppressed
[6]2014	k-means clustering and mean shift filter	Easy to understand for non -mathematicians
[8]2015	Kernel based fuzzy C means algorithm	performance increase and computational complexity decreases
[9]2016	Bilateral space method	Scales linearly with image size, and allow for interactive feedback
[10]2016	Convolutional Neural Network and camera planning by	It is simple and fast but reliable to give useful information for event segmentation

	optical flow estimation	
[11]2016	Object flow segmentation used	Performs favorably against state of the art methods on two datasets
[12]2016	Multi view segmentation video segmentation of dynamic scene	Fully automated method that can segment subject without any particular preprocessing stage.
[13]2017	Performance Analysis using different algorithms	Region Growing algorithm provides the best possible segmentation results for entertainment, sports and scenery videos
[14]2017	Two stream deep architecture for robust video segmentation	Voxel level implementation gives the better precision.
[15]2017	Convolutional method for segmentation is used which operates on sliding window of frame.	Performance of segmentation is improved to great extent.
[16]2017	SVM and HMM is used	The phase prediction accuracy which is achieved to certain extent

Table 1: Comparison of result paper

III. Conclusion

From the above survey it is clear that , most challenging part is video object segmentation in digital video processing.

for video broadcasting application , the video segmentation is very important part.

Video object segmentation can be done by different technology ao are as Modified Background Subtraction, CNAFCM ,Histogram Based FCM Algorithm and Spatial prob ,Clustering and Enhancement Methods,Optimizing Motion Detection algorithm,,Simplified Mean Shift Filter and K-Means clustering,Kernel Based Fuzzy C Means Algorithm, bilateral space method and multi view segmentation methods,having some advantages and disadvantages. Region growing algorithm provides best possible segmentation for sport and scenery video.

TWO stream deep architecture is used for robust video segmentation which gives the better performance.the phase prediction accuracy is achieved by SVM and HMM method.

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Plagiarism Detection for Marathi Language

Harshall V Lamba
Department of Computer Engineering
Pillai College of Engineering
Mumbai, India
hlamba@mes.ac.in

Sharvari S Govilkar
Department of Computer Engineering
Pillai College of Engineering
Mumbai, India
sgovilkar@mes.ac.in

Abstract— **Plagiarism is an illicit act of using other's work wholly or partially as one's own in any field such as art, poetry literature, cinema, research and other creative forms of study. It has become a serious crime in academia and research fields. The evolution of internet and the use of computers on a large scale has led to easier access to a wide range of resources and thus made the situation even worse. Therefore, there is a need for automatic detection of plagiarism in text.**

There are variety of tools available for detecting plagiarism in English language, but we don't find any support for Indian regional languages like Hindi, Marathi, etc. The designed system presents a plagiarism detection approach based on fingerprinting for identifying copy in Marathi text-based documents. Identifying plagiarism in Marathi is a complex task due to the fact that Devanagari script is morphologically rich and consists of intricate linguistic composition. The method establishes the percentage of similarity between a suspicious document and a reference document. The k-gram, 0 mod p and winnowing algorithms are used to compute the fingerprints for the document. The winnowing algorithm detects structural changes at sentence level and hence gives very high level of similarity percentage.

Keywords— Plagiarism Detection; Document Fingerprint; Winnowing.

I. Introduction

Nowadays, access to information is easy due to internet. However, this has its own disadvantages. Plagiarism is a threat to the society, especially the publications and academia sections. In order to protect intellectual property and maintain academic integrity, institutions and publishing houses have turned to using services to detect plagiarism. Although some commercial tools are available but are very limited and language specific. Plagiarism is a major concern from the time of education assessment. Internet has further increased the issue by providing fast and easy access to a wide pool of information.

Plagiarism is the act of presenting someone else's work and ideas as our own. It is not only a moral offence but also a legal offense. Plagiarism is derived from the ancient Latin root words "plagiaries", the meaning being an abductor and "plagiare" meaning to steal. The dictionary definition of plagiarism is "The action or practice of taking someone else's work, idea, etc., and passing it off as one's own; literary theft." (Oxford English Dictionary) [1]. Plagiarism has become a major concern since the establishment of education

assessment. Immense, easy and quick access to information in the modern internet era has made the problem of plagiarism even more intense.

To estimate similarity and detect plagiarism there are some manual methods and automatic tools. Some of these methods and/or tools are language-independent, i.e. can be used for many languages while others are language-dependent. The way similarity estimation and plagiarism detection is done in free texts can be basically of two types, Intrinsic (or Internal) and Extrinsic (or External). Internal plagiarism detection methods detect changes in the style of writing, and use them as a proof of a claim of plagiarism. While, External plagiarism detection methods are independent of internal evidences, but make use of a reference corpus of documents to detect similarities between the suspicious document and reference documents [2]. The scope of this work belongs to the latter category.

II. Literature Survey

In this section we present the relevant literature review that uses various technique for plagiarism detection. A number of Plagiarism Detection algorithms have been applied on various languages.

Sindhu L and Sumam Mary Idicula [3] present a detection system based on fingerprinting for identifying copy in Malayalam text-based documents. A method for detecting plagiarism in Malayalam documents by identifying similarity between documents is presented in this paper. The winnowing algorithm efficiently computes the fingerprints at sentence level. The search time of the method is improved and the detection process gives better accuracy.

Sindhu L, Bindu Baby Thomas and Sumam Mary Idicula [4] present a plagiarism detection tool for detecting plagiarism in Malayalam documents. The tool compares the suspect document with the reference documents using NLP techniques and the results show that this type of similarity was not identified by the existing methods for detecting plagiarism in Malayalam documents.

Sindhu L, Bindu Baby Thomas and Sumam Mary Idicula [5] propose a method of copy detection in short Malayalam text passages. An n-gram algorithm was developed for extracting the words to detect plagiarism and it was found that the best model for comparing the Malayalam text is trigrams. The performance of the trigram model was also acceptable in

terms of computational complexity which was shown through experimentation.

Agung Toto Wibowo, Kadek W Sudarmadi and Ari M Barmawi [6] propose fingerprint and Winnowing algorithm for detecting plagiarism of scientific articles in Bahasa Indonesia. A threshold was set and plagiarism was detected using the Dice coefficient between suspicious and reference documents.

Nurhayati and Busman [7], propose a document plagiarism detection software using Levenshtein Distane Algorithm on Android Smartphone. The proposed system calculates the Levenshtein distance between the suspicious document and reference document. The value of this distance is used to calculate percentage similarity of the two documents.

Hui Ning, Cuixia Du, Leilei Kong, Haoliang Qi and Mingxing Wang [8] proposed a system that compares key phrase extraction methods like TF-IDF, weighted TF-IDF, TF-IDF based on passages and Weighted TF-IDF based on passages. Vector space model was used to implement all the comparisons experiments. TF-IDF based on passages was found to be the best choice through experimentation.

Deepa Gupta, Vani K and Charan Kamal Singh [9] propose to detect intelligent plagiarism cases in the context of semantics and linguistic variations. The paper analyses the different pre-processing methods from the techniques of Natural Language Processing (NLP). Fuzzy-semantic similarity measures are also explored for comparing the documents. The final evaluation of the system is done using PAN 2012 data set and comparison is done between the performances of various methods.

MAC Jiffriya MAC Akmal Jahan and Roshan G. Ragel [10] propose a tool to detect plagiarism effectively using extrinsic plagiarism detection for text based assignments. In the proposed method unigram, bigram, trigram of vector space model are compared with cosine similarity measure. In addition, the selected trigram vector space model with cosine similarity measure is compared with tri-gram sequence matching technique with Jaccard measure.

Ahmed Hamza Osman and Naomie Salim [11] introduce an improved semantic text plagiarism detection technique based on Chi-squared Automatic Interaction Detection (CHAID). In the proposed technique each term of a sentence is allocated a semantic label and the text is compared and analyzed based on these labels. Thus the underlying semantic meaning in terms of the relationships between its concepts is captured via Semantic Role Labeling (SRL).

Ahmed Hamza Osman, Naomie Salim, Mohammed Salem Binwahlan, Ssennoga Twaha, Yogan Jaya Kumar and Albaraa Abuobieda [12] introduce a technique which uses Semantic Role Labeling (SRL) to detect plagiarism. Each term is allocated a semantic label based on which the technique compares the text and analysis it. SRL is good in generating semantic arguments for each sentence.

Asif Ekbal, Sriparna Saha and Gaurav Choudhary [13] propose a technique based on textual similarity for external plagiarism detection. The method proposed is based on POS classes, VSM and graph based approach.

Urvashi Garg and Vishal Goyal [14] present an automated plagiarism detection software tool Maulik, which divides the text into n-grams. It uses stop word removal and stemming. Similarity score is calculated using cosine similarity. Findings: 96.3 similarity score has been achieved which is better when compared to the existing Hindi plagiarism detection tools such as Plagiarism checker, Plagiarism finder, Plagiarisma, Dupli checker, Quetext.

Nilam Shenoy and M.A. Potey [15] present fuzzy semantic-based similarity search model and Naïve Bayes model for uncovering obfuscated plagiarism for English and Marathi language. 'If-then' fuzzy rules are used in this model. Part-of-speech (POS) tags and WordNet-based similarity measures are used to find semantic similarities among the words. Naïve Bayes classifier is used to achieve better detection performance.

III.   PROPOSED METHODOLOGY

The proposed system is plagiarism detection for Marathi documents using external plagiarism detection. The system takes input a suspicious Marathi text document which will be matched with all the Marathi documents maintained in a reference corpus. The output of the system will be a report which will list the percentage of plagiarism found in the suspicious Marathi document against all the documents maintained in the reference corpus.
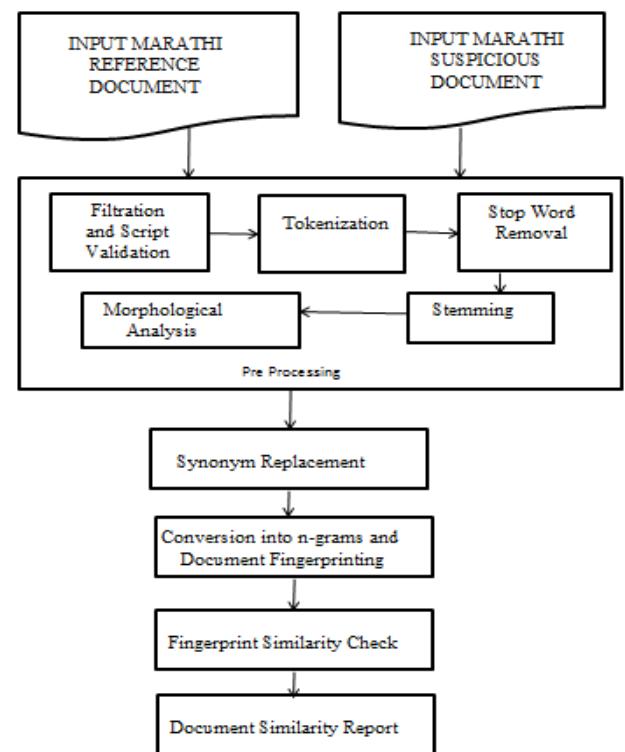
Fig. 1 System Architecture

The documents undergo pre-processing steps which includes input validation, tokenization, stop word removal, stemming and morphological analysis. Then the pre-processed data is

given as input to the document fingerprinting module for plagiarism detection. The final output a report is produced based on a set threshold value which decides whether both the documents have similar content or not.

A. Pre-processing

- **Input Validation**- Validating the set of Marathi text documents is the initial step in preprocessing. The input documents may comprise some terms, phrases in other script or languages. So, in this phase we will validate whether the input documents are in Devanagari script or not.
- **Tokenization**- In tokenization all the words in the text document are considered as separate tokens. Space is used as a separator between the tokens.
- **Stop-word Removal**- The most frequently occurring words in a document are nothing but stop words; which slow down the processing of documents. These stop words are insignificant for document processing. Hence we remove the stop words to enhance the speed of searching by comparing with a corpus of stop words.
- **Stemming**- Stemming is an important step of preprocessing which reduces word to its stem using suffix list to remove suffixes of words. This is input to the morphological analysis step.
- **Morphological Analysis**- In this step, the stem word is analyzed to check for some inflections. The task of morphological analysis is to identify inner structure of word. The output of morphological analysis is root word of given input documents.

B. Synonym Replacement

Often plagiarism is hidden using synonyms. At first sight, it may look like a different sentence but the semantic is left unmodified. If a large number of words are replaced by their synonyms, many plagiarism detection tools might fail [3].

C. Conversion into n-grams

The Hashing of k-grams or w-shingles is commonly used for detecting plagiarism using document fingerprinting. All formatting, punctuations, capital letters, etc. are removed from every document which is then considered as a sequence of meaningful tokens. The document is divided into k-grams or w-shingles. A k-gram is a contiguous substring of length k. For example, the sequence of 5-grams of the phrase "A do run run run, a do run run" is:

adoru dorun orunr runru unrun nrunr runru unrun
nruna runad unado nador adoru dorun orunr runru unrun

On the other hand, a shingle is a contiguous subsequence of words, and more concretely a contiguous subsequence of w words is a w-shingle. For example, the set of 4-shingles of the phrase "one two three one two three one two three" is:

{(one, two, three, one), (two, three, one, two), (three, one, two, three)}

Then hash each k-gram/w-shingle and select a subset of these hashes to be the document's fingerprints [3].

D. Document Fingerprinting

There are different schemes available for the selection of fingerprints. They are:

- **N-gram**- Every chunk of the document is selected as fingerprints. The advantage of this method is its easy implementation and the disadvantage is that it takes a lot of time.
- **0 mod p**- For an inter value p this method selects fingerprints located at every 0 mod p. If the hashes of copied text belong to those selected by the 0 mod p, then copied content is detected. Here the number of the fingerprints is reduced by the value of p.
- **Winnowing**- First the pieces of the documents are generated using the n-gram technique. Then hash values are produced using a hash function on these pieces of text. Hash values are numerical representations. Next another window of fixed size is used to iterate the previous step on the hash-values generated instead of the original text. At last, from each window the least hash-value is selected. The rightmost occurring hash-value is selected, if multiple hash-values with the minimum value are present. For any input text document, a set of fingerprints to represent it is obtained as a result of winnowing. The input in this work is a document that undergoes several steps of pre-processing, for extracting its text and normalizing it. Then, the normalized text will be segmented into sentences and each of these sentences is passed through the winnowing phase and its fingerprints are generated. Pairwise comparisons are done between all possible combinations of sentences fingerprints to detect plagiarism [3].

E. Fingerprinting Similarity Check

Algorithm: Document similarity
Input: DocA, DocB
Output: Similarity between DocA, DocB
Steps:

1. MinDocSize = min (|DocA|, |DocB|)
2. IntersectionDocSize = |DocA ∩ DocB|
3. If (IntersectionDocSize>=MinDocSize*DocThreshold) then go to step4 else go to step5
4. Similarity = true, go to step6
5. Similarity = false
6. Stop

IV.   RESULTS AND DISCUSSIONS

A. Dataset Used

In this project 30 documents were created from the content available on the https://www.maayboli.com/ website. The plagiarized documents were created from the original documents with the following mechanism:

a) Approximately 40 to 50% of the words were replaced randomly with their similar words. Stop words were avoided.
b) The structure of some of the sentences were changed like converting active to passive voice and vice versa, changing the order of consecutive nouns, etc.

B. Performance Measures

There are a lot of performance measures used to evaluate different types of applications systems. A plagiarism detection system is nothing but a classification system as it classifies the suspicious document as either plagiarized or non-plagiarized. Thus we use the most common classification metrics like accuracy, precision, recall and F-measure to evaluate our plagiarism detection system.

The results are generated by varying the parameters of each of the algorithms. When a suspicious document is compared to a reference document by the system, a similarity score is generated as the output. To classify the suspicious document as either plagiarized or non-plagiarized, we need to find threshold score. If the score will be above this threshold, then the suspicious document will be classified as plagiarized with the reference document and if the score is below this threshold, the suspicious document will not be treated as plagiarized one. In order to select the threshold value for various techniques, we tested 30 documents with various system parameters and we used the box and whisker plot to view the behavior of different techniques with various parameters.

C. Analysis of k-gram

k-gram technique selects all the hash values as fingerprints and matches the fingerprints of the suspicious document with the corresponding fingerprints of the reference document to find the similarity score. The tokens in the suspicious document and the reference document are converted into 3-grams and then into 4-grams. The comparison was is on the behavior of the similarities generated using these to gram values. Based on the similarity score generated for all the 30 documents it is found that the variance between the similarity scores is less in case of n = 3 than in case of n = 4.

TABLE 1 STATISTICAL SUMMARY OF K-GRAM SIMILARITY SCORES

Statistic	n = 3	n = 4
count	30	30
mean	61.5	51.4
std. deviation	9.12	10.89
min	48	34
25%	56.25	45.25
50%	60	49
75%	67	56.75
max	86	81

Based on this summary we concluded that k-gram method gives better similarity estimates when n=3 and the DocThreshold was selected to be 45%

D. Analysis of 0 mod p

In 0 mod p the hash values at the interval of p are selected as the fingerprints of the document. Using these fingerprints, the suspicious document and the reference document are compared to generate the similarity scores. For 0 mod p, we first grouped the tokens of the suspicious and the reference documents into 3-grams and then into 4-grams. And again in both the cases we tested the similarity behavior by taking p=2 and p=3. Based on the similarity score generated for all the 30 documents it is found that the variance between the similarity scores is less in case of n = 3 and p = 2.

TABLE 2 STATISTICAL SUMMARY OF 0 MOD P SIMILARITY SCORES

Statistic	n=3, p=2	n=3, p=3	n=4, p=2	n=4, p=3
count	30	30	30	30
mean	32.7	21.9	26.77	18.53
std. deviation	12.89	9.19	12.59	7.9
min	15	9	10	7
25%	24	15.25	19	14
50%	31	21	24	18
75%	35	25	32.25	20.75
max	79	45	74	39

Based on this summary we conclude that 0 mod p method gives better similarity estimates when n=3 and p=2. The DocThreshold was selected to be 20%

E. Analysis of Winnowing

In winnowing the hash values are grouped into windows of fixed size and from each window the least hash value is selected. The collection of all such hash values form the fingerprints of the document. Using these fingerprints, the suspicious document and the reference document are compared to generate the similarity scores. For winnowing, we first grouped the tokens of the suspicious and the reference documents into 3-grams and then into 4-grams. And again in both the cases we tested the similarity behavior by taking window size=3 and window size=4. Based on the similarity score generated for all the 30 documents it is found that the variance between the similarity scores is slightly less in case of n = 3 and win size = 3.

TABLE 3 STATISTICAL SUMMARY OF WINNOWING SIMILARITY SCORES

Statistic	n=3, ws=3	n=3, ws=4	n=4, ws=3	n=4, ws=4
count	30	30	30	30
mean	77.13	76.09	77.03	76.03
std. deviation	6.11	6.87	6.15	6.89
min	65	61	63	61
25%	73	73	71	73
50%	77	75	76.05	75
75%	81	79.75	81	79.75
max	92	94	92	94

Based on this summary we conclude that winnowing method gives better similarity estimates when n=3 and win size=3. The DocThreshold was selected to be 65%

F. Evaluation Results

k-gram gives an accuracy of 100% and a perfect F-score of 1, if the DocThreshold is set to 45%. Amongst all the 30 documents that were tested, the minimum similarity percentage was 48% and hence we can safely classify any document above 45% similarity as plagiarized with reference document in consideration.

0 mod p gives an accuracy of 93% and an F-score of 0.96, if the DocThreshold is set to 20%. Amongst all the 30 documents that were tested, two documents had similarity percentage less than 20% and so we decided to classify any document above 20% similarity as plagiarized with reference document in consideration.

Winnowing gives an accuracy of 100% and a perfect F-score of 1, if the DocThreshold is set to 65%. Amongst all the 30 documents that were tested, the minimum similarity percentage was 65% and hence we can safely classify any document above 65% similarity as plagiarized with reference document in consideration.
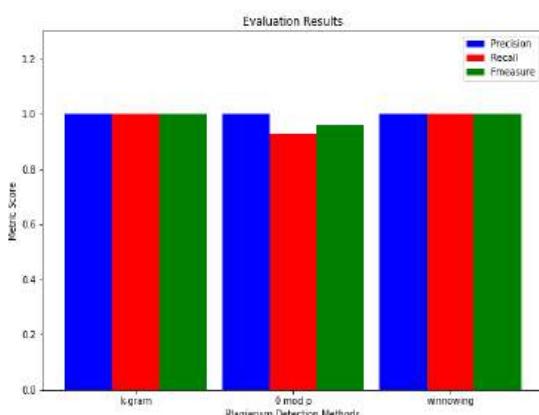
Fig. 2 Evaluation Results

V. CONCLUSION

The advancement of technology has led to the availability of data on a very wide scale. Hence plagiarism detection is an intricate issue and many problems are tightly concerned to it. A number of text pre-processing methods have been investigated in terms of the quality of plagiarism detection. A lot of tools for detecting plagiarism in English text documents have been developed but extremely less amount of work has been done for Indian regional languages like Hindi and Marathi.

A detection method for Marathi document plagiarism is proposed using the fingerprinting and winnowing techniques. The proposed method can detect plagiarism copy/paste of the text, paraphrasing using synonym substitution, structural changes at the sentence level. From the results, we find that the proposed system is capable of detecting exact copy of documents, documents with synonym replacements and documents where sentence structure is changed. Extremely negligible work has been done in the area of developing language processing tools for the Marathi language. This acts as a restriction when it comes to developing a plagiarism detection system for Marathi as very robust tools are not available. Also for the evaluation process, a tagged corpus consisting of plagiarized and non-plagiarized documents, as is available in English language, would be very helpful.

In the future this work can be extended to capture similarity based on the context of the sentence. Also there is a scope to capture structural changes within sentences and at paragraph level. The pre-processing steps like stemming and morphological analysis can also be improved which will in detecting the synonyms in a more efficient way.

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Prediction of Crop Yield using Data Mining Approach

Rushika Ghadge   Juilee Kulkarni   Pooja More   Sachee Nene
rushika.ghadge@ves.ac.in   juilee.kulkarni@ves.ac.in   pooja.more@ves.ac.in   sachee.nene@ves.ac.in

Priya R L

priya.rl@ves.ac.in

Computer Engineering VESIT, Mumbai, India

Abstract—**Looking at the current situation faced by farmers in Maharashtra, we have observed that there is an increase in suicide rate over the years.The reasons behind this includes weather conditions, debt, family issues and frequent change in indian government norms. Sometimes farmers are not aware about the crop which suits their soil quality, soil nutrients and soil composition. The work proposes to help farmers check the soil quality depending on the analysis done based on data mining approach. Thus the system focuses on checking the soil quality to predict the crop suitable for cultivation according to their soil type and maximize the crop yield with recommending appropriate fertilizers .**

Keywords—Kohonen's SOM(Self-Organizing Map), BPN(Back-Propagation Neural Networks), API(Application Programming Interface)

I. Introduction

As per the statistics of 2016 [10] around 272.82 million farmers dwell in Maharashtra.With this myriad number of farmers and increasing suicide rates , we want to help farmers to understand the importance of prior crop prediction, to flourish their basic knowledge about soil quality, understanding location-wise weather constraints, in order to achieve high crop yield through our technology solution.

Most of the existing system are hardware based which makes them expensive and difficult to maintain.Also they lack to give accurate results.Some systems suggest crop sequence depending on yield rate and market price.The system proposed tries to overcome these drawbacks and predicts crops by analyzing structured data.

The work about the prediction of soil quality discussed [8] , certainly focuses on agricultural aspects . Being a totally software solution, it does not allow maintenance factor to be considered much. Also the accuracy level would be high as compared to hardware based solutions, because components like soil composition, soil type, pH value, weather conditions all come into picture during the prediction process.

II..Literature Survey

Agriculture sector plays a major role in indian economy, as 70 percent households in india depends purely on this field [9]. Agriculture in India contributes to about 17% of Gross Value Added as of 2015-16.But there is a continuous decline in agriculture's contribution to Gross Value Added. As food plays an essential element for life and is purely depend on agriculture outputs.Hence farmers play a very important role.

The study in [1] used Multiple Linear Regression(MLR) technique for crop analysis.Decision tree algorithm and Classification is used to perform analysis of over 362 datasets and provide result.The training dataset here is classified into as organic,inorganic and real estate for predicting the type of soil.Results computed by this system are accurate as well as reliable.

The study in [2] fed data to a Back Propagation Network to evaluate the test data set.Back Propagation Network uses a hidden layer which helps in better performance in predicting soil properties.Back Propagation Network here,is employed to develop a self trained function to predict soil properties with parameters.This gives more accuracy and performs better than the traditionally used methods.However the system becomes slow t times and inconsistency is observed in the output.

In [3] two regression supervised machine learning methods are used:Support Vector Machine(SVM) and Relevance Vector Machine(RVM) to show effectiveness in soil quality prediction.A smart wireless device for sensing soil moisture and meteorological data is used.The wireless device gives an error rate of 15% and 95% accuracy. However,it has not been tested for real time data.

The paper [4] involves a check for Soil Fertility and Plant Nutrient by using back propagation algorithm.The results are accurate and enables improvement in soil properties.It performs better as compared to traditionally used methods. However, the system behaves slow at times and inconsistency is observed in the output.

According to paper [5], three methods are used which includes Decision tree, Naive Bayes Classifier, and KNN Classifier which analyses soil and predicts crop yield, However rule based induction and SVM can be used for more accuracy as results are not accurate.

III. Proposed System

The system aims to help farmers to cultivate proper crop for better yield production.To be more precise and accurate in predicting crops, the project analyze the nutrients present in the soil and the crop productivity based on location.It can be achieved using unsupervised and supervised learning algorithms, like Kohonen Self Organizing Map (Kohonen SOM) and BPN (Back Propagation Network). Dataset will then trained by learning networks. It compares the accuracy obtained by different network learning techniques and the most accurate result will be delivered to the end user. Along with this, the end user is provided with proper recommendations about fertilizers suitable for every particular crop.

A System Architecture

The proposed system will check soil quality and predict the crop yield accordingly along with it provide fertiliser recommendation if needed depending upon the quality of soil.
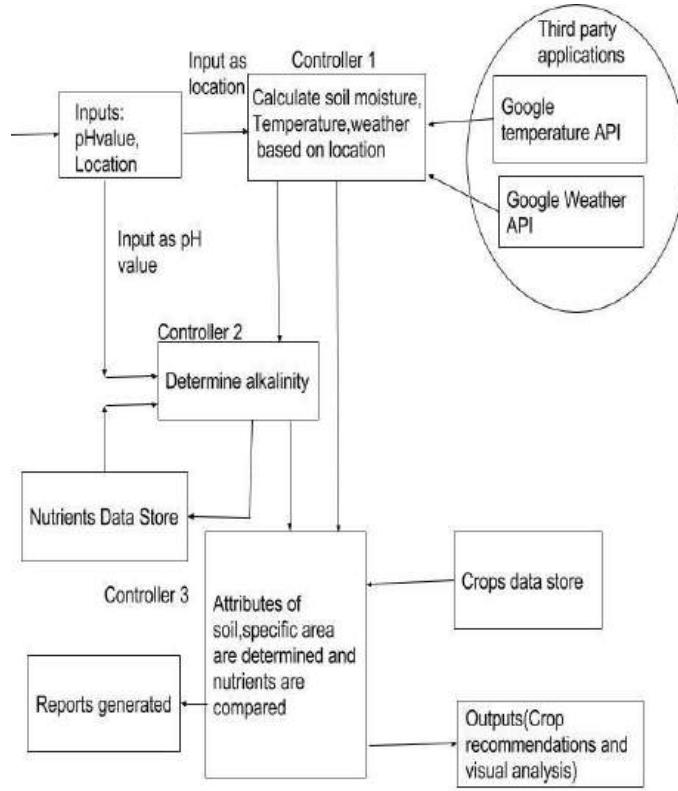
Fig.1.System Architecture

The functionality of the system architecture for the proposed system as depicted in (Fig.1.) is discussed as follows :

The system takes inputs pH value (based on percentage of nutrient) and location from the user. Result processing is done by two controllers.

Location is used as an input to controller 1, along with the use of third party applications like APIs for weather and temperature,type of soil, nutrient value of the soil in that region,amount of rainfall in the region , soil composition can be determined.

pH value[6,7] is given as an input to controller 2, from which alkalinity of the soil is determined. Along with it, percentage of nutrients like Nitrogen(N), Phosphorous(P), Potassium(K), Sulphur (S), Magnesium (Mg), Calcium (Ca), Iron (Fe), Manganese, Boron and Zinc and Organic matter can be obtained.

The result of the controller 1 and controller 2 are compared with a predefined "nutrients" data store. These compared results are supplied to controller 3 wherein the combination of the above results and the predefined data set present in the crop data store is compared.

Finally, the results are displayed in the form of bar graphs along with accuracy percentage.

B. Modular Diagram

The modular representation of crop yield prediction system is shown in (Fig.2.)
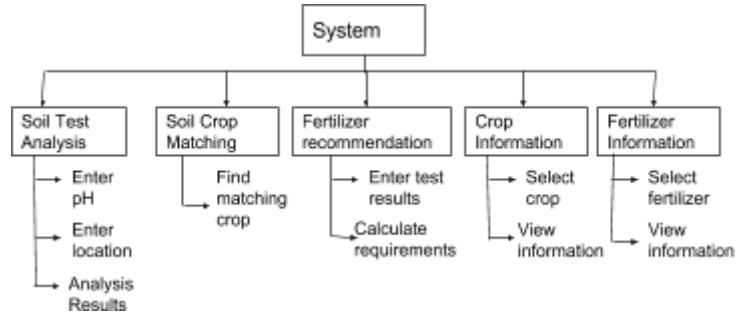
Fig.2.Modular Diagram

In soil test analysis user enters pH and location as input parameters..Output of this module is analysis result of the percentage of nutrients in respective soil.

Soil crop matching module is used to find the matching crop that could be cultivated in that soil.It is achieved by comparing with the crop dataset.In fertilizer recommendation module helps the user by providing suitable fertilizer recommendation in order to achieve the highest crop yield.The crop information module allow the user to select a crop and view information about the same.In fertilizer information module permits the user to select the fertilizer and view information about it.

IV. CONCLUSION

The system uses supervised and unsupervised Machine learning algorithms and gives best result based on accuracy. The results of these two algorithms will be compared and the one giving the best and accurate output will be selected.Thus the system will help reduce the difficulties faced by the farmers and stop them from attempting suicides.It will act as a medium to provide the farmers sufficient information required to attain greater yield production and thus maximize the profit.The system in turn helps to reduce suicide rates and lessen his difficulties.

V. FUTURE SCOPE

The system can be enhanced in the future by adding functionalities like crop disease detection using image processing and implementation of smart irrigation system.

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Overview of Data Security & Cryptography in Cloud Computing Environment

Smita Kulkarni
Terna Engineering College, Nerul, Navi Mumbai (India)
smitakulkarni.it@gmail.com

Abstract-- Cloud data is characterized as Massive, Outsourced, Shared & Distributed. Due to this, it suffers from unusual challenges in data security in terms of threats to Confidentiality, Integrity and Availability of data. This survey paper provides a brief overview of cloud data security and use of traditional and advance cryptography in achieving it.

Keywords: Cloud Data, Cloud Data Security, Cryptography.

I. INTRODUCTION

Though there are lots of benefits of cloud computing and though it is capable of providing variety of services such as IaaS, PaaS, SaaS, DbaaS and so on, cloud computing is mainly used for massive data storage. This data can be user data or service related data. 'Cloud Storage' is an emerging paradigm which shifts computation and storage capabilities to external service provider. The data can be stored on remote distributed locations and can be shared by multiple tenants. This data management is performed by cloud service provider with nominal user interaction. This causes loss of physical control on data and this is the main cause that users are hesitating to adopt the cloud based services.

The data in cloud faces lots of challenges such as- challenges with availability, performance, redundancy, disaster recovery, backup, replication, location, reliability, fragmentation, integration, transformation, migration etc.

In this paper we discuss the overview of cloud data security basics, cloud data security issues and cryptography as one of the solution to cloud data security. We discuss traditional cryptography, its limitations, advanced cryptography, its types and application later in this paper.

II. CLOUD DATA SECURITY BASICS

Let us start with what is cloud data and its characteristics.

A. Cloud Data
Cloud Data is also referred to as cloud contents and can be classified as-
- *User Data:* - This includes the user virtual machines (VMs), user's application software, application data, activity logs, user's transactions etc. This data can be persistent or volatile but usually stored in block storage.

- *User Account Information:* - This data includes user's identity information such as account number, account name, user's name, email id, and other personal information and service specific information. This data is persistent data and is stored in special database at cloud service provider's (CSP) site.

Also, cloud data can be classified as 'Data in Transit' and 'Data at Rest'. 'Data in Transit' means data in transmission, and computation phases, whereas 'Data at Rest' means data that is stored in any local or remote storage place.

Cloud data is different from normal application data in many ways. There are some cloud specific characteristics of cloud data such as-[17]
- *Massive:* The data in cloud has very big volume which is continuously changing with variations in patterns, attributes and access rights. With this nature, data replication, integrity and consistency becomes very important.
- *Outsourced:* The data in cloud is usually stored and processed at remote place. This causes full or partial loss of control over data.
- *Shared:* The data in cloud is shared among multiple tenants and groups of tenants. So confidentiality and group communication security is expected.
- *Distributed:* Data in cloud is remote as well as dispersed at various location. Data can be stored anywhere globally with the provision that user can choose preferred location. [1]

B. Cloud Data Security

These cloud specific characteristics arise lots of challenges with cloud data. We divide these challenges in three classes.
- *Security Risks:* Because of multitenant architecture and ease of data access, cloud data faces multiple security risks such as- Snooping, unauthorized Discovery, Spoofing, Accidental or Malicious deletion, Denial-of-Service etc.
- *Quality-of-Service:* Performance, long response time, and WAN-induced latency these are some of important parameters affecting Quality-of-Service of

cloud data.

- *Availability:* This is related to the unexpected downtime of data service. i.e. data is not available to use when required. In practice, no service provider can guarantee 100% up time. [17]

Let us concentrate on some traditional information security principles applied to cloud data.

- Confidentiality: It refers to protection from intentional or un-intentional unauthorized access to cloud data. In cloud system it is related to the areas of intellectual property rights, covert channels, traffic analysis, encryption and inference.
- Integrity: It requires that the cloud data cannot be modified by unauthorized person or process, unauthorized modifications are not made by authorized person or process and data should be consistent internally and externally.
- Availability: It ensures that cloud data is available timely and reliably to its users.[18]

These three principles can be compromised by cloud specific vulnerabilities and attacks. For example, table 1 gives summery of basic CIA i.e. Confidentiality, Integrity and Availability principles of information security and their relative vulnerabilities and possible attacks. [1]

Security Principle	Vulnerability	Cloud Specific Attacks
Confidentiality	Co-resident VMs	Cross VM Attacks
	Loss of Physical Control	Data Manipulation
	Cloud User management	Vertical / horizontal privilege attacks
Integrity	Loss of physical control	Dishonest computation
		Data loss
		SLA violation
Availability	Bandwidth under provisioning	Flooding attack
	Cloud Pricing Model	Fraudulent Resource Consumption attack

Table 1: CIA principles and related cloud specific vulnerabilities and attacks. [1]

III. CRYPTOGRAPHY FOR CLOUD DATA SECURITY

A. *Traditional Cryptography*

Cryptography is one of the promising solutions to data confidentiality related threats in information security. Data confidentiality in cloud is nothing but protecting data from being understood or used by unintended tenants and clients of cloud. There are two common ways to protect confidentiality- Asymmetric Key Cryptography and Symmetric Key Cryptography. Asymmetric key cryptography uses two different keys for encryption and decryption of data. More over special care mechanism has to be used to convey these keys secretly to other party. Therefore, asymmetric cryptography has a drawback that it is very slow and takes too much computing resources. And hence it is not recommended to use in cloud where users pay for data processing and bandwidth.[17].

In symmetric key cryptography, same shared key is used for both encryption and decryption. The only issue is protecting this shared key. The solution can be either encrypting the key itself while sending it to other party, or changing the shared key at regular intervals.

In cloud environment, this shared key should be used for short sessions and duration of session key should be based on number of documents decrypted or amount of data to be transferred using that key.

There are several algorithms available for cloud data encryption such as- RSA, DES/3DES, IDEA, Blowfish, RC4, SEAL, and AES etc. The keys used are usually 128 bits, 196 bits, 256 bits long. Longer is the key, tighter is the security.

Out of all these algorithms, AES-256 bits key algorithm is popularly used for cloud data security by leading cloud service providers. [1]

B. *Limitations of Traditional Cryptography for Cloud Data Security*

Traditional cryptography has several limitations for cloud data security because it is huge and mainly outsourced. In cloud computing environment bandwidth, memory consumption and computational power are big concerns. Moreover, some other issues can be-

- Generally clients prefer to encrypt the data before outsourcing it to untrusted cloud service provider. Therefore traditional encryption mechanism require more computation power at client side to encrypt this large amount of data.
- Traditional cryptography requires deploying PKI and certificate Authority for creation and distribution of keys and certificates to authenticated users. Also it requires that client keep continuous track of revocation list and download it periodically. It may consume excessive bandwidth and harm availability of resources.
- In traditional symmetric cryptography, maintaining data confidentiality become complex for flexible data sharing among multiple uses. It requires efficient distribution of decryption keys among multiple authorized users. Which

can be a challenging task.
- Last but not the least, traditional cryptographic algorithms are deterministic they are not reusable and do not allow operations on encrypted data.[1]

Advance cryptography has provided various solutions over these limitations of traditional cryptography for cloud data security.

C. Advanced Cryptography

Advanced cryptography which is also known as applied cryptography provides flexible decryption techniques and supports advanced features like searching encrypted data and providing Proofs of Possession (PoP) and Proofs of data Irretrievability (PoR). These features play quite important role in multitenant cloud environment.
Here is introduction of some advanced cryptographic mechanisms-

- *Identity Based Cryptography:-*
  It is also known as ID-based cryptography or IBC and was introduced by Shamir to provide public and private key pairs without need of certificates and its authority. It is an asymmetric key cryptography which makes use of entities unique identifiers as its public key. It also uses a private key generation function known as 'Pairing Function' to generate private key. The new IBC is an enhanced version of original one to incorporate use of Elliptic Curve Cryptography. ECC has many attractive features such as instead of using two large prime numbers for key generation, it uses elliptic curve equation. It can achieve a level of security with merely 164bit key while others require 1024 bit key to achieve same level. Thus it requires less computational power and low battery usage and now it is popularly used in mobile cloud applications. [1]

- *Attribute Based Cryptography:-*
  Attribute Based Cryptography (ABC), is an extension of ID based cryptography in that 'Identity' is represented by a group of 'Attributes'. Here, encryption is not done for one particular user as in traditional public key cryptography. Instead both users' private keys and cipher text are associated with a group of attributes or a policy defined for attributes. If user's attributes matches with cipher text, user is allowed to decrypt cipher text.
  Attribute based cryptography provides two benefits. First, ABC allows searching over encrypted data. That is, the ciphertext is assigned with a set of descriptive attributes. Thus, viewing these attributes as keywords in such a system leads a keyword based search on encrypted data.
  Second, although data are outsourced in an encrypted form, each authorized user is allowed to

decrypt different pieces of enciphered contents based on security policy. This effectively eliminates the need to rely on the cloud storage server for preventing unauthorized data access.
ABC can be used to secure outsourced data in the cloud, where a single data owner can encrypt his data and share with multiple authorized users, by distributing keys to them. [1]

- *Homomorphic Cryptography:-*
  In Homomorphic Cryptography, encryption function is a homomorphism which allows group operations to be performed on ciphertexts by ensuring privacy preservations. The homomorphic cryptography is said to provide *Privacy Homomorphism, i.e.* an ability to store an encrypted data at untrusted third party cloud server by allowing the owner of data to perform simple operations such as update and queries without revealing database contents. Homomorphic cryptographic algorithms are defined over algebraic groups or rings. Algorithms defined over groups support single operation either multiplication or addition for cryptographic purpose. Whereas algorithms defined over rings support two operations – addition and multiplication. Homomorphic cryptography can be considered as Black Box where input is two ciphertexts and a operation and the output is encrypted result of that operation on two corresponding plaintext.[1]

D. Comparison of Advanced Cryptography

Table 2. Gives the comparison of three advanced cryptography methods.

IV.   CONCLUSION

The specific characteristics of cloud data such as massive, outsourced, shared and distributed creates many limitations for traditional cryptography to be used as a data security solution in cloud. Instead, Advanced Cryptography can be efficiently used for cloud data security for its attractive security features such as search over encrypted data, providing Proofs of Possession (PoP) and Proofs of data Irretrievability (PoR). ID based cryptography and Attribute based cryptography are popularly used in many applications where as more opportunities are there for research in Homomorphic cryptography.

	Identity Based Cryptography	Attribute Based Cryptography	Homomorphic Cryptography
Concept	Public key of the user can be derived from unique identifier of the user ID and a pairing function is used to generate ciphertext	Extension of ID based Cryptography. Encryption is not performed for one particular user. Whereas user's private key and cipher text are associated with group of attributes.	Encryption function is a homomorphism which allows group operations to be performed on cipher texts
Specifications	Uses bilinear pairing function	Enables expressive policies and provides fine grained access to encrypted data	Simple arithmetic operations such as addition and multiplication is used over groups
Advantages	Eliminates use of Certificates and CA and need to maintain extra public keys	Decryption is controlled by matching "d of k" attributes and effectively prevents unauthorised access to data	Allows encrypted search query and encrypted without even looking into clear text Preserves privacy
Dis-advantages	Overhead of pairing computation	Data owner needs to use every authorized user's public key to encrypt data.	Complex computations requiring lots of additions and multiplications
Applications	Secure data transmission over channel replacing SSL	Proposed to provide fine grained access policy admitted by HIPPA	Encrypted data search and retrieval over distributed network

Table 2: Comparison of Advanced Cryptography

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Decision Support System for Diagnosis of Chronic Kidney Disease using Decision Tree (HealthEase)

Tejas S. Naik

UG Student, Department of Computer Engineering

Vidyalankar Institute of Technology
Mumbai, India

tejas.naik@outlook.com

Mandar A. Patkar

UG Student, Department of Computer Engineerig

Vidyalankar Institute of Technology
Mumbai, India

mandarpatkar@live.com

Shubham S. Phape

UG Student, Department of Computer Engineering

Vidyalankar Institute of Technology
Mumbai, India

phapeshubham776@gmail.com

Kavita Shirsat

Assistant Professor, Department of Computer Engineering

Vidyalankar Institute of Technology
Mumbai, India

kavita.shirsat@vit.edu.in

Abstract – HealthEase is a clinical decision support system that is able to predict chronic kidney disease risk of an individual based on his medical/clinical data. We are using Machine Learning and Data mining approach to predict accurate chronic kidney disease risk. It predicts individual disease evolution in real time so that some precautionary actions might be taken beforehand with the help of doctor/assistant associated with this system. We are going to use data of a chronic kidney disease patients to predict the possibility of it. We are calculating CKD stage and based on CKD stage, we will recommend the diet plan for the patient. After particular period healthease system will again predict the risk of CKD to determine whether it is reduced or not. It will also help patients to store his individual data and track his/her diet plan in his account via a web portal. We can also use it for future purpose. Doctor/Assistant will also come to know that what was the stage and what kind of treatment you were given before. The purpose of this project is to diagnose & care patient disease using Artificial Intelligence.

Keywords – Chronic Kidney Disease (CKD), Data Mining, Machine Learning, Decision Support System, Decision Tree, Diet Recommendation

I. INTRODUCTION

Chronic kidney disease (CKD) is a disease in which kidney shape get decreases and decreases the ability to function properly resulting in a high amount of waste in the blood which makes a human body disorder in the long run. People having high blood pressure, diabetes and those who have family members suffering from CKD are likely to be at risk of kidney diseases. 17% of Indians have some form of chronic kidney disease. Diabetes and hypertension cause over 65% of the cases of Chronic Kidney Disease in western countries. In India too, diabetes and hypertension today account for 40–60% cases of CKD. It caused 956,000 deaths in 2013 from 409,000 deaths in 1990 [1]. It is recognized as a life-threatening disorder affecting a large number of people. Treatment can help, but this condition can't be cured. Lab tests or imaging always require for treatment. It can last for years or be lifelong.

The main function of data mining is to get implicit knowledge or data from the dataset. In Knowledge Discovery process, we first prepare data for applying data analysis and discovery algorithms that produce a particular list of patterns over the data. Data mining involves fitting models and definitive patterns from, observed data. Most data-mining methods use machine learning, pattern recognition and statistics and so on.

Data mining is the most important step, which infers potentially valuable knowledge from huge amount of data. Data mining technology is an approach to find new and implicit patterns from massive data [7]. In the healthcare domain, detected observations can be used by the healthcare administrators and medical physicians or their assistant to improve the accuracy of analysis, to enhance the goodness of surgical operations to propose less expensive therapeutic.

Clinical decision support (CDS) systems [13] give knowledge and person-specific information to clinicians, patients etc. to intelligently filter and present that knowledge at proper times, to enhance health and healthcare. In the large dataset, the relevant information may be hidden so data mining techniques are used for retrieval of this hidden patterns. The knowledge or important information identified using data mining techniques can be used by the medical assistant and doctors to improve the quality of treatment.

In this paper, we are using several techniques to transform health operations with advanced predictive analytics. If technology is to improve care in the future, then the information provided to doctors needs to be digitized and enhanced by the power of analytics and machine learning. So that General physician/assistant can use this technology to take a necessary step before any risk occurs. It will help to calculate the possibility of Chronic Kidney Disease (CKD). The reason behind choosing CKD because the research related to this disease has not that much done in machine learning like other disease are researched eg. Heart Cancer, Breast Cancer, Diabetes etc. Our goal isn't to replace physicians or health-care professionals, but give them better decision-making tools. We are trying to improve personal quality of life and lower the cost of healthcare delivery by predicting health risks.

II. LITERATURE SURVEY

This section serves as the existing research and work are done on many disease diagnosis using machine learning techniques. In this, different approach, performance tools and process provide different conclusion and provide a different aspect of this disease. These studies primarily intent at improving the efficiency in the prognosis of the disease.

Nusrat Tazin et al.[1] used various data mining and machine learning techniques on the dataset to diagnose chronic kidney disease. The techniques they have used are – Naive Bayes, Support Vector Machine, Decision tree and Nearest Neighbor algorithm. They used all 25 attributes from the dataset. Some attributes have been proved significant in making the decisions. Comparison in terms of Kappa statistics, Mean Absolute Error, Root Mean Squared Error and Receiver Operating Characteristic (ROC) area is implemented on the dataset. They have observed that the tree method performed approximately better than other techniques and valuable for CKD predictions.

Ani R, Greeshma Sasi et al. [2] used different classification techniques like K-nearest neighbour, Naive Bayes, Back-propagation Neural Network (BPN), LDA, Decision tree and Random subspace classification for predicting the presence of CRF, it is tested and finally, its performance is evaluated. They have used performance evaluation techniques to incorrectly predicting the class of new data. As observed from the analysis as random subspace classification obtained a better result, and decision support system is made by using classification model.

Manoj Reddy et al. [6] have used two different machine learning approach to this problem i.e classification and clustering. In classification, he built a model that can accurately classify if a patient has CKD or not using its features. In order to understand if people can be grouped together based on the presence of CKD, he has performed clustering on this CKD dataset. Different classification algorithms were used such as logistic regression, Support Vector Machine (SVM) with various kernels, decision trees.

K. R. Anantha Padmanabhan et al. [5] observed that comparing the classification algorithms with respect to Naive Bayes and Decision tree, they came to the outcome that the accuracy is up to 91% for Decision tree classification. Applications/Improvement: To increase the accuracy of the results, they have take advantage of algorithms like neural network and clustering which highly assisted in their mission. Srinivasa et al. [4] have developed a dialysis support system with a kidney failure data and decision tree algorithm.

III. METHODOLOGY

Dataset Description - The dataset we are using is from Apollo Hospital, Karaikudi, Tamilnadu [8]. The dataset is obtained from UCI machine learning repository. Dataset has 25 attributes which include age, blood pressure, sugar, serum creatinine etc. that obtained from 250 patients with chronic kidney and 150 patients with non-chronic kidney within 2 months from a hospital.

Classification – The CKD prediction problem is modeled as a classification task in machine learning where we have two classes: CKD and not CKD which represents if a person is suffering from chronic kidney disease or not respectively. Each person is represented as a set of features provided in the dataset described earlier.
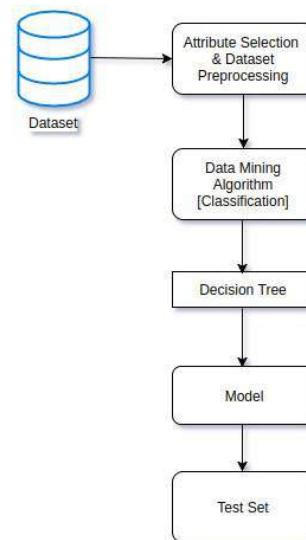
Figure 1. Machine Learning Approach

Machine Learning – We are using Numpy which is primarily used for N-dimensional array objects, Pandas data-frame for reading and preprocessing of the dataset, Matplotlib for generating 2-dimensional figures and Scikit-learn for machine learning and data-mining functions.

A. Data Pre-processing: The dataset collected has 400 rows of record and some missing entries. The dataset is loaded by pandas as a data frame. The missing values are recovered by the mean value of the attribute columns. Nominal values of the dataset are replaced by binary values. The dataset is then split into X-train, X-test, y-train, y-test using sklearn.cross_validation library. In the data analysis step, the decisive parameters are determined.
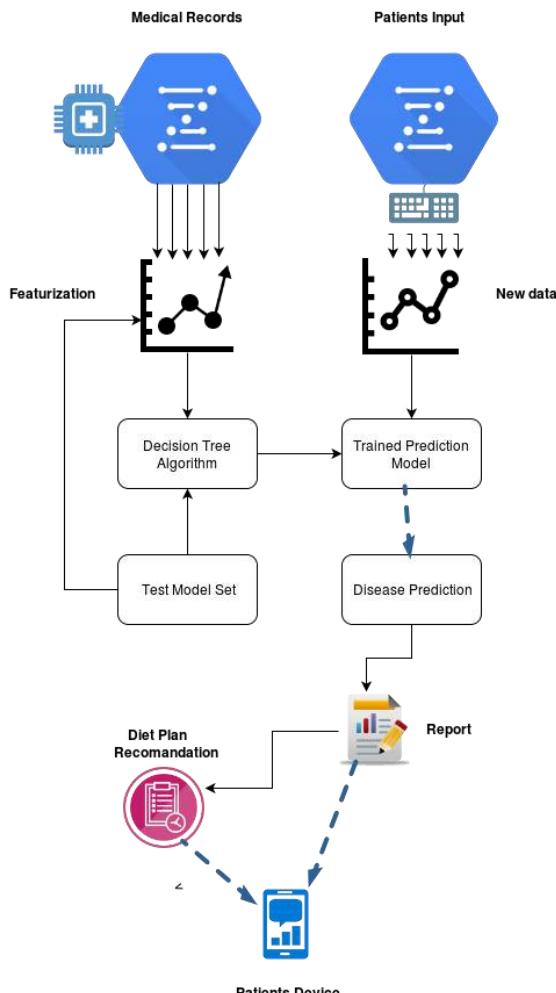
Figure 2. Proposed System

B. Features Selection: It is used to find attributes that are most relevent to our problem. Decision trees are also used for dimensionality reduction, after being trained, one might scan the importance of the features within the decision tree, i.e. how much each feature is used to create a split a different node.

C. Predictive Modeling using Decision Tree: We are using Decision Tree for classification of CKD. A decision tree is a tree-like approach which makes use of branching method and produces the available resulting decision. In decision tree [9], the best splitting attribute is found out by information gain or Gini index, the major splitting criteria become root node in the tree graph. This process is iteratively done by algorithm till all the attributes are used or based on a number of instances present. An internal node of the tree represents splitting conditions and finally, leaf node represents the class label. In the decision tree, if-then rules are the paths from the root node to leaf node i.e class label. In the dataset, using information gain or Gini index we can get important attributes that dominate the required result. It divides the number of samples into class labels. We can use tree pruning techniques to prevent the model from overfitting.

The collected dataset was used for prediction of chronic kidney disease in the patient. Around 70% of data samples are preferred for training and the 30% for testing.

We used Gini Index/ Gini Split splitting criteria in the decision tree.

$$Gini = 1 - \sum_{i=1}^{C} (p_i)^2$$

CKD stage will be determined by HealthEase System based on certain attributes from patients dataset.

Glomerular filtration rate (GFR) is the measure of kidney function. It is used to identify a person's stage of chronic kidney disease. A mathematical equation(CKD-EPI) using the person's age, race, gender and their serum creatinine is used to measure a GFR [14].

The CKD-EPI equation is:

$eGFR = 141 * min(SCr/k,1)^a * max(SCr/k,1)^{-1.209} * 0.993^{age} * 1.018[if female] * 1.158[if black]$

Where SCr is serum creatinine in (mg/dL), k value is 0.7 for females and 0.9 for males, a is −0.411 for males and −0.329 for females, min indicates the minimum of SCr/k or 1, and max indicates the maximum of SCr/k or 1.

D. Diet Plan Recommendation: After calculating CKD stage we will recommend a diet plan for CKD patients. Diet is based on certain nutrients like potassium, phosphorus, fluids and sodium intake. The patient can have this diet for breakfast, lunch and dinner category.

E. Web Portal: We are making a cross-platform/responsive portal for HealthEase System. It will be easy for patient and assistant to interact with the proposed system. It will be build using Html, CSS, JavaScript, JSON and MySQL. Flask will be used to deploy machine learning model. The patient will have its own account to view recommended diet as well as disease-related information. It will also help to view past records as well. Assistant will interact with the system to manage whole patient data.

IV. RESULTS

Decision Tree algorithm used in the estimation process is performed by testing and training data in two different sizes. For model training, we used 70% of the data and 30% for testing purpose.

With the help of performance measures and confusion matrix, the achievement of the model is figured out.

From test set, decision tree classified 116 instances correctly and 4 instances incorrectly in total 120 instances i.e 30% of the dataset. Graphical representation of confusion matrix of the classifier is shown in the Table. 1.

From the trained model we obtained 96.67% accuracy.

Table 1: Confusion Matrix

Class	Predicted Class	
	CKD	NOT CKD
CKD	77	3
NOT CKD	1	39

Overall classification report is shown in *Table. 2.*

Class	Precision	Recall	F1-Score	Support
CKD	0.99	0.96	0.97	80
NOT CKD	0.93	0.97	0.95	40
Avg / Total	0.97	0.97	0.97	120

Precision: TP / (TP + FP)

where TP refers to the true positives and FP the number of false positives in the dataset. Precision is possibly the ability of the classifier not to label as a positive sample that is actually negative.

Recall: TP / (TP + FN)

where TP refers to the true positives and FN the number of false negatives in the dataset. The recall is possibly the ability of the classifier to find all the positive samples while testing in the dataset.

F1-Score: It can be understood as a weighted harmonic mean of the precision and recall, where an f-beta score 1 represents best score and 0 as the worst score.

Support: It is the number of the existence of individual class in y_true.

After prediction of CKD, we calculate CKD stage of the respective patient so we can recommend him/her suitable diet according to his/her CKD stage. On web portal, the patient will have its own reports and recommended a diet plan.

V. CONCLUSION

Machine Learning's dominance in the near future will involve data analysis. With each patient comes large bulks of data including X-ray results, vaccinations, blood samples, vital signs, DNA sequences, current medications, other past medical history, and much more [16]. The aim of Machine learning is to get the hidden pattern from all this data available and make use of them to provide the intelligent system based treatment in near future. The proposed work is to determine CKD and classify the different stages of chronic kidney disease according to its severity. The decision tree classification algorithm has been considered for predicting chronic kidney disease. The proposed approach is used to make a better decision while predicting CKD. It will also guide patients to take proper diet until CKD reduce.

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Activity Planner using Christofides Algorithm with Ant Colony Optimization

Neil Singh
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Tarun Khandelwal
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Anit Basu Thakur
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Sagar Thacker
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Vanita Mane
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Pallavi Chitte
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Abstract—**In today's world people seldom find quality time to spend outdoors. Although they have an urge to explore new places, the unawareness about a place often makes them gather information about the places that they would like to visit. This process becomes cumbersome, and is time-consuming, adding up to their busy schedule. This may lead to missing out on various places of interest. The proposed system aims to replace this existing tradition by providing an easy and user-friendly interface which will suggest them a guided round trip on their fingertips within the time limit mentioned by them. This will provide them an insightful travel plan which will be based on their personal taste that will fit their busy schedule and hereby will make the most of their time. Also for the fitness freaks unable to maintain their physical fitness due to their busy schedule, this system will act as a platform which will motivate them by pushing their average steps per day count to the minimum number of steps required by each individual to stay fit. Integrating exploration feature with fitness activities will enhance the user's experience and will also promote physical wellness along with this.**

Keywords—Christofides algorithm, Ant Colony Optimization, Travelling Salesman Problem, Time constraint, Trip planning, Optimization, Google Maps.

I. INTRODUCTION

Ever since the advent of the smartphone era, people have witnessed the evolution of every aspect that is within the human reach in the form of a digital application. While the current tally shows more than 2 billion smartphone users in the world, this platform is yet to reach its pinnacle. But to sustain this huge user base there is a constant need to revolutionize the existing innovations.

The existing tourism industry's interest in tapping the digital platform to attract and enhance tourist experience is rising which is now fairly convenient due to the emergence of the high speed wireless network technologies. In order to make mobile travel apps influential and meaningful, the proposed system has been come up with the concept of integrating travel planning and personal fitness. This not only takes care of shortest route from Source to Destination, but it also personalizes the journey on the basis of individuals interests and their time availability, irrespective of long term travel plans along with daily plans that are aimed towards maintaining fitness.

The proposed system aims to replace the current tradition of doing research before planning a trip on the places which may be cumbersome at times. With the help of friendly interface, the system will allow its users to go anywhere with tapping and clicking, increasing interaction with the app and imparting a greater deal of comfort to them.

II. BACKGROUND

A. Travelling Salesman Problem

The traveling salesman problem (TSP) is an NP-hard optimization problem. Given a set of cities and distance between every pair of cities, this algorithm focuses on finding the optimized i.e. the shortest possible route that visits every city exactly once and returns to the starting point. In graph-theory, this problem tries to find the shortest hamiltonian cycle in a graph.

B. NP-hard Problem

A problem is assigned to the NP (nondeterministic polynomial time) class if it is solvable in polynomial time by a nondeterministic Turing machine. NP-hardness is the defining property of a class of problem that are at least as hard as the hardest problem in NP.

C. Approximation Algorithm

Approximation algorithms are efficient algorithms that find approximate solutions to NP-hard optimization problems with proven guarantees on the distance of the calculated solution to the optimal one. They try to understand how closely the solution can be approximated in polynomial time. Approximation algorithms are typically used when finding an optimal solution is complex, but can also be deployed in scenarios where a near-optimal solution can be found quickly and an exact solution is not needed. Solving the TSP optimally takes too long and hence here, usage of approximation algorithms is recommended.

III. PROBLEM DEFINITION

Lately most apps provide route and navigation for going from one set of source and destination only. Often, tourists and other frequent users want to explore multiple places and spots of their interests. However, they have time constraints and lack of knowledge about the places that they prefer. Also existing fitness applications give monotonous solutions to encourage health conscious people. They only deal with fitness of the user and not with how to make these fitness activities interesting and fun so as to enhance the experience.

The objective of the proposed work is as follows:

- To implement a digital guide that will remain available 24*7 to its users.

- To make users enjoy their trip leaving all the information gathering activities behind.

- To save users valuable time by always showing optimized route.

- To motivate the users to remain physically fit by promoting physical wellness.

- To provide a simple and friendly interface that reduces the entry barrier for elders and those who are not tech savvy.

IV. LITERATURE SURVEY

Markus Blaser et al has provided an experimental evaluation about stochastic version of Christofides algorithm, a popular approximation algorithm used for the travelling salesman problem. For the Euclidian TSP with input as n randomly chosen points, the author has proposed a probabilistic analysis of the algorithm which generates computed tour with bounded length.

Yingying Yu and Yan Chen has focused on the mechanism of ant colony optimization for solving the Travelling Salesman Problem and has shown the power of the algorithm in terms of its high performance and efficiency.

Eric Hsueh-Chan Lu and Chih-Yuan Lin has proposed a data mining based approach for finding an efficient and optimized trip with consideration of travel time constraint.

Chung-Hua and Chu has proposed a platform for travel planning which enhance user's travel experience by allowing them to make their own self-planned itineraries by using Google Maps and other data sources.

Similar applications already exist that try to fulfill the similar problem statement as our proposed system. Table 1 shows the comparison between these applications.

A. Analysis

The existing applications in the market lay emphasis on either providing a properly optimized route or just information on the points of interest. Any consideration for user interests or other constraints like time are not considered in the functionality of the existing applications. Additional features of rating based preferences, fitness, etc. are also not considered since the aforementioned features have dedicated stand-alone

TABLE I: Existing project overview

Apps for Comparison	Features	Disadvantages
Run Go App	Users are given routes which explore notable spots in the city. Users can create their custom routes.	Very few available for Indian cities. Most of the routes for India are for places which have just broad roads.
Spotted by Local	Spots and places are updated by Locals. Travelling tips to explore cities. 100% offline	Paid App. Advance Features have a paid subscription depending from city to city.
Like a Local	Travel app with full-fledged routes covering points of interests, restaurants and local attractions. All places are reviewed and viewed based on ratings.	Not available in Asia. Paid after a certain trial period. Certain routes are only shown by Local Guides on Hire.

applications that don't have any means of integration. Most of the applications fall short in their offerings for Indian cities. Few of these applications are available only on a trial basis, after which the user has to pay a fee for continued service for the same. Furthermore, there seems to be a lack of providing activity tracking in most of these applications, which are of key importance in the development of the proposed application. The applications provide routes by producing the best solution. The proposed application lays emphasis on providing an optimal solution on the same, while still providing the services and features which the aforementioned applications lack.

While the existing implementations offer a plethora of features under their hood, these are the common shortcomings in most of the applications:

- No consideration for scenic/meaningful routing

- User interests are not considered. Generic point of interests and attractions are displayed.

- Provisions for setting up user profiles is scarce or not present.

- Routing and presentation of routes in not fast.

- Activity tracking is not comprehensive.

- No emphasis on completing fitness goals or tasks.

- Clunky and complicated user interface, which deters elderly or naive users.

V. PROPOSAL

Usage of the approach comes in the form of an Android application.

Fig 1 shows the flowchart of the system. It starts with getting the input from the user. User is required to give as input his/her point of interests, amount of time that they can give to this trip and an origin which can be either their current location

or will be taken manually by them. The start and end points are chosen to be the same. Once the locations has been selected, a combination table will be build which will store the distance of the places that will be of users interests from the origin. Each combination will represent a potential solution and will be tested by checking whether that combination fits the time constraints. The combinations that fits those constraints will get stored in the solution set. Here, solution set will store the list of all the combinations that will satisfy the given time constraints.

Here the main task i.e. finding the best solution will come into picture. The best solution will be the solution i.e. the trip with the shortest travelling time and which has got the highest ratings. To achieve this objective, the ratings of the places of each solution set will get compared and combination with the best ratings will be selected as the solution.

The solution will then be passed as an input to an approximate algorithm- Christofides algorithm which will construct the route and will return a partially optimized solution. Since the main aim of the proposed system is to return fully optimized route to its users, further optimization will be done using an optimization technique- Ant Colony Optimization technique which will return a fully optimized round trip covering all the suggested places that user might like based on their interests and that fits their time constraints too.

A. Christofides Algorithm

In the proposed system, Christofides algorithm will be used as tour construction algorithm which will generated partially optimized route covering all the places as suggested for the user to visit.

The Christofides algorithm is used for the situations where the distances form a metric space. It is an approximation algorithm that guarantees that its solutions will be within a factor of 3/2 of the optimal solution length, and is named after Nicos Christofides. Currently, it has one of the best approximation ratio for the TSP on general metric spaces.[5]

The algorithm will take suggested places as input and by considering these places as nodes will calculate minimum spanning tree. Then all the odd vertices will be found and will be converted to even vertices. This can be done by joining pairs of odd vertices together. Thus an Euler cycle will get formed. The final step will be traversing this Euler cycle and removing repeated vertices if any to get partially optimized route.

B. Ant Colony Optimization

Tour construction algorithms stops when a solution is found and never tries to improve it. Hence for further optimization, it becomes necessary to use some tour improvement algorithms like Ant Colony Optimization algorithm.

Ant colony optimization (ACO) is a metaheuristic algorithm that imitates the movement of ants. It is an approximation algorithm that uses software agents(artificial ants) to estimate solution for such complex problems. Initially, ants are placed in the origin and at each step it iteratively adds one unvisited node to its partial tour. At the end,the ants go back to their
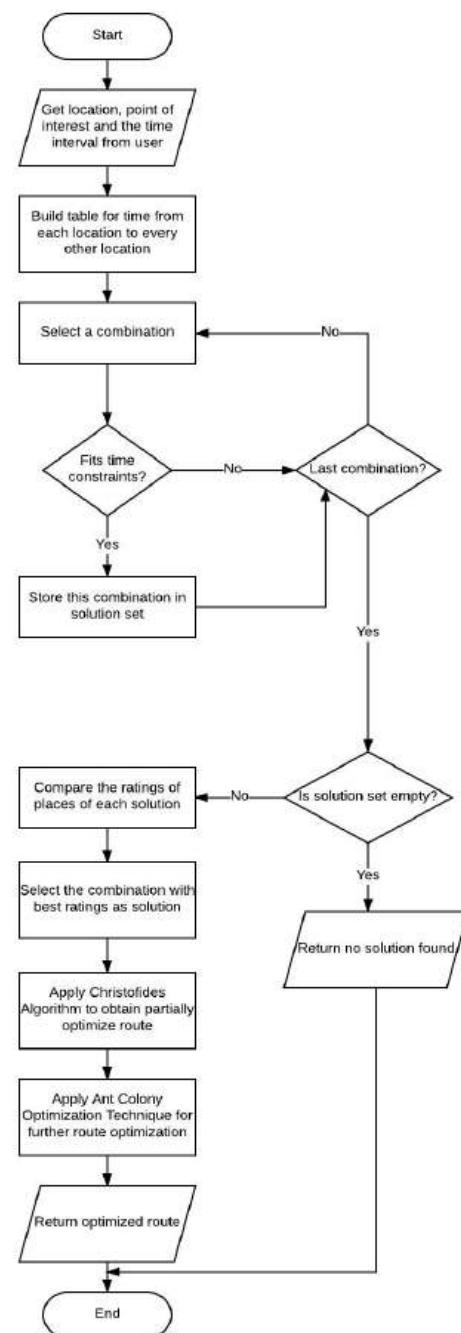
Fig. 1: Flowchart of the System

origin. This process is repeated until a tour being short enough is found.

This algorithm will take as input partially optimized route as generated by Christofides Algorithm and will return a fully optimized solution which will fulfill the promise of giving an optimized route to the users.

VI. EVALUATION PARAMETERS

The proposed system will be evaluated on the basis of how truthfully it implements the solution to the problem

statement.The accuracy of the results and other such criteria have been defined with the help of the True Positive Rate (TPR), False Acceptance Rate (FAR), and False Rejection Rate (FRR) The efficacy of the provided results will be calculated by asking the user for feedback on the results and then using that data to calculate the above mentioned metrics.

VII. CONCLUSION

It has been observed that people like to spend their quality time going outdoors. But sometimes due to lack of knowledge about the place they are forced to follow the tradition of doing planning and research on places before visiting which sometimes become hectic for them and might not give a fruitful result. The proposed system will aim to enhance the users experience of travelling by providing them insightful travel plans that are based on their interests and that fits to their busy schedule. The main feature of the system will include flexibility, quickness, convenience, reliability and efficiency so that it can lower the bar of skills it takes to plan a trip. The proposed system will also maintain the track of fitness activities of users so that they can stay fit by achieving the goal of taking minimum number of steps required by each individual to stay fit.

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Automatic Palm Reader

Priya Rai
Department Of Computer Engineering
RamraoAdik Institute of Technology
Navi Mumbai, Maharashtra 400706
Email: rait.priya@gmail.com

Prahlad Singh
Department Of Computer Engineering
RamraoAdik Institute of Technology
Navi Mumbai, Maharashtra 400706
Email: rait.prahlad@gmail.com

Anjali Gharat
Department Of Computer Engineering
RamraoAdik Institute of Technology
Navi Mumbai, Maharashtra 400706
Email: anjaligharat16@gmail.com

RutujaBauskar
Department Of Computer Engineering
RamraoAdik Institute of Technology
Navi Mumbai, Maharashtra 400706
Email: rutujabauskar@gmail.com

ShilpaKolte
Department Of Computer Engineering
RamraoAdik Institute of Technology
Navi Mumbai, Maharashtra 400706
Email: koltshilpa17@gmail.com

Abstract- **Palm reading is a practice used very well in Indian astrology and Roman fortune-telling. It is a fun activity performed all over the world. This application aims to know about a human's health condition by analyzing the palm of our hand. Palm reading is used to discover about the character traits of a person. Palm reading is also advantageous for the medical field people. Palm reading has attained importance in identifying about the disease an individual is suffering from. At present there are less number of mobile applications that allow palm reading to be done automatically and efficiently. This study aspire at creating an application which could be run as a mobile application and which aims at developing an effective algorithm. Automatic Palm reading is a mobile application which uses fuzzy logic and data interpretation for the prediction of health related status and about the person's behavior. Palm reading algorithm makes use of image processing operations like an adaptive threshold method to segment the palm image from background, extract the fingers and calculate their length, extract the principal palm lines by applying regression to generate joint and continuous edge lines. Based on the information gathered from the palm lines, our application predicts health related information like whether the person is suffering or has symptoms leading to heart disease, lung disease, etc. by using fuzzy logic.**

Key word — Palm reading, health, mobile application, automatic, Android, Library, Java

I. INTRODUCTION

Palm Reading is a traditional practice which is done in India and China. Ancient records of the frescoes in ruins of India and words given by Brahmans has proved that palm reading was very well liked in India at that time. Chiromancy is another name for palmistry. Palmistry is not only used to read one's hand or palm, it is also includes reading of arm, finger and fingernail. By analyzing one's hand or palm, finger, fingernail, arm we are able to identify about the character traits, health, wisdom, marriage and many other aspects of a person.

Now-a-days people prefer investing time in mobile applications. At present, there are lacks of mobile applications that allow palm reading to be done efficiently. So we proposed to develop a mobile application that works effectively and efficiently. Automatic Palm Reading is a mobile application which will be used to learn a person's fortune, future and personality. Automatic Palm Reading is based on Android platform. Palm reading is help in Medical field.

The design, implementation, and use of biomedical information systems in the form of computer – aided decision support have become essential and popular. Medical scientists discovered that the hand can be used as an indicator for medical problems and the palm is the reflection of activities going on brain. The purpose of this application is to design and implement a decision support model for healthcare on the basis of medical palmistry to diagnose the diseases.

Flow of Automatic Palm Reader system is starts with capturing of the palm image and extracting the principle palm lines. Various image processing techniques are used for noise removing and sharpen the image which are helpful on the input images to get a clear sharpened image without noise. This helps in the extraction of the palm lines. The palm lines provide patterns that can be compared to past findings in predicting the illnesses. Fuzzy Inference System is an important phase of Automatic palm reader system which is used to map input with desired output with logical relations. This is used for observing illnesses as it saves time and effort and provides brief information about the person's health status. The rest of the paper is structured into 7 sections. In section 2 and 3, literature review of

the related work is presented. In section 4, the proposed methodology is presented and details regarding the algorithm to be used are explained. In section 5 conclusion has been included, in section 6, the future is mentioned.

II. RELETED WORK

According to **"*An Efficient Automatic Palm Reading Algorithm and its Mobile Applications Development*"** [1] research paper published by, Department of Electronic and Information Engineering and written by *Kwan-Pui Leung and N.F. Law* studied from The Hong Kong Polytechnic University in the year 2016. This study aimed at developing an effective palm-reading algorithm, which can run in an Android platform efficiently. Java Library and Java languages were used for this application development.

According to research paper *"Palm Image Segmentation by Using Edge Detection"* [2] written by *Ms. Nadiya Khan, Ms. Sonali, and Ms. Anita Khand* method for segmentation of the palm image for the edge and region segmentation is provided. They used different filters on the palm image like Sobel operator, prewitt operator, Laplacian operator, Gaussian operator, Roberts operator, Motion operator, Log operator, Disk Operator, Average operator, Un-sharp operator, and they compared the result of each operator with one another they got that the best operator is the Gaussian operator to get the good result for the segmentation of the palm. For edge detection palm segmentation they used the different six techniques These are prewitt edge detector, sobel edge detector, Log edge detector, Roberts edge detector, canny edge detector, zero-cross edge detector.

According to *"Diseases Diagnosis Using Medical Palmistry Fuzzy Model"* [3] research paper written by *ZainabOthmanandSarmadSaleem*, Department of Computer Science, Science College, University of Basra, Iraq in the year 2016, The design, implementation, and use of biomedical information systems in the form of computer – aided decision support have become essential and widely used over the last two decades. Medical scientists discovered that the hand can be used as an indicator for medical problems and the palm is the reflection of activities going on brain. Database palm images for patients infected with specific disease are created from capturing live images from hospitals.

According to the research paper *"EXPAR: A fuzzy rule based expert system for palmistry"* [4] written by *Sanjay Kumar Singh, Meenakshi Sharma, PrateekAgrawal, VishuMadaanandAmitaDhiman published in the year 2016, says that: Palmistry* or chiromancy is the investigation of individual characteristics with the assistance of individual hands because our hands hold the entire story of our life. In this paper, we are going to develop the system based on fuzzy interference system to calculate the exact result of a person by extracting features of individual palm. In this work, we are going to build up a fuzzy based expert system, which provides information of particular individual based on palm features head line, heart line and life line. These extracted features further can be useful in the field of astrological as well as in medical field.

The science of Palmistry is alienated into two wide areas:

- The knowledge of Principle lines.
- The knowledge of the curves on hand.

In this paper, fuzzy logic is used to read the palm and find the characteristics of people. In this work, firstly, palm lines are extracted and further fuzzy inference system is designed with three input lines lifeline, headline and heart line. For this purpose palm, prints of various age groups arrange from 15-40 year which includes male and female.

III. PROPOSED WORK

This study aimed at developing computational algorithms that allow palm reading to be performed automatically and conveniently in an Android application.

Proposed work is as shown in the fig. 3.1:
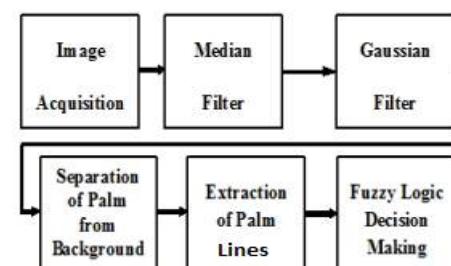
Fig. 3.1 System Working Model Segmenting the Palm from the Background

To reliably segment the palm from the background, adaptive segmentation using Otsu's thresholding technique is used with a combination of flood filling. First, the image is converted to the YUV format. We have noticed that the YUV format gives accurate segmentation results under different levels of illuminations and shadows. The palm color range was proposed as follows

$Y > 80 \ 85 < U < 135 \ 135 < V < 180$

Otsu's thresholding determined a threshold that maximizes the between-class variance of the background and foreground. At each intensity value, the background and the foreground was separated, and the between-class variance was calculated

$$\sigma^2 = w(t)[1-w(t)][\mu(t)- \mu(t)]^2$$

Where w (t) is the weighted sum of background, μ (t) is the mean intensity value of background and μ f (t) is the mean intensity value of foreground.

To further filter out the background pixels and produce connected regions, flood filling was performed after thresholding. The starting point was set as the middle of the palm image, and then its 8 directions were scanned.

A. Extracting Fingers and Computing Length

After segmenting the palm from the background, fingers were extracted with their lengths computed. This is done by first tracing the contour of the palm and enclosing it by a convex hull. Contour of the palm means the boundary adjoining the segmented palm. Border Tracing algorithm was used to trace the contour of the palm. Next, a convex hull enclosed the palm. Convex hull means the smallest convex polygon that could enclose all the points of the contour. Gift Wrapping algorithm proposed by Javis was applied to find the convex hull. First, the contour's vertex was identified. Next, starting from the vertex, the contour was scanned in clockwise or anti-clockwise direction. The furthest and outermost point was chosen in each row of the contour. The convex hull was traced. Finally, convexity defects of the palm were determined to locate the fingertips and finger gaps. Convexity defects are the area, which does not belong to the polygon but being enclosed by the convex hull.

B. Extracting the Three Principal Palm Lines

First, the region containing the palm lines was cropped. Next, several pre-processing operations were performed to remove noises and sharpen the image. To enhance the image contrast, histogram image became sharper and clearer. Canny edge detection could now be performed to extract the three principal palm lines[6]. In Java Library, edges are the discontinuities in an image representing sharp intensity changes. Palm lines could be regarded as edges because they appear as strong discontinuities in the palm. A pixel would be regarded as edge if its gradient magnitude exceeds particular threshold equalization was performed on the image.
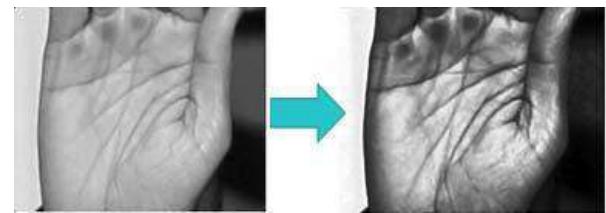
Fig. 3.2: Palm image after histogram equalization

Finally, the length of the palm lines was obtained using the Euclidean distance defined as,

$$L= \sqrt{(E_y-S_y)^2+(E_x-S_x)^2}$$

Where Ex and Ey are the x-coordinate and y-coordinate of the ending point, and Sx and Sy are the x-coordinate and y coordinate of the starting point respectively. The slope of the palm lines was obtained using the slope formula as,

$$M= |(E_y-S_y)/ (E_x-S_x)|$$

It should be noted that the length of the palm lines was further normalized[5] using the diagonal length of the palm; and absolute value of the slope was taken because the slope of palm lines in the left palm and right palm has an opposite different sign.

C. Fuzzification

After computing the lengths of principle lines apply fuzzy logic to input data which is carried out by converting inputs into membership values of the fuzzy sets[8]. Life, head and heart line length is input variables of the fuzzy logic based system. Each line has divided in five fuzzy set very small, small, medium, large and very large as shown in Figure 3.3.
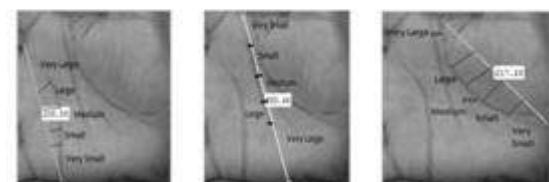
Fig. 3.3: Fuzzification of hear line (left), head line (middle) and life line (right)

D. Fuzzy Rule Construction

Apply Fuzzy inference controlled system which is knowledge based system stores knowledge in form of rules and performance of overall system is depends on accuracy of the rules. Each fuzzy rules are in term of if-then rules. We construct Fuzzy rule for accurate result and to make software flexible[9].

E. Defuzzification

For Multiple inputs we need to produce single output for that purpose we use Defuzzification[4]. Defuzzification converts fuzzy value to crisp value. In this system we used one of the defuzzification method is the centroid calculation, which returns the center of area under the curve. We also used some supported deffuzification methods: centroid, bisector, middle of maximum, largest of maximum, and smallest of maximum. We have applied centroid, bisector and middle of maximum methods on input sets and compare their ranks and produce the desired accurate output.

IV. PROPOSED METHODOLOGY
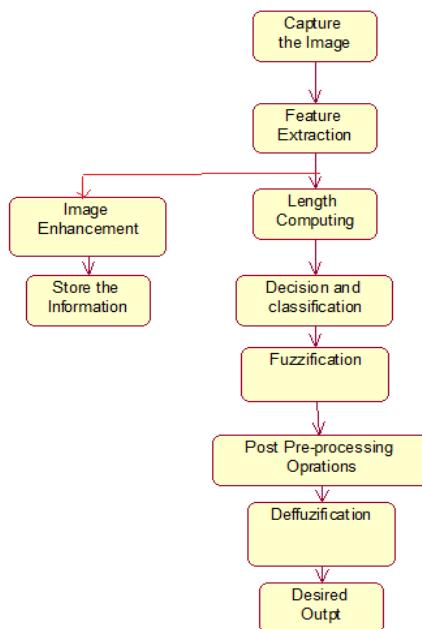
Fig.3.4: Palm reader Working Flow

The methodology of palm reader divided in two parts. First part of this paper includes palm line extraction. Second part of this paper includes designing of fuzzy logic. In inference system with three inputs lifeline, headline, Fate Line and heart line. Various steps involved in design of Automatic Palm Reader follows given algorithm:

- *User Login:* User will create his/her profile and system will check user age should be more then 3years if not then only Birth sign will display as result.

- *Image Capture:* User will capture the image using any android smart phone.

- *Image Pre-processing:* Segmenting the palm lines and use YUV model and flood fill

algorithm. To further filter out the background pixels and produce connected regions, flood filling was performed after thresholding. After feature extraction proper alignment is to be done using the Homographic matrix. Given any point in one image, in the homogeneous coordinate system $[x, y, 1]^T$, the corresponding point in the second image is given by

$$[x'y',c] = H[x,y,1]^\wedge T$$

- *Computing the length of the palm:* first tracing the contour of the palm and make a convex hull. Border Tracing algorithm used to trace the contour of the palm. Next, a convex hull used the Gift wrapping algorithm applied to find the convex hull.

- *Extract Principle lines:* Several pre-processing operations were performed to remove noises and sharpen the image. Histogram equalization was performed on the image to enhance the image contrast. After filtering out the noises, contrast was enhanced and the image became sharper and clearer. For palm feature extraction Central part of the palm called as Region Of Interest (ROI) is used. Now define a co-ordinate which is used to align different palm print images. Palm ROI cropping is checking of robustness against rotation and translation of hand images.
By

$$TLx=(Centerx128)+(128*m)$$
$$TLy=(Centery-(128*m))-128$$

- *Computing the length of the palm:* First tracing the contour of the palm and make a convex hull. Border Tracing algorithm used to trace the contour of the palm. Next, a convex hull used the Gift wrapping algorithm applied to find the convex hull

- *Extract Principle Lines*: Several pre-processing operations were performed to remove noises and sharpen the image. Histogram equalization was performed on the image to enhance the image contrast, after filtering out the noises, contrast was enhanced and the image became sharper and clearer. After image alignment, the query image and the gallery are better aligned, and traditional algorithm applies a bank of modified Gabor filters with different orientations to palm print

images, and encode the orientation into 3 bit-planes

$$G(x,y,\delta,\theta,\sigma) =$$
$$w/(\sqrt{2}\Box k)\exp(-(w^2/8x^2)$$
$$(4x'^2 + y'^2)$$

With

$$x'=(x-x0)\cos \theta + (y-y0)$$
$$\sin\theta \; y'= -(x-x0) \sin \theta + (y-y0) \cos\theta$$

And then finally score fusion is performed using this formula

$$d=wd_{SIFT} + (1-w) \; d_{compcode}$$

- *Fuzzification:* Create membership function, the fuzzy sets of the input variables and their range.

- *Fuzzy rule construction:* Apply knowledge based Fuzzy controller (KBFC).

- *Defuzzification:* Apply Defuzification techniques, compare input sets, and calculate the result.

- *Result generation*

V. CONCLUSION

This study is among the first to develop a palm-reading algorithm that could segment the palm from the background, compute the length of fingers, and extract the three principle lines of the palm automatically. Experimental results showed that the proposed algorithm produces accurate detection results. First, although there are many image-processing operations in our proposed algorithm, the computational speed under the mobile application development platform is acceptable. Second by fuzzy logic, we predict about the health status of the person like the heart disease and kidney disease.

VI. FUTURE WORK

On the development of health prediction database, continuous efforts to add more information of illnesses and palm features can help in broadening the database. In addition, verification of collected information on health prediction and fortune telling can be done with various expertises in those fields to improve on the accuracy of the database.

As this is the age of mobile technology, after the system is successfully implemented and integrated with the deciphering system, a mobile application version of the system can be developed. This new mobile application should be able to utilize the deciphering system and the phone's camera to accurately identify the user's palm features. After deciphering, the extracted features can be pushed to the database to fetch the corresponding results for the users. This helps to provide increased accuracy and more convenience for the users.

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Data Hiding In Audio Files Using Steganography

Nilesh Patil
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Mayur Sonwane
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Rushikesh Nage
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Siddesh Pansare
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Namita Pulgam
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Abstract—**Information hiding and secure data communication is a very important concern today. The emerging growth in use of digital data recommended the need of effective measure to ensure security of digital data. The goal of steganography is to hide information by concealing it into some other medium like image, audio or video so that only sender and intended recipient knows existence of information in communication. This system of audio steganography focuses on embedding a text file into another audio signal, which acts as a carrier file. It is concerned with embedding information in an innocuous cover speech in a secure and robust manner. Current systems attempt to use image files as a carrier file for communication. However, image files are more prone to error detection and are less innocuous as compared to other media like audio files. Image files are more susceptible to message detection as the changes can be viewed directly in the structure of an image. This system makes sharing of files more secure by using the concept of audio steganography. The confidential message is embedded by fairly altering the binary sequence of a audio file. In this way, we can exploit the limits of the human auditory system, thus making it less susceptible. Embedding secret messages in digital sound is usually a more difficult process than embedding messages in other media, such as digital images. In order to conceal secret messages successfully, a novel method for embedding information in digital audio has been introduced.**

I. INTRODUCTION

Steganography is the technique of hiding one media within another, to help communicate private messages in such a way that no other person other than the intended one gets access to it. It is taken from Greek word STEGANOS which means Covered and GRA- PHIE which mean Writing. So, Steganography is a method of covering important information behind an image. We are of the belief that the easiest way to keep something from prying eyes is to place it right in front of the person looking for it and make it look as innocuous as possible. People share a lot of music files on regular basis, which is quite normal nowadays. It is very difficult to find out whether there is any data hidden in the audio files. If one were able to hide the message in any audio file, it can be done without raising any suspicion. Messages can be transferred very conveniently.

A. Objective

The main objective of this system is to embed the text file data in the stego-cover audio file to facilitate secure transfer of data. It will avoid drawing suspicion to existence of hidden message, so that it can facilitate covert communication between the sender and receiver. The user will be able to choose a audio file of his choice as a cover file to use it as a medium for hiding his original data file. It also aims at formulating an algorithm based on data hidden techniques in the audio file to increase the quantity of hidden data and strike a right balance between the contents of the audio file and text file. Since security of data is of paramount importance, this system also uses encryption techniques, which involves encryption of message before embedding it into cover file. This is to make sure that only the intended person gets access to the contents of the file, thus making the communication secure and hassle-free.

II. RESEARCH PAPER SURVEY

Paper [1], Alain C.,Brainos II explained the concept of Steganography. Steganography is a technology which is used to hide data within text, image, audio, video etc. Steganography is often confused with the word cryptography. The difference is, in steganography, most people would not detect the presence of the message. Different approaches of steganography is explored. A new word came into knowledge called Steganalysis. Steganalysis is a method to detect presence of a hidden message and attempt to reveal the true content of the message. This paper demonstrate various components of steganography. The Paper explores set of rules implemented to preserve intended results which are secret messages with a cover data. This paper also explains application of steganography in defense, government purpose etc.

Paper [2],Burate D.J, M.R Dixit explained the proposed method is improved version of the LSB technique used as audio steganography, combined with coding technique gives high embedding capacity with reference to literature survey LSB technique gives best results hence considered for implementation. Present day stego techniques take help of cryptographic algorithms to increase security

level. The message is embedded by first converting it into decimal and then to binary. A matrix is created using the words whose rows are equal to total no. of characters to be embedded, which is later converted into column matrix and each bit is embedded into LSB of each audio sample. The audio signal is converted into bits while embedding the textual information into any audio file. Then the message to be embedded is converted using the proposed strategy. By applying LSB algorithm, the message is embedded into audio sample in a 16 bit format.

Paper [3],Digvijay Singh Mankotia, Kuldeep Sharma explained the Steganographic method for embedding textual information in audio signal which has been deliberated here. A new fast algorithm is proposed which will use DCT base audio compression to speed up the audio steganography algorithm.

Paper [4],Jayaram P, Ranganatha H R, Anupama H SI,explained the Various techniques for implementing steganography have been introduced like LSB Coding,Parity Coding,Phase Coding,Echo Hiding and Spread Spectrum. The advantages and disadvantages of each method along with their data hiding capacity and robustness towards steganalysis has been listed.

Paper [5], Rubby Garg, Dr.Vijay Laxmi explained a novel approach to hide the data in audio signals based on LSB technique. Performance of the proposed system is evaluated on various parameters and is compared with the existing systems. Also, important parameters like SNR(Signal to Noise Ratio) and CR(Compression Ratio) and their influence on the quality of the audio files has been explained

A. Existing Project Comparison

TABLE I
EXISTING PROJECT OVERVIEW

Sserial Number	Advantages	Limitations
1	Simple and easy-to-implement	Prone to cracking under Steganalysis
2	More robust than standard bit embedding	Data integrity at risk
3	Less prone to breaking	Complex to implement, noticeable mix of echoes which increases risk of detection
4	Large capacity for embedding of data	If the encoding system is known, the system is defeated
5	Low noise levels in the cover file	Low levels of security because of weak algorithms

B. Analysis

The points mentioned above in the table show that the current systems do have limitations in their implementations and can be improved by a considerable extent to make a better steganographic system. Hence, a new system has been proposed here which will work on making an improved system such that it will overcome a lot of these limitations. The proposed system and its methodology has been explained in the next chapter.

III. PROBLEM DEFINITION

We are of the belief that the easiest way to keep something from interfering eyes is to place it right in front of the person looking for it and make it look as innocuous as possible. The existing systems try to use image files as a cover file. However, image files are more prone to suspicion as the alterations in the structure of an image file can be visible to the naked eye and can draw unnecessary attention to itself, thus defeating the purpose of steganography. Issues like color degradation and addition of noise in the image files gives away the existence of embedded data. Thus, image files are not the best type of cover file to be used for communication. Hence, audio files have been explored as an alternative medium for secure and confidential data communication. The primary goal of this project is to provide end users the ability to supply steganography on audio files and secretly convey messages to the other end users. The main purpose of this tool is to transfer the messages in such a way that it prevents the intruders from detecting the presence of the secret message. Low-bit encoding is the one of the simplest and most efficient way to embed data into other data structures. It works by substituting the least significant bit of each sample of the file with a coded stream of binary bits, which helps in encoding a large amount of data in an audio signal. An improved LSB method has been proposed to improve on the quantity of the data that can be stored in the audio file while retaining its quality. Also, the embedded data will be encrypted prior to embedding, thus adding to its security.

IV. PROPOSED METHODOLOGY

In the proposed method the carrier file is taken as audio carrier format to hide the secret message which would be a text file. This file is encrypted using a 4 digit key entered by the sender. Then the embedding process is carried out with the carrier audio file. In the embedding process, on the encoder side, the audio file is sampled at 8000 samples/second which contains 8 bits per sample. The text file, after encryption, is converted into ASCII format and each bit of this file is now embedded in each sample according to the formulated algorithm. For the worst case, if the formulated algorithm fails, the intruder will be presented with the encrypted message only instead of the original message, thus adding to the security. To attain robustness and confidentiality, the last bits of the audio file cannot be exploited as it becomes vulnerable to invariate steganalysis. Hence, the proposed method induces randomness in choosing the required bits of a sample in the audio file. The initial two Most Significant Bits(MSBs) of each sample in the audio file are used to decide the LSB of the sample which will be replaced with the respective message bit. Following table displays the mapping of the proposed bit selection process. Here, only the last three LSBs of the sample are used for the embedding process. In this process, if the first two MSBs are equal to 00, then the third LSB will be replaced with the message bit. If the first two MSBs are equal to 01, then the second LSB will be replaced with the

TABLE II
BIT SELECTION MAPPING

1st MSB	2nd MSB	Position of LSB
0	0	3rd bit
0	1	2nd bit
1	0	1st bit
1	1	1st bit
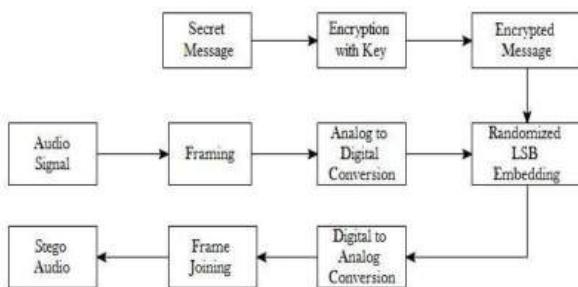
Fig. 1. Randomized LSB Technique Encoder Module(Implementation of Embedding Text in Audio using Randomized LSB Method for Secure Audio Steganography)

To add more randomness, the embedding process is improved by making random selection of samples before making random selection of bits in a sample. So, all the samples of audio file will not contain secret message bit but only few will contain. Here also the randomness is obtained by using first three MSB values of a sample. The following table shows this sample selection mapping. In this process some of the samples are skipped in between embedded samples.

TABLE III
SAMPLE SELECTION MAPPING

1st MSB	2nd MSB	3rd MSB	The next sample
0	0	0	n+1
0	0	1	n+2
0	1	0	n+3
0	1	1	n+4
1	0	0	n+5
1	0	1	n+6
1	1	0	n+7
1	1	1	n+8

Consider n is the initial value of the last sample where the data bit was stored. In the table given above, the last column gives the next sample where the data bits will be stored. In this process, a few number of samples are skipped in between two consecutive secret message bits. Initially (n=1), if the first three MSB bits of cover audio samples are equal to 011, then the last column indicates the next sample (n+4=5) contains second secret message bit. It means that, first secret message bit is embedded in first sample and next message bit is saved in fourth sample. In the same way, the fourth sample of audio file is equal to 000, and then the third message bit will be saved in sixth sample of the audio file.

On the receiver end, the exact reverse process of the above will be proceeded. The intended user will have to enter the stego key for gaining access of the data file. After the key is
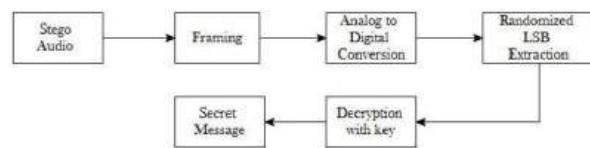

Fig. 2. Randomized LSB Technique Decoder Module(Implementation of Embedding Text in Audio using Randomized LSB Method for Secure Audio Steganography)

verified, the embedded data bits will be extracted from the audio file according to the formulated algorithm. Once the data bits are extracted, they will undergo decryption and the original file will be recovered. Thus the communication has been made between the two users.

The algorithms on the sender side and receiver side are explained as follows:

Randomized LSB algorithm -At the Sender side.

Input: Cover Audio file, Key and Secret Message
Output: Steganographic Audio File.
Step 1: Read the audio file which is to be sent.
Step 2: Take as input the secret message file.
Step 3: Enter the secret encryption key.
Step 4: Divide the audio file into different frames and convert them into bytes form. By passing through ADC, the bytes are represented in the form of bit patterns.
Step 5: Using the encryption key, encrypt the original message using RSA algorithm.
Step 6: Consider the next sample for embedding the message bit.
Step 7: Embed the message bit in the respective sample and its respective bit, according to the specified algorithm.
Step 8: Repeat the same process for all the bits of the text file to be embedded.

Randomized LSB algorithm -At the Receiver side.

Input: Steganographic audio file,Stego-Key
Output: Original Secret Message, audio file.
Step 1: Take the audio file where the message has been embedded.
Step 2: Enter the key used for decrypting the text file.
Step 3: Verify the user. Extract data bits from the carrier audio file using the given procedure and join all the bits to form the text file.
Step 4: Decrypt the text file and retrieve the original message.

This is the improved LSB methodology that will be used for embedding process. The main advantage of the LSB coding method is a very high watermark channel bit rate; use of only one LSB of the host audio sample gives capacity of 44.1 kbps (sampling rate 44 kHz, all samples used for data hiding). The embedding process will need spectral analysis which can be done in MATLAB. It provides audio processing tools which can be used for the same. This algorithm doesnt degrade the

audio files quality by a significant level, hence is undetectable to the human ear.

V. Conclusion

Security and Privacy is the need of the hour, especially after advancements in various sniffing and intruding techniques that have been developed in the past few years. Steganography helps in communicating messages discreetly via safe mediums to shroud the very existence of a secret message. The innocuous nature of this system makes do in the belief that it is better to be inconspicuous while communicating as it raises less suspicion as compared to other cryptographic techniques which are visible to everyone. Audio steganography is a widely used technology also it has bright future and applications.This system will serve as a very good tool for making private and confidential conversations a standard norm rather than a rarity.

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A Job Recommendation System For Enhancing Recruitment Process

Pooja Yami
Information Technology
K..J Somaiya College of Engineering
Vidyavihar , Mumbai, India.

Aruja Toke
Information Technology
K..J Somaiya College of Engineering
Vidyavihar , Mumbai, India.

Aishwarya Tata
Information Technology
K..J Somaiya College of Engineering
Vidyavihar , Mumbai, India

Abstract - **As we know that people all over the world use the internet for multiple purposes, one main use is of an online job portal . With the growing amount of information on the internet and with a significant rise in the number of users, it is becoming important to provide people with the relevant chunk of information according to their preferences and tastes. Keeping the necessities and skills of candidates in mind, our system is a web-based job recommendation system. It combines both the skills of the candidate as well as his psychometric traits in order to recommend jobs. It allows Job seekers and Recruiters to register on the website to get access to the services. Job seekers can provide their Qualification details and give Psychometric test inorder to apply for the recommended jobs which are most suitable to them. Job seekers can apply for the jobs and if the criteria is matched then candidates can move to the Interview rounds. Interview status will be updated on the website by Admin. Recruiters can post the jobs, view candidate details and view applications for their posted jobs. The website content and candidate information updation will be managed by the Admin.**

Keywords – **Content Based Filtering, Artificial neural network, Psychometric test**

I INTRODUCTION

We are proposing a system which recommends job using user qualification details and psychometric test score inorder to improve the accuracy of job recommendations. Candidates with more than just the knowledge and the skills are required so that they have a successful career. This is the utmost reason why employers are increasingly including personality tests in the recruitment section. This system enables candidate's personality to be assessed by the recruiters. This system also provides the global platform for both job seekers and recruiters, where the job seekers can find jobs they are best fit for and organization can find the right candidate to fulfill their staff requirements. This has been accomplished using the qualification details of the candidate on combining with the psychometric test score obtained using Artificial Neural Network.

II RELATED WORK

There are various algorithm which are implemented for Job Recommendation:

Optimised algorithm is used by combining position descriptions and resume information. Specifically, job preference prediction formula is op- timized by historical delivery weight calculated by position descriptions and similar user weight calculated by resume information. The experiments tested on real data set have shown that our methods have a significant improvement on job recommendation results.[1]

Distributed hybrid recommendation frame- work addresses the new-user cold-start problem based on user classification. First, current user characteristics, user context and operating records are used to classify the user type. Then, suitable recommendation algorithms are dynamically selected based on the current user type, and executed in parallel. Finally, the recommendation results are merged into a consolidated list.[2]

A reciprocal job recommendation system, CCRS (Classification-Candidate Reciprocal Recommendation), is proposed. With this proposed system, offering job advertisements in a sequence for candidates that they can get feedback reciprocally by using the user's profile, interaction and preference information is aimed all together. An approach has been used based on the preference information of the candidates to determine the jobs' order in the proposed list and the success of different classification methods has been compared to estimate the feedback rate of the advertisements for the target candidate.[3]

III PROPOSED SYSTEM

The proposed system allows user to attempt the psychometric test for better job recommendations. The psychometric test involves three stages which are designed to test the candidate's overall personality. The candidate must attempt all the stages to acquire the psychometric final test score.

This system is efficient in providing recommendation to the Recruiters and Candidates:

- It enables most suitable candidates to be recommended to the recruiters based on the qualification and test score criteria.

- It recommends jobs which are most suitable for the candidates and also allows candidates to let recruiter know more about them by attempting the test.

A. PSYCHOMETRIC TEST

The psychometric test involves three stages which checks the analytical skills, communication, decision making and leadership skills of the candidates. Candidate must attempt all the three stages inorder to obtain the final test score.

The psychometric test score is calculated using Artificial Neural Network(ANN). ANN uses back propagation technique. The output values are compared with the correct answer to compute the value of some predefined error-function. Using this information, the algorithm adjusts the weights of each connection in order to reduce the value of the error function by some small amount. After repeating this process for a sufficiently large number of training cycles, the network will usually converge to some state where the error of the calculations is small. In this case, one would say that the network has learned a certain target function. For this, the network calculates the derivative of the error function with respect to the network weights, and changes the weights such that the error decreases.[6]

Squared error function:

$$E = \tfrac{1}{2}(t - y)^2$$

(1)

E- squared error,
t- target output for training data
y- actual output of the neuron

Updating weights:

Change in weight is given by the product of the learning rate and the partial derivative of the error

with respect to the weight.

$$\Delta w_{ij} = -\eta \frac{\partial E}{\partial w_{ij}}$$

(2)

Here we have considered 0.001 as the learning rate.

Here the activation function used is the sigmoid function.

$$f(x) = \frac{1}{1 + e^{-x}}$$

(3)

The neural network for this system consist of two inputs, two hidden neurons, two bias neurons and one output. ANN takes the score of the three stages of the test as one input and the average time taken to attempt the test as another input.

ANN performs over 6000 iterations for adjusting the weights and around 500 iterations for training the network based on training dataset. It performs overall 3000000 training cycles. We have used 50 records of training dataset. ANN outputs the final score which will be updated on the candidate's profile.
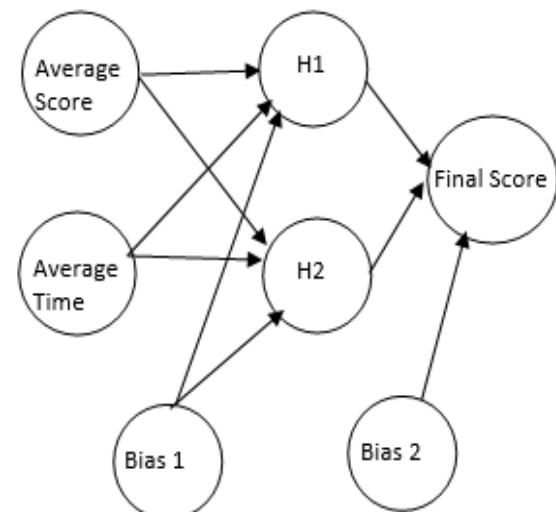

Figure 1 : Artificial Neural Network Structure

B. RECOMMENDATION ALGORITHM

Recommendation algorithm is an prediction method which utilizes some mathematical theory to analyze user behavior and predict the user's preference of items.

- Content Based Filtering

Content based recommendation generates recommendation lists based on user's profile. More simply, content based recommendation algorithm recommend items which are similar to user's profile.[4]

J- {j}-set of all available jobs.

U-{u}-set of users

Where j∈ J and u ∈ U

Content(j)- skill set of the job

UserProfile(u) – skill set of the user

Content(j) and UserProfile(u) are represented as feature vectors with n-dimension. Each dimension is a keyword or feature. All the available Jobs are mapped to the vector Content(j). TF-IDF is used to estimate value of each feature

$$F_{CB} = CosineSimilarity(UserProfile(u), Content(j)) \quad (4)$$

$$CosineSimilarity(a,b) = \frac{a * b}{||a|| * ||b||} \quad (5)$$

Based on the Cosine Similarity value , Top N jobs are recommended. The value lies between 0 to 1.

The proposed system allows user to provide the qualification details and also attempt the psychometric test. Based on the Score and Qualification candidates will be recommended the jobs. The candidates will also be recommended the jobs based on their profile for which Content based filtering is used. Cosine Similarity and TF-IDF are used for this algorithm. Cosine similarity is used to find similarity between the skills of candidate's past preferred job and other job postings. TF-IDF is used for extracting important skills from the jobs.

Candidate can apply for the jobs and after the response from the recruiter move to the interview round. The results of the interview round, that is the selection status will be updated on the candidate's profile.
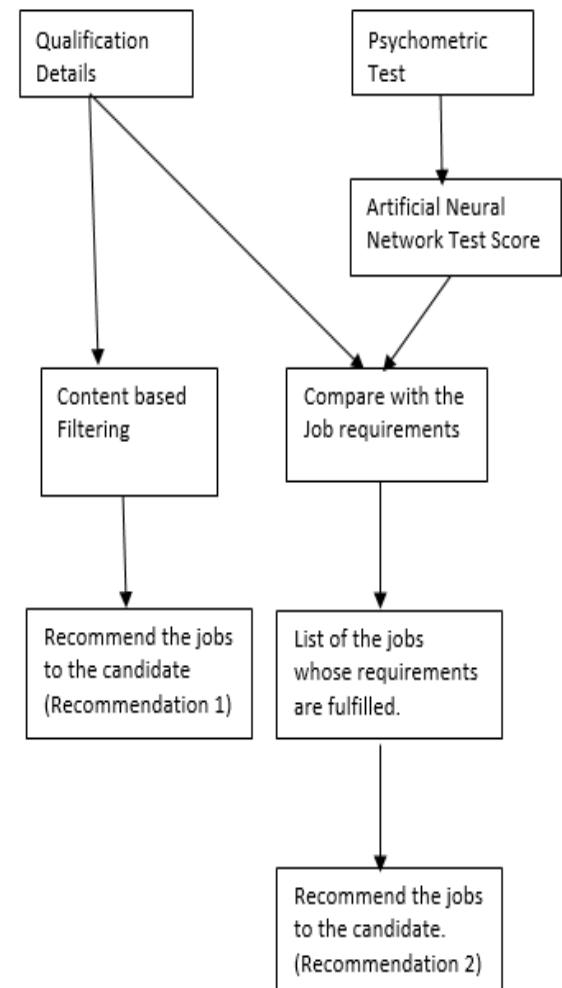


Figure 2 : Recommendation System

IV   RESULTS

We have used Artificial neural network to predict the scores of the candidate by considering the average Time taken and average Score obtained in three levels of the test as the inputs. According to the results obtained from Visual Gene Developer tool, the training status is shown in Figure 3.

Training status

Parameter	Value
Total cycles	300001
Sum of error	0.12572920322418
Avg error per output per dataset	0.00251458406448

Figure 3 : Training Status of Artificial neural network

The regression analysis obtained (Figure 4) also shows the effectiveness of the artificial neural network in predicting the scores of the candidates.
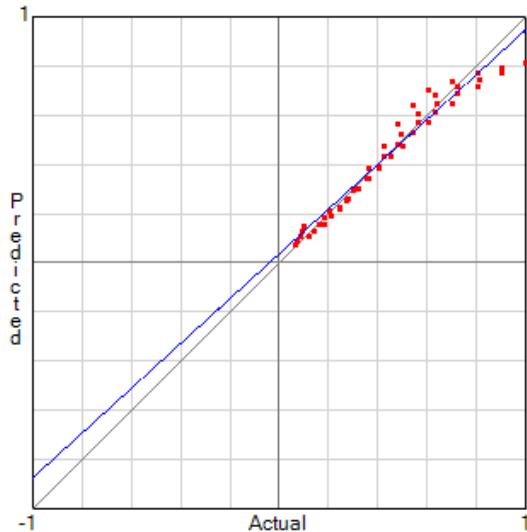
Figure 4 : Regression Analysis of Artificial neural network system

V   FUTURE SCOPE

Further feasible or potential improvement that can be done with our proposed approach is:

- Github can be used as a wealth of information to look at the kind of work the candidate has done. A link to the same can be included.

- Personality of the potential candidate can be analyzed using the resume uploaded by him on the social media platform. This will help in determining the personality of the candidate and further analyze if he is fit for the job.

- Verify the feasibility of our optimization method on more data set.

VI   CONCLUSION

This system considers the personality trait of a person as an effective personality plays a key role in gaining success. Knowing the personality helps shape the future by giving a range of abilities. It also helps in choosing a dream career instead of a job, providing long-term information about what one can contribute

and accomplish. We have made this system to make it easier for the recruiter to select candidates. It also presents the information in a standardized format. The raw data we acquired through the details of jobseeker is screened and scored to display the top N candidates considering the personality test. We have also incorporated the recruiters demands while scoring the jobseeker's details, thus making it recruiter specific. Hence our system aims at matching the candidates to their most suitable jobs and Recruiters to the candidates they are looking for.

Personalized recommender systems have gained much required recognition by researchers and been widely used in many domains in the last decades. The job recommender system is proposed for job seekers who search job positions and recruiters who find registered candidates on the portal by applying the concept of personalized recommender systems into the job recruiting domain.[5]

The cold start problem specifically, concerns the issue that the system cannot draw any inferences for users about which it has not yet gathered sufficient information.[7] The experiment result conducted previously by some scholars shows that content-based method is more suitable for the cold start problem than the other traditional methods.[8]

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Audio Classification Using Segmentation, MFCC and PNN Classifier

Nilesh M. Patil
Research Scholar, Computer Engineering,
Pacific Academy of Higher Education and Research
University, Udaipur, India.
Email:nileshdeep@gmail.com

Milind U. Nemade
Professor, Electronics Engineering,
K J Somaiya Institute of Engineering and Information
Technology, Mumbai, India.
Email:mnemade@somaiya.edu

Abstract—**The popularity of audio classification is immensely increasing both in academics and industries. Audio classification is also gaining large popularity in pattern recognition and artificial intelligence. Audio features like STE, ZCR and MFCC are extracted. Classification is done using PNN classifier. We measure the performance using parameters like precision, normalized mutual information (NMI), F-Score, entropy, sensitivity, specificity, and accuracy.**

Keywords—**PNN, STE, ZCR, MFCC, Precision, NMI, F-Score, Entropy, Accuracy**

I. INTRODUCTION

One of the vital sources of human perception is the audio information. The tremendous increase in the volume of audio files on public networks like Internet requires efficient indexing and annotation mechanisms. Audio classification can help in describing the semantics of the audio information and organizing it in a structured way. Next generation multimedia search agents on the web can also use this method for searching contents on the internet. In this paper, we classify the audio signals using feature vectors and machine learning regime into speech and music signal. Initially we are pre-processing the input audio signal by removing the Gaussian noise present using the mean filter. We have used peak estimation and pitch extraction method for segmentation, MFCC feature vectors and PNN classifier for audio classification.

II. RELATED WORK

Muthumari Arumugam, Mala Kaliappan [1] classified audio signals from GTZAN dataset and achieved an accuracy of 96.2% using PNN classifier. Nilesh M. Patil, Milind U. Nemade [2] proposed an approach for classification of pre-processed audio signals using SVM, kNN and PNN classifiers and found that PNN achieves better classification accuracy of 99.279% with computation time of 4.25 minutes. In [3], authors performed audio information retrieval using weighted MFCC (WMFCC) on GTZAN dataset and obtained mean precision value of 96.40% and better recall value. Trsiladevi C Nagavi, Anusha S B et al [4] developed an expert system to classify and retrieve audio files using Sort-Merge technique and achieved accuracy of around 80% within 2-3 minutes. Tong Zhang et al [5]performed segmentation and classification of audio recordings as speech, music or noise in real time achieving an accuracy of 90%. Stan Z. Li [6] presented the

nearest feature line (NFL) method for content-based audio classification and retrieval and stated that the NFL-based method presented better results with an error rate of 9.78%. In [7], authors used SVM and ANN for classification method achieving an accuracy of 98%. Feng Rong [8] proposed a novel audio classification method based on machine learning technique using SVM and achieved an accuracy of 86.95%. Toni Hirvonen [9] presented a method for speech/music classification using unsupervised learning and sparse feature encoding with accuracy of 95%. Jozef Vavrek, Jozef Juhr, Anton imr [10] utilized the rule-based approach and the one-against-one SVM (OAO-SVM) for classification. ZHU Le-Qing [11] identified insect sounds automatically using sound parameterization techniques and PNN classifier and achieved the accuracy of 96%.

III. PROPOSED SYSTEM

In this section we explain the proposed system in detail. The Fig. 1 below depicts the system flow. For input audio signals, we have taken GTZAN dataset from Marsyasweb which included 128 audio files. Each audio track in the dataset is 16-bit, 30 seconds long and 22050 Hz Mono file in .wav format. [12]
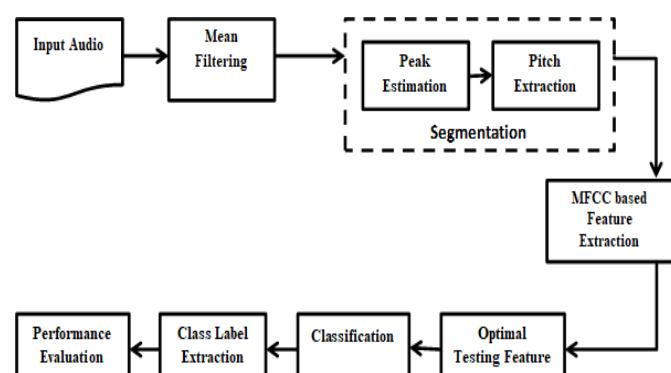

Fig. 1: Proposed System

For removing the Gaussian noise present in the audio signal, it is pre-processed using Mean Filter. Mean filtering normalizes the amplitude of the audio signal thereby smoothing it. In this paper, we show the plot of corea.wav audio file in Fig.2 and the filtered audio signal is shown in Fig.3.
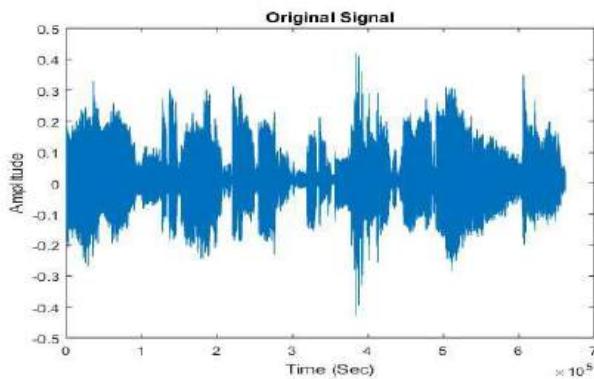
Fig. 2: Input Audio Signal
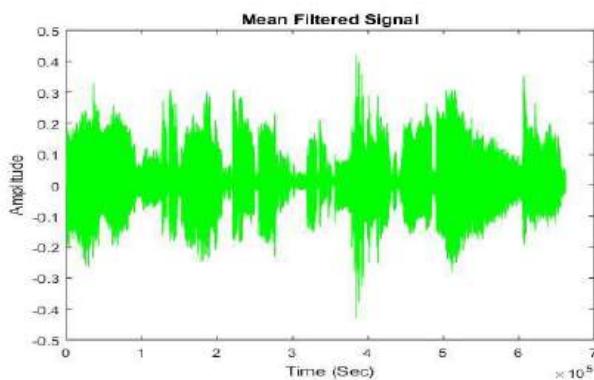
Fig. 3: Mean Filtered Audio Signal

The segmentation process divides the input signal into homogeneous segments as voiced segment and unvoiced (silence) segment. Peak estimation and pitch extraction method for segmentation process are implemented. We calculated peak from the starting edge of the signal, the finishing edge of the signal and the peak amplitude edge of the signal. The average value of these gives the peak threshold value which is used for segmentation. The Fig.4 below shows peaks in audio signal. For pitch extraction process, we have taken both time domain
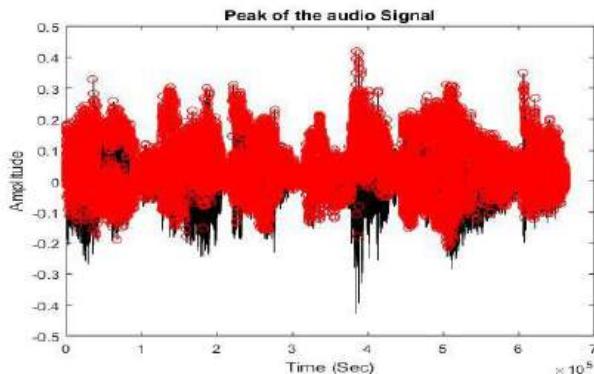

Fig. 4: Peaks in Audio Signal

and frequency domain features. In time domain, we have used ZCR and STE whereas in frequency domain we have used spectral centroid.

A. Zero Crossing Rate

The short-time zero-crossing rate is defined as the number of times the amplitude of the speech signal passes through zero within a given time window as shown in Fig. 5. Speech exhibits greater ZCR than music. The expression for the ZCR is given by

$$Z_n = \sum_{m=-\infty}^{\infty} |sgn[y(m)] - sgn[y(m-1)]| w(n-m) \quad (1)$$

where

$$sgn[y(n)] = \begin{cases} 1 & \text{if } y(n) \geq 0, \\ -1 & \text{if } y(n) < 0. \end{cases} \quad (2)$$

$$w(m) = \begin{cases} \dfrac{1}{2N} & \text{if } 0 \leq n \leq N-1, \\ 0 & \text{otherwise.} \end{cases} \quad (3)$$

and y(n) is the time domain signal for frame m.
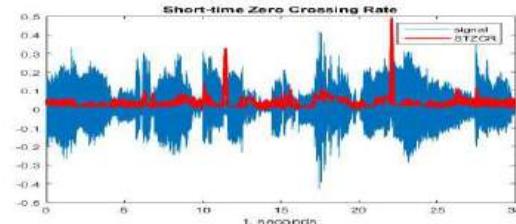
Fig. 5: Zero Crossing in Signal

B. Short Time Energy

STE is a measure of the total energy power of a frame. STE is expressed as

$$E_m = \sum_{n=-\infty}^{\infty} |x(n)w(m-n)|^2 \quad (4)$$

where x(n) is the input discrete signal, m is the number of frames and w(n) is the window used for analysis. Fig. 6 shows the STE calculated from multiple frames of the input audio signal.
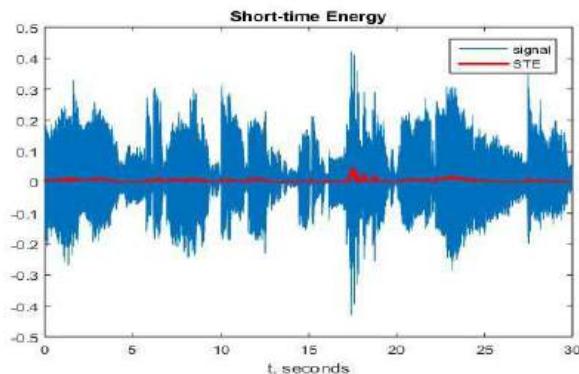

Fig. 6: STE of Audio Signal

C. Spectral Centroid

Centroid deals with sound sharpness. The spectral centroid is calculated using the formula:

$$C_r = \frac{\sum_{k=1}^{N/2} f[k]\,|X_r[k]|}{\sum_{k=1}^{N/2} |X_r[k]|} \qquad (5)$$

where f [k] is the frequency at bin k. The spectral centroid of the audio signal is shown in Fig.7 below. The pitch period
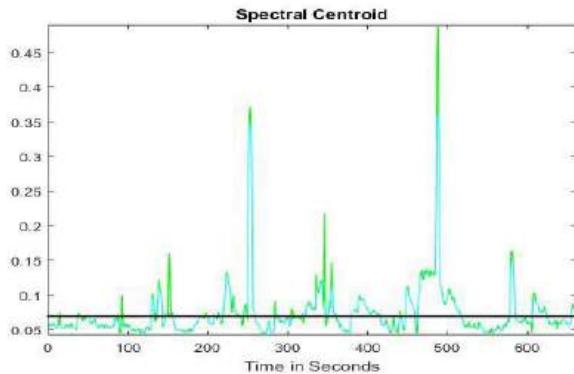

Fig. 7: Spectral Centroid of Audio Signal

plot of the audio signal is shown in Fig.8 and the voiced and unvoiced segments in the audio signal are shown in Fig.9 below. The red color indicates voiced segment and the gray color indicates the unvoiced segment in the audio signal.
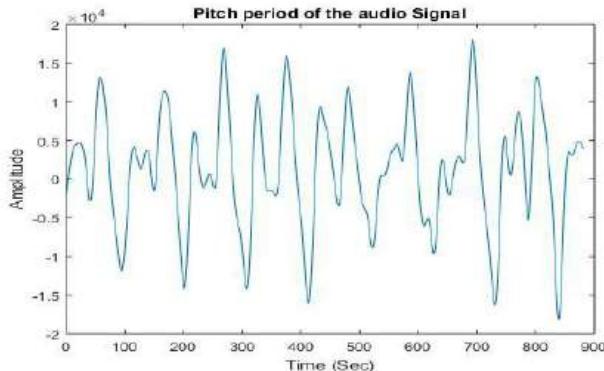

Fig. 8: Pitch Period of Audio Signal

The next step is MFCC feature extraction. MFCCs are one of the most used features in speech recognition. MFCCs are the coefficients obtained in the mel frequency cepstrum (MFC) where the frequency bands are equally spaced on the mel scale. MFCCs are calculated as follows:

1) We divide audio signal into short frames.
2) For each frame we took FFT and calculated the periodogram estimate of the power spectrum.
3) Then applied the mel filterbank to the power spectra, sum the energy in each filter. The relation can be expressed as follows.

$$m = 2595\,log_{10}\left(1 + \frac{f}{700}\right) = 1127\ln\left(1 + \frac{f}{700}\right) \qquad (6)$$

The output of the Mel frequency warping is shown in Fig.10.
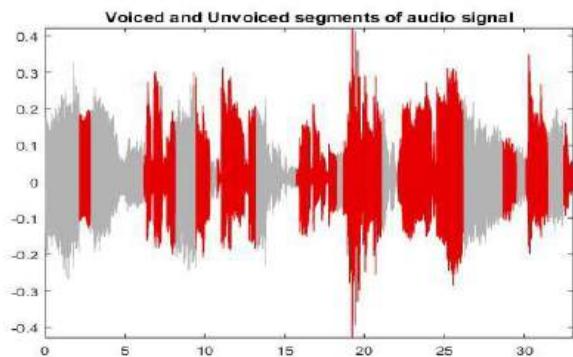
Fig. 9: Voiced and Unvoiced Segments in Audio Signal
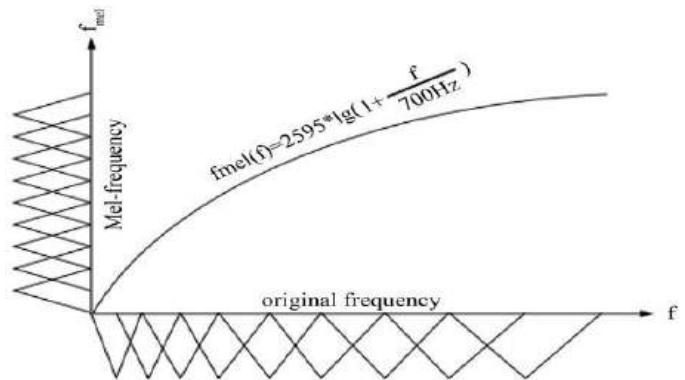
Fig. 10: Plot of Mel frequency warping

4) Then took the logarithm of all filterbank energies. The plot of mel filterbank energies of an audio signal is shown in Fig.11 below. The mel frequency cepstrum of
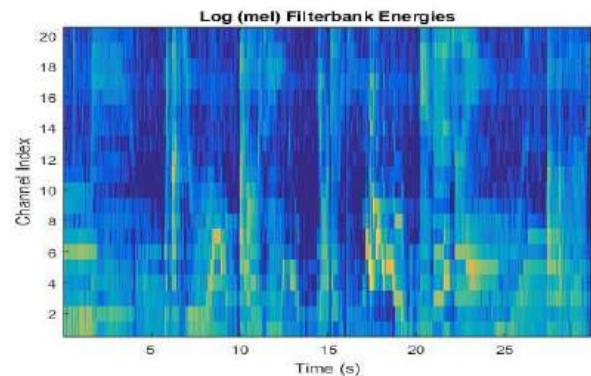
Fig. 11: Mel Filterbank Energies of Audio Signal

the input audio signal is shown in Fig.12.

5) Took the DCT of the log filterbank energies. The DCT decorrelates the energies. The DCT compressed input audio signal is shown in Fig.13 below.
6) From each frame 12 MFCC features are extracted and then the mean and variance of the MFCCs of all the frames are computed separately for each song. The mean and variance of the MFCCs are then used to train the classifier which can be used to assign a suitable class label to the unlabeled music or speech signal.
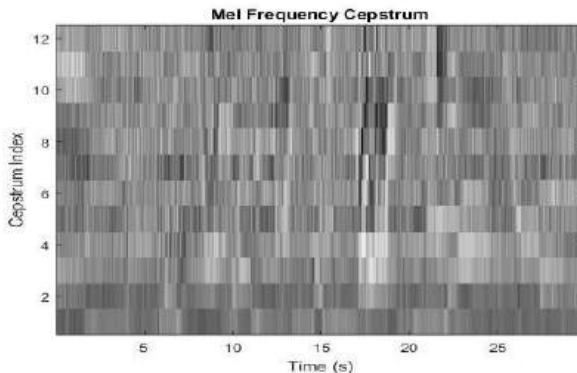
Fig. 12: Mel Frequency Cepstrum
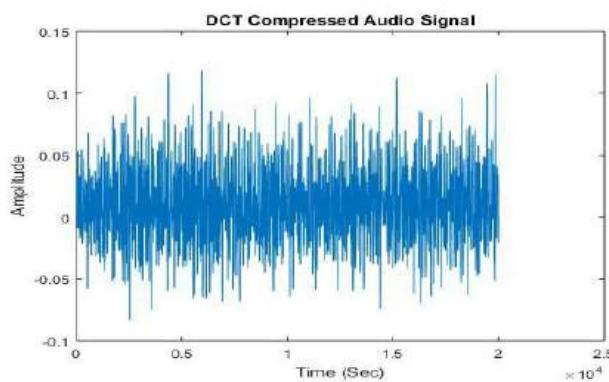
Fig. 13: DCT Compressed Audio Signal

Classification of audio signal is performed using PNN classifier based on the features obtained from segmentation and feature extraction process using MFCC.

Probabilistic Neural Network (PNN):

The PNN is the quick learning model than the other neural network models. PNN classifier has a grand potential for making classification decisions accurately and providing probability and reliability measures for each classification. The PNN provides high speed of learning. The anatomy of the PNN classifier is shown in Fig. 14. In this example we had
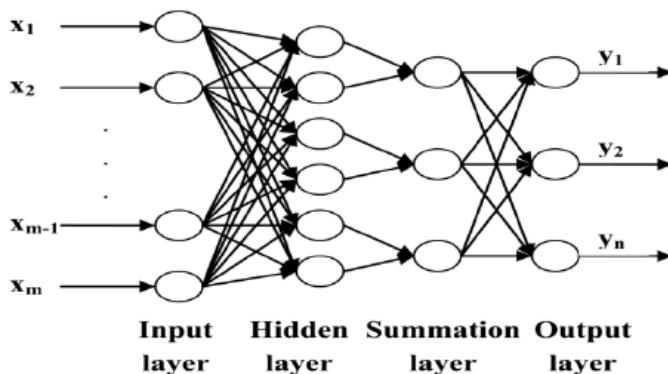
Fig. 14: Anatomy of PNN Classifier

used functions NEWPNN and SIM. Here there are three two-element input vectors X and their associated classes Tc. We had created y probabilistic neural network that classifies these

vectors properly. First we convert the target class indices Tc to vectors T. Then we design y probabilistic neural network with NEWPNN as shown in Fig.17. We use y SPREAD value of 1 because that is y typical distance between the input vectors. After that we test the network on the design input vectors.
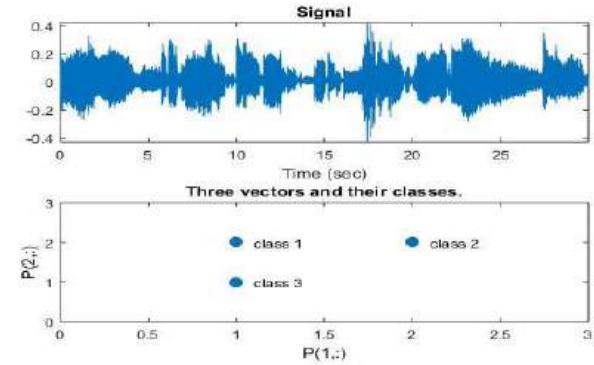
Fig. 15: Training PNN classifier

Fig.18 shows how the probabilistic neural network divides the input space into the three classes.
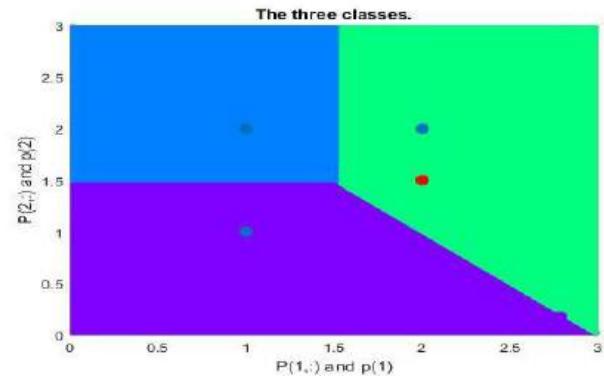
Fig. 16: PNN classification into 3 classes

IV. EXPERIMENTAL RESULTS

This section illustrates the performance evaluation and comparative analysis of the proposed approach with the existing techniques. we have taken GTZAN dataset from Marsyasweb which included 128 number of files. Each audio track is 30 seconds long, 22 kHz Mono 16-bit audio files in .wav format. The performance of the proposed approach is evaluated for 10 among 128 audio signals using the metrics such as Precision, NMI, F-Score and Entropy. They are shown in Table 1.

1) **Precision**: Precision is defined as the ratio of the number of correct results to the number of predicted results.

$$Precision = \frac{TP}{TP + FP} \qquad (7)$$

2) **Normalized Mutual Information (NMI)**: NMI is calculated as follow:

$$NMI = \sum_{m,n} p(m, n) \ln \frac{p(m, n)}{p(m)p(n)} \qquad (8)$$

TABLE 1: Analysis of Precision, NMI, F-score and Entropy.

Precision	NMI	F-Score	Entropy
0.7043	0.4198	0.7048	1.6745
0.7108	0.4069	0.7091	1.67
0.7131	0.4023	0.7094	1.673
0.7115	0.4055	0.7085	1.66
0.7093	0.4099	0.7083	1.6745
0.7066	0.4153	0.7056	1.67
0.7117	0.4051	0.7092	1.6745
0.7058	0.4169	0.705	1.66
0.7074	0.4137	0.7061	1.675
0.7123	0.4039	0.7088	1.6745

where p(m) and p(n) are the marginal probabilities and p(m,n) is the joint probability.

3) **F-Score**: F-score is the weighted average of the precision and recall values. It is calculated using below formula.

$$Recall = \frac{TP}{(TP + FN)} \qquad (9)$$

$$F - Score = \frac{2 * Recall * Precision}{Recall + Precision} \qquad (10)$$

4) **Entropy**: The entropy is the information content calculated using the below formula.

$$H(X) = \sum_{j} P(x_j)I(x_j) \qquad (11)$$

Fig.17 below shows the graph comparing Precision, NMI, F-Score and Entropy values of the proposed approach. We achieved average precision value of 0.70928,
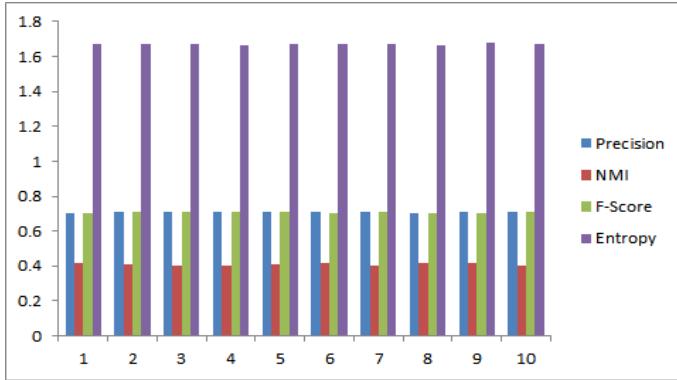

Fig. 17: Comparative Analysis of Precision, NMI, F-Score and Entropy of Proposed Approach and Existing Features

average NMI value 0.40993, average F-Score value 0.70748 and average entropy value of 1.6706 which are higher than that of existing features. Higher values of precision, NMI, F-score and entropy indicate the improved efficiency for segmentation and better classification results.

5) **ROC Plot for Classification**: A receiver operating characteristic curve, i.e. ROC curve, is a graphical plot created by plotting the true positive rate (TPR) against the false positive rate (FPR) at various threshold settings. Fig.18 is the ROC curve that shows the performance

of the PNN classifier for classification of audio signal. From the figure, it is found that the proposed approach achieves high classification result.
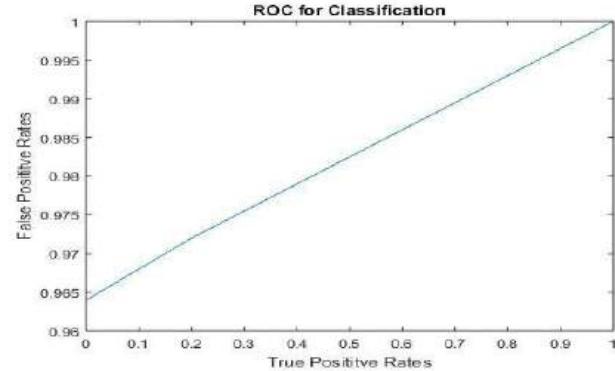
Fig. 18: ROC for Classification

6) **FRR Graph**: The FRR is defined as the ratio of the number of false rejections to the number of classified signals. Fig.19 shows relationship of FRR with respect to the number of classes.
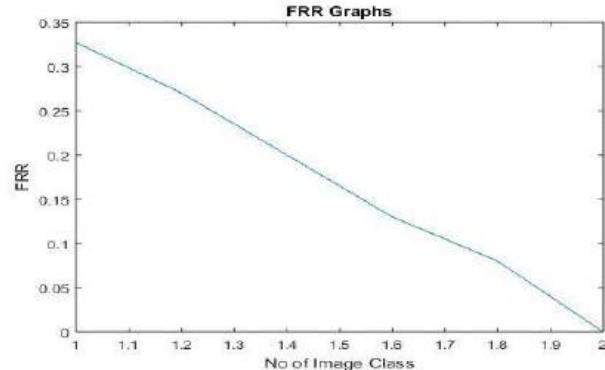
Fig. 19: FRR Graph

7) **Sensitivity**: It is calculated using the formula as below.

$$Sensitivity(\%) = \frac{TP}{TP + FN} * 100 \qquad (12)$$

8) **Specificity**: It is found by the formula as below.

$$Specificity(\%) = \frac{TN}{TN + FP} * 100 \qquad (13)$$

9) **Accuracy**: It is defined as the ratio of number of correctly classified results to the total number of classified results.

Fig.20 shows the comparative analysis of average values sensitivity, specificity and accuracy for PNN classifier.

V. CONCLUSION

In this paper, we have presented an approach for classification of pre-processed audio signals. We have computed the classification accuracy using PNN classifier and found that PNN achieves better classification accuracy of 99.35%.
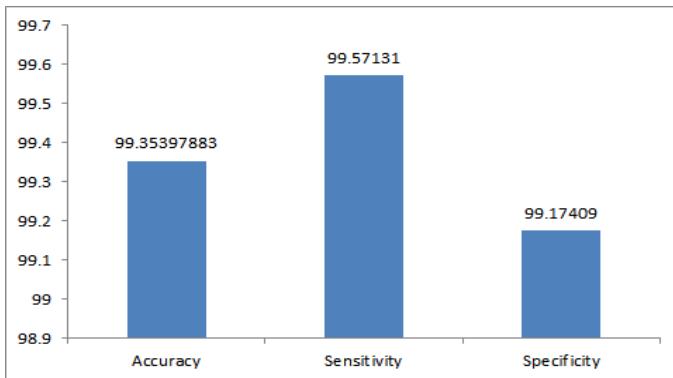
Fig. 20: Plot for Sensitivity, Specificity and Accuracy

The audio signal is classified as Music signal or Speech signal. PNN classifier obtain the results in on an average of 4.48 minutes. Also we have computed performance measures like Precision, NMI, F-Score, Entropy, Sensitivity, Specificity and found that values for these metric measures in proposed approach is better.

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Textile Inventory Stimulator

Priyanka Silveri
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Prabhakar Yadav
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Aditya Shanbhag
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Nilesh Sinalkar
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Sheetal Ahir
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Trupti Patil
Department of Computer Engineering
Ramrao Adik Institute of Technology
Nerul, Navi Mumbai, India

Abstract—**Textile Industry is one of the leading Industries in the world. This industry was mainly not an organized industry but after liberalization of Indian economy many improvements have occurred. Indian Textile Industry largely depends on the Textile Manufacturing and export. This plays very huge impact on Indian economy.[9] The existing system in Textile is manual system. Everything is done on paper using minimal automated gadgets. The maintenance and management of the business is now a tedious job involving a lot of paper work, manual task which takes a lot time and effort of the organization.In the earlier system there was no security, lack of proper data, lack of variety of patterns and major problem of changing the pattern in the machine. So, Textile Inventory Simulator is software for textile industries, aimed to reduce the workload in the textile industry.The Textile System is designed to allow the industry to keep track of all employee details and to solve the problem of task utilization and frequent patterns.[5]**

I. INTRODUCTION

As Textile Industry is one of leading and large manufacturing company which mostly known for Cloth making Industry. In these section we have mentioned overview and objectives of project[6]. Textile Inventory Simulator is a software for textile industries which aimed to reducing the workload in textile industry.[7]

A. Overview

Indian Textile Industry largely depends upon the Textile Manufacturing and export of it have a major role in the economy of the country.[10]Also, this industry have given many jobs for people and makes employment incredibly.[6] Indian Textile Industry have many segments in it, some of which is listed below [6]:
1. Cotton Textile
2. Silk Textile
3. Woolen Textile
4. Ready made Textile
5. Hand-Crafted Textile
6. Jute and Coir

B. Objective

The main objective is to increase customer support and increase goodwill, to reduce the tedious manual task and to reduce the cost incurred in performing all the transaction manually. The other objective is to automate, to some extent, the business activities flawlessly.[8] The problem of the system is to eliminate the discrepancies of the existing system. Hence the proposed system has the following advantages over the existing system. Reducing error due to human factor as all the major manipulations are carried by the system itself. The proposed system turns out to be cheap compared to the manual system. The activities of various department heads are coordinated at the preparation of reports. It is helpful in developing team work which is very much needed for the success of an organization.While Automating textile process it is easy to retrieve the last year accounts and the calculation for report generation will be easier. Finding a particular voucher or receipt takes a lot of time manually but it was done with in a fraction of seconds. Billing is calculated for each entry using Receipt and Payment details. The time factor increases the efficiency of the proposed system since less amount of time is taken to print the reports and to prepare the final statement.Accuracy, Reliability and Efficiency are greatly improved since the functionality of the proposed system excels the former one.The proposed system handles various requirements of the textile. The administrator of the system has been assigned to make their settings of the system. He also has the right to see the login details.[7]

The textile simulator system will accomplish the following Objectives:
1. The authorized department of the company will be able to log into the application using different log-ins , which will give them access permission.
2. The Accounting Module should be able to handle account department and it should generate necessary reports including GST.
3. It should generate variety of design patterns in available stock or ordered stock.
4. The owner and respective department should be able to know about current status.
5. In case of cancellation of order, process details should be updated in database.
6. By adding the order details, it should predict how much thread and colors will be needed.
7. The main objective is to increase customer support and increase goodwill.

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Process Flow Chart of Textile Manufacturing

Spinning
↓
Weaving
↓
Dyeing +Printing+ Finishing
↓
Garments Manufacturing
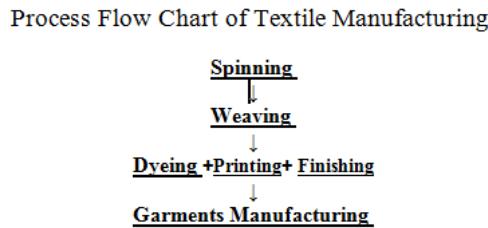
Fig. 1. Processing Model for Textile Industry .

II. RESEARCH PAPER SURVEY

1.Influence of Weave and Weft Characteristics on Tensile Properties of Fabrics[1]

In the research not only the influence of the weft characteristics and weave on breaking strength was analyzed also there was study going on in each part of these components.The strength of elongation and breaking force point is measured before and after the weaving process at different clamping lengths and extension rates. Afterwards these values are analyzed further to get the overall view of the changing characteristics.These are the primary steps in fabric generation.In order to examine the influence of the weft, fabrics of plain weave with different characteristics of the weft were prepared. Furthermore, different weaves were designed, one group with single weft threads and another with doubled (twisted) weft threads. The results of measurements of the yarn showed only a minimal influence of measuring conditions, but according to the expectations, the important influence of the weaving process on the tensile properties of yarns was also noted. In comparison with single threads,the use of doubled threads in the weft caused a general improvement in the breaking force and elongation at break by stretching tests in the warp direction.

2. The Design Alphabet for Textiles as applied Method at the Frontiers of Textile Design Research[2]

For the design of fabrics the development is done by both institutions and industry members.so, there must be proper agreement between both the parties and design vision in order to get the desired result.There must be scheduled communication between skateholders of different field involved.The TDRM textile design research method addresses this kind of framework in order to successful collaboration of practical context.The method consist of four steps,which are crucial to the application of textile design research projects:
1)Design Vision ;
2)Systematic experiments;
3)Design Alphabets for the textile;
4)Design Briefing.

3. Comparative Study on the Properties of Vortex and Ring Spun Yarn and the Properties of Woven Fabrics Containing Those Yarns in Weft[3]

The purpose of the research was to examine the properties of vortex and ring spun yarns and their influence on the properties of woven fabrics when used as weft. Two different mixtures of fibres in different portions and pure cellulose viscose fibres from the same input material were used to produce vortex and ring spun yarn of 16 67 text. The properties of the measured yarns evaluated showed that ring spun yarns were, depending on the blend used, superior in the breaking force up to 30%- and in the elongation at break up to 20%. The same occurred with the properties of woven fabrics in the weft direction, only that the difference was significantly smaller up to 15% breaking force and up to 5% elongation at break. At the same time the abrasion properties of woven fabrics containing vortex yarns in the weft were significantly better than those of full ring spun yarn fabrics.

4. Toyonori Nishimatsu "Automatic Recognition of the Interlacing Pattern of Woven Fabrics"[4]

A neural network and image processing technology are introduced for classifying woven fabric patterns. To determine the one weave repeat of the fabric an auto-correlation function is used.The reflected fabric image is snapped and then digitized by the computer system software.Along with it the learning vector quantization algorithm is used this learning rule is of the artificial neural network and this enables matching of woven fabric type.This can be classified accurately and factors such as yarn spacing , yarn spacing variance and ratio of warp spacing to weft spacing can also be obtained.Fuzzyfication and defuzzyfying is one of the important factors which is used in this system.With the help of information analysis and computer image processing system, the type of fabric woven is categorized.And experimental procedure for the same is described.Different techniques used for the this processing are edge enhancement processing,the smoothing processing ,threshold processing the mosaic averaging and mesh processing.It was determined weather the weft yarn was on the top of woven fabric made of combination of warp and weft yarns.The determination was successful in pain weave fabrics, but in the case of twill weave it was not determined.

III. EXISTING PROJECT COMPARISON

TABLE I.   EXISTING PROJECT OVERVIEW

serial Number	Advantages	Disadvantages
1	It is an automated system	It was a manual system
2	Easy to manage stock	Difficult to manage stock
3	High level security.	No security
4	Saves time and energy.	Consumes lot of time and energy
5	Records are maintained	No records maintained
6	Tasks like fee receipt, attendance management and salary generations are automatically generated	Tasks like fee receipt, attendance management and salary generations are manually carried out.
7	No error in calculations or results.	Low levels of security because of weak algorithms

IV. PROBLEM DEFINITION

The project is intended to increase customer support and increase goodwill, to reduce the tedious manual task and to reduce the cost incurred in performing all the transaction manually. The other objective is to automate, to some extent,the business activities performed in flawlessly. The existing system does not have flaws but it is very tedious and complex for all workers to work in because of all paper work calculation for fabric requirement and also paper work for manager to handle all of their employees. Thus this system gives solution to all such problem faced in the Textile Industry.

V. PROPOSED METHODOLOGY

The system is based on ERP[14].ERP is an Enterprise resource planning.ERP software combines various functions into one complete system to streamline processes and information across the entire organization. The central feature of all ERP systems is a shared database that supports multiple functions used by different business units.Different business activities in an organization such as to collect ,store , manage and interpret is performed and interpret from these activities is done in ERP .Latest updated view of the business system is gathered from database management system which gives latest updated data.Various technologies and platforms are combined with the help of this software. This is the most useful methodology for making the system with too many internal components and it has proved to be working in many industrial applications which were distributive in nature.

Fig. 2. Data Flow Diagram shows the overall flow of proposed systems. These systems have following entities along with its database. This gives an idea of how modules are interconnected with each other.

To know the best patterns and to keep the products quality updated with the need of market APRIORI algorithm has been

used . This Apriori algorithm is used on different datasets which are different attributes of the database and using association learning rule over this transactional datasets.It proceeds by searching the most repeating data which appear in the database thus using this algorithm it gives more output for these data in that datasets.[13]Also this is kind of machine learning which gives currently what is general trend in database thus used in business analysis.[11] The algorithm uses different data structure techniques which maybe breath-first-search and it can be Hash and tree data structures to count candidate in the list correctly.The one with less count is pruned by the system.Thus overall procedure is to get the frequent data in the set and using transactional database determine most frequent candidate. It is common in association rule mining, for instance given a set of item sets retail transaction,item purchased this algorithm is used to find subsets which is present at least C number of times.Apriori uses bottom up approach,where frequent subsets are extended one item at a time, and groups of candidates are tested with the data.Then algorithm terminates when no further successful extensions are found.[13] With the help of this algorithm in textile industry there is no need to monitor the system closely by the workers instead the next instruction required to the machines for the manufacturing of the fabric will be predicted by this and output of this algorithm will provide the input to the machine for further production.

```
procedure Apriori (T, minSupport)
{
//T is the database and minSupport is the minimum support
L1= frequent items;
for (k= 2; Lkt-1 !=; k++)
{
Ck= candidates generated from Lkt-1 //that iscartesian product
Lkt-1 x Lkt-1 and eliminating any k-1 size
itemset that is not
//frequent
for each transaction t in database do
increment the count of all candidates in Ck that are contained
in t
Lkt = candidates in Ckt with minSupport
//end for each
}//end for
return Lkt;
}
```

A. Hardware Software Requirement

The Proposed system has been entirely developed using Visual Studio C Sharp as front-end and MS SQL Server as back-end .

TABLE II.   HARDWARE REQUIREMENT

Operating System	Microsoft Windows 7
Front-end	Visual Studio(Enterprise C)
Back-end	MS SQL server

TABLE III.   SOFTWARE REQUIREMENT

Processor	Intel Pentium 4
Mother Board	Intel Via Chip set
Memory (RAM)	128 MB RAM
Hard Disk Space	40 GB

VI. DESIGN OF SYSTEM

The System Design includes a high-level description of why the System is required and it contains detailed descriptions of the architecture and system components.

Using Diagrams, system requirements can be easily conveyed. There are different kind of diagrams which consist of different structure and components.
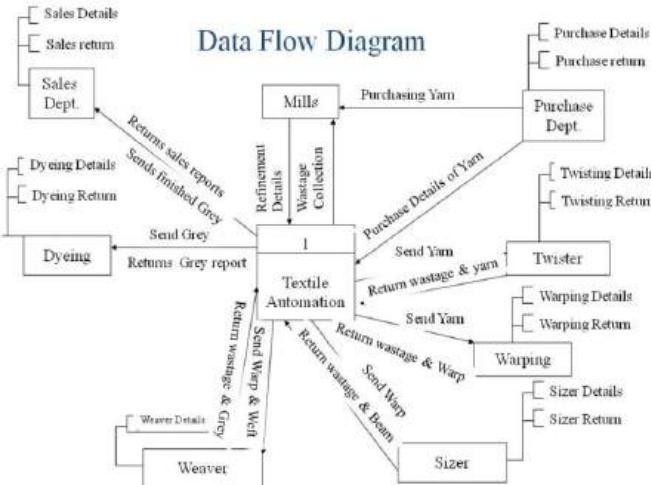

Fig. 3. Data Flow Diagram shows the overall flow of proposed systems. These systems have following entities along with its database. This gives an idea of how modules are interconnected with each other.
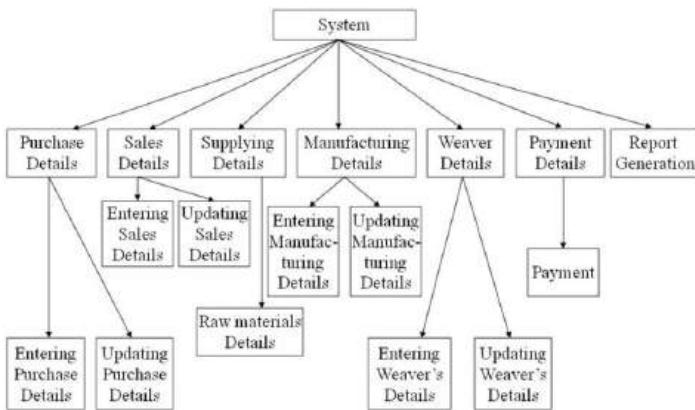
Fig. 4. Structural architecture Diagram showing all the important modules to be implemented by our system for improvement in the textile industry management and its business handling

VII. EXPERIMENT DETAILS

Some details about the software is explained with the help of snapshot of the software.This software is created in Visual Studio using C-Sharp programming.Its back-end is designed and developed in SQL server.
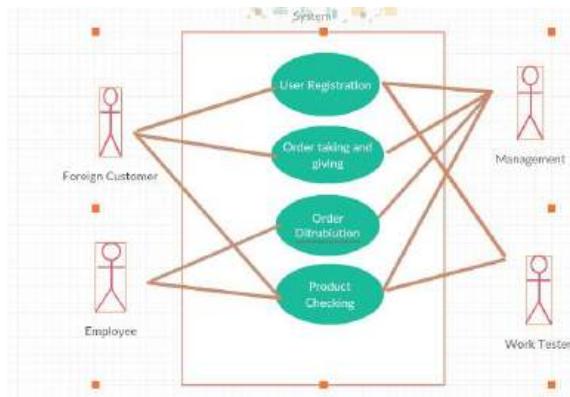
Fig. 5. UML diagram shows basic flow of employee and management of project. In System, there are some activities are mentioned which are takes place in project.The management department will have control over all process.

Fig. 6. It is the Master Page which gives user different tasks provided by the software.It includes different option such as handling account,generating bills,creating design etc.
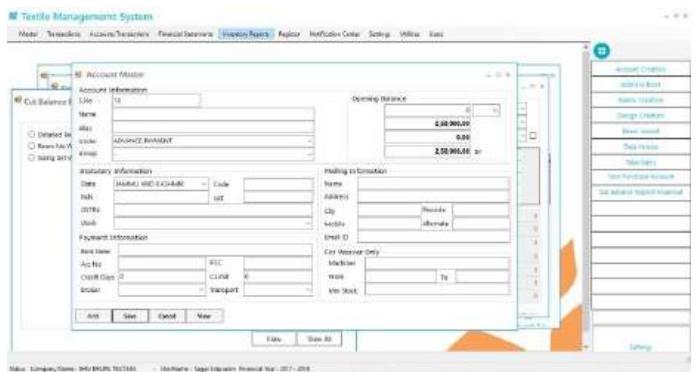
Fig. 7. This page in the software provides handling account, storing information of the customers and details of customers purchase.
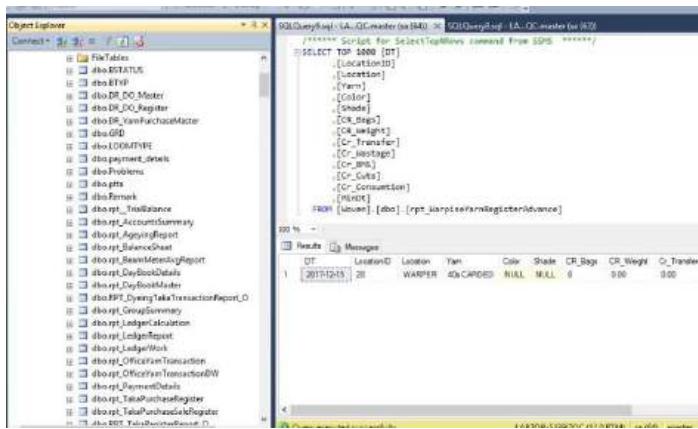
Fig. 8. Different tables for the storage purpose designed in SQL server.Using this databases Apriori Algorithm will work and predict pattern and also predict stocks required to design it.

VIII. CONCLUSION

Textile Industry is a vital part of society. Textile software can be hugely beneficial to all workers working in the this field. The system which is currently being used in industries is manual system. Also, it consumes a lot of time.

The system which is developed will be a fully automated system. Different patterns will be easily available for the users without any effort and calculation for pattern designing. In the earlier systems, the reports were generated on a paper for different orders which is difficult to handle and store.

In this system, the reports will be generated automatically based on orders and will be send to the respective customers. At the end of implementation, the software will overcome the problem of task utilization, frequent patterns where one can choose different pattern designs. Also, the system will reduce the manual paper work completely and will be able to predict required materials like yarn, etc. on basis of order which are important to proceed further process in textile. The system will also be able to generate reports with GST. The system will accomplish mentioned objectives.

IX. FUTUREWORK

The current system is able to predict and generate patterns but in future same process can be extended in 3D way so that owner can classify the cloth that becomes easy. Using IoT,the system can directly automate the design to machine which are actually expensive but it makes software more flexible and efficient.[12]

X. ACKNOWLEDGEMENT

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Smart Electricity Bill Generation

Sheetal Sable, Khushaboo Nemade, Pooja Patil, Jyoti Patil, Trupti Patil
sheetalsable16@gmail.com, khushaboo77nemade@gmail.com, poojapatil2783@gmail.com,
jyotipatil8088@gmail.com, truptipatil111.gmail.com
Ramrao Adik Institute of Technology, Nerul, Navi Mumbai, India

Abstract—To calculate the consumption of electricity, the electricity meters need to be manually read by people in order to provide periodic bills. Now in present scenario, the energy provider employee has to take the meter reading in terms of snapshot of meter and submit these photos to the main office which are used to read the readings and bill is generated accordingly, but in this whole process due to human intervention accuracy is not achieved. To reduce these drawbacks, Smart Electricity Bill Generator concept is developed in which automatic collection of readings, transmission and sending bill to customer is done easily. The Smart Electricity Bill Generation concept minimizes the human intervention in the billing process. Reducing human intervention results in reduction of manual errors and maximizing the accuracy in the process. This technology increases the efficiency, effectiveness, reliability by mainly saving utility providers expense of periodic trips to each physical location to read the meter thereby reducing human interventions in billing system. It is ecofriendly system as it eliminates the use of paper for bill. The concept of IoT increases the efficiency as it is used to send the digital meter readings to the MSEB office conveniently.

Keywords— *Digital meter, Android processor, Relay, GSM module, IoT.*

I. INTRODUCTION

Meters are used to record the consumption of various energy sources. Digital meters are introduced to simplify the process. Nowadays in every sector, there are numerous customers which use the energy resources but they are not satisfied with the services provided by power distribution companies. Same is the case with electricity. Also electricity authority & the government realizes problems occurring in the existing transmission network, such as increase in cost due to poor operational efficiency, environmental impacts and an ongoing demand for energy. In the current scenario, a person from M.S.E.B has to visit every house and take the photograph of digital meter due to which lot of inconsistencies may occur. Visiting every house or every society and submitting the photographs to the main office is a time consuming and tedious job. Also the picture may not be clear due to which digits are not visible. Sometime the digital meter may be placed in an area which is not easily accessible and

may require revisits. This process includes a lot of human intervention therefore manual mistakes may take place. Hence Smart Electricity Bill Generation concept is introduced.

II. LITERATURE SURVEY

A literature review is a text of a scholarly paper, which includes the current knowledge including any substantial findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources, and do not report new or original experimental work. Following papers are analyzed to obtain information about automation of billing system.

A. Research paper surveys

Literature survey has been done according to the important aspects of this project, which covers the basic building blocks of project.

Automation of Electricity Billing Process [1]:

In the paper, Automatic Meter Reading (AMR) system is developed that uses a Traditional meter, Zig-Bee modules, and a serial camera unit. This camera will take the photo of meter reading and transmit it to the server PC through Zig-Bee, where that image undergoes segmentation, recognition process and reading is get separated which is further used for preparing bill. ZigBee is the most popular industry wireless mesh networking standard for connecting sensors, actuators, and instrumentation and control systems. The objective of developing this wireless energy meter reading system is not only to have high accuracy over a wide current dynamic range, better reliability and robustness but also to face the weakening competence in meter reading in localities such as increasingly over crowded big cities, overpopulated rural, sub urban regions and remote or snowy districts. The disadvantage of this system is that the images captured vary in

day and night time and also image degradation takes places.

Smart and Intelligent GSM based meter reading system [2]:

This system introduces AMR with GSM. The procedures of sending the bills to customer are very laborious and cumbersome, to eliminate this problem a GSM based AMR system is developed .Automatic Meter Reading system (AMR) continuously monitors the energy meter and sends data on request of service provider through SMS. It reduces human labor. The data is stored in the database which is situated at the electricity board station. The electricity bill is sent to the customer through message service, mail, or by post card. The energy provider sends electricity bill. The customers can pay bill online by credit or debit card because of this system. GSM based energy meter or AMR provide tempering alert, auto disconnect feature, power cut facility. Advantages of AMR system are that it provides low infrastructure cost, low operating cost and high data security.

An Approach to secure Mobile Agents in Automatic Meter Reading [3]:

Mobile agent is a suitable paradigm to collect information from multiple sites in a distributed environment. Mobile agents are used for Automatic Meter Reading (AMR) and to measure power quality information at each energy meter. Since meter contains embedded system, so the choice of agent platform for such an application is very important. It proposes a method that reduces the total security computation cost which is incurred in AMR process. In this system the external mobile agent need not visit as it is replaced by the local mobile agent. The security manager receives queries from the local mobile agent. This system reduces the security computation cost, compared to other methods.

GSM based automatic energy meter reading system with instant billing [4]:

A wireless GSM and web interface is developed that automates and manages the billing system. Remote access of energy meter is enabled. Traditional meter reading methods are changed. To get remote access the wireless GSM is created. The system needs a PC with a GSM receiver, which contains the database. This acts as a billing point, which periodically receives live meter reading from the GSM enabled

energy meter and the data is updated in a central database.

III. PROPOSED APPROACH FRAMEWORK AND DESIGN

A. Problem Definition

The system can be formulated as a digital electricity billing system. It contains an android processor connected to it to fetch the number of units consumed from the digital electricity meter and send it to the server where the electricity bill will be generated for user. The bill generated will be sent through SMS to concerned person's mobile number. The Relay connected between the meter and the processor will controls the electricity supply based on payment of bill within due date. The system aims at reducing the human intervention and automates the process.

B. Proposed Architecture
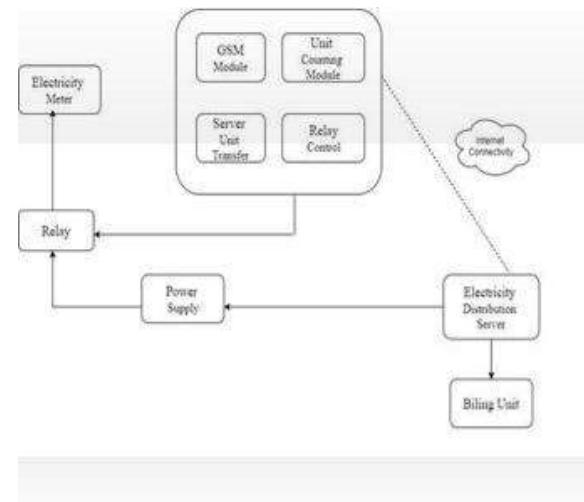
Fig 1. Block diagram

The proposed system consists of 4 different modules. These modules are as follows:

(1) **Digital meter** - Digital meters are devices that are installed at customers' premises to measure electric energy delivered to their customers for billing purposes. Energy

consumed is calculated and displayed digitally using digital meters and are used to display the units consumed digitally. In the proposed system the Digital meter comprises of the following components: Microcontroller, LED display, bulb.

- Microcontroller - The microcontroller used is 8051. The functioning is done by the microcontroller.
- LED display - The LED is 16*2 matrix. The LED displays the meter reading and the bill amount.
- Bulb - It is used for consumption of power.

(2)Android Processor- The proposed system comprised of an android processor which will be acting as communication Medium between the digital meter and the electricity distribution server. There are 4 modules in android processor:

GSM Module –It is used to establish a connection between server and processor. Internet will be used as communication technology for communicating the units consumed from the meter to the electricity distribution server.

Unit counting module –It is used to count the units from the digital meter. As the numbers of units vary, the processor will capture the units' value and send it to the server for calculating the electricity bill of the system.

Relay control module It is used to control on/off of the relay. If the bill is not paid within the due date, the server will send the relay controlling command to the processor and the processor will control the supply of electricity to house using relay switch.

Server unit transfer –used to transfer the count of the units to the server.

(3)Relay It is an electrically operated switch which will on/off the electric supply. Relays are switches, which are used to control the circuits by employing a low power signal. The relays comprise of a magnet, a coil, a series of electrical contacts and

a spring. There is no electrical connection between the two circuits within the relay, because that is connected through the magnetic connection. Relays are used to perform logical operations .If the bill is not paid within the due date, the server will send the relay controlling command to the processor and the processor will control the supply of electricity to house using relay switch.

(4) Server- The server will contain the database. It is used to store the data in a centralized manner. It receives the unit count from the android processor via the GSM module using internet connectivity (IOT technology) and generates the bill. Once the bill is generated, the bill will be mailed or and SMS will be sent to the registered users contact number to avoid paper usage. Along with the electricity bill, the due date will also be provided for assumed 10 days after the bill is generated and generates the bill amount and sends it to the user via messages.

These modules are connected to each other by three main connections namely Bluetooth, Wi-Fi, GSM. The Bluetooth module is used for connectivity between Android Procesor and Digital meter. TheWi-Fi module connects Server and Android Processor. The GSM module is required to send message to the consumers.

OBJECTIVES OF THE PROPOSED WORK ARE:

- To get knowledge of different energy meter reading
- systems.

- To study and understand different techniques and the models used by researchers for energy meter reading
- systems.

- Taking necessary actions in order to make the solution reliable and robust.

- Human intervention must be reduced.

FEATURES AND CHARACTERISTICS

- Less man power: The proposed system has wider scope in the current era of automation as the cost spent on human resource will be saved.
- Go Green Policy: The proposed system considers the environment friendly architecture which reduces the usage of papers.
- Eliminate errors: The electricity bill is system generated, the human errors in bill amount calculation is reduced.
- Centralized Data Storage: Due to the proposed system all the data of users and their digital meters is stored in centralized database server.
- SMS service: In the proposed system, the electricity bill will be sent through SMS to the users' registered mobile number.
- Transparency in billing: The proposed system will dilute the proportion of disputers occurring every time due to incorrect billing unit measurements.
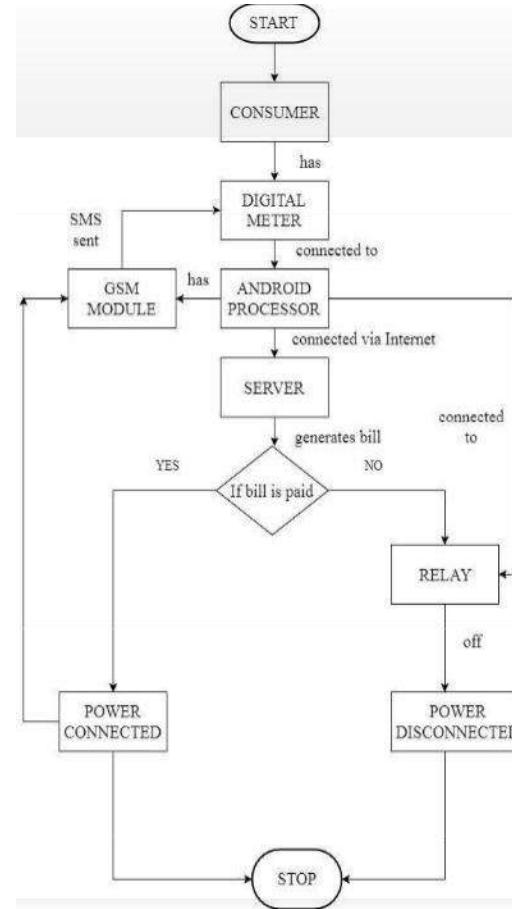

Fig 3.Flowchart
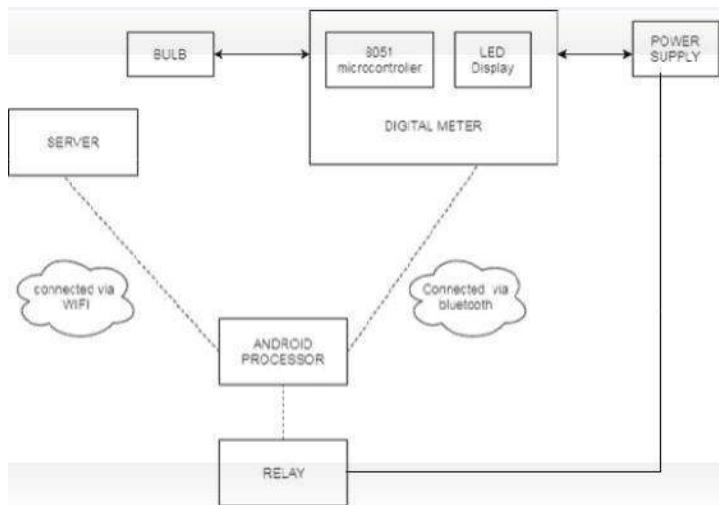
Fig 2.Diagrammatic reperesentation of Implementation

IV.   WORK DONE

Here we are discussing the practical environment and its related scenarios.

Hardware and Software Configuration

TABLE I

HARDWARE REQUIREMENT

Processor	Android Processor(Android Mobile)
Device	Relay,HC05 Bluetooth Module, Server(Laptop or PC for sever Software Operations)
Microcontroller	8051 microcontroller

TABLE II

SOFTWARE REQUIREMENTS

Operating System	Windows XP and above
	Eclipse JUNO with ADT
Front End	Java JDK 1.7 onwards
Back End	Wamp Server
Tools Used	MySQL server 5.5 and above

IMPLEMENTATION

There are 3 major modules in the proposed system:
1. User Module
2 Hardware module interfaced with android device
3. Server Module

Module 1: Server side Database
The server side database is used for storing the consumer details. The admin will be able to edit or delete the details of the consumer whereas the consumer can only view it by logging it.
The server side database is built using Wamp server and MySQL 5.5.
When the user is registered from server side, those user credentials are registered in the hardware device i.e. android processor which is controlling the working of the hardware.
These values are immediately sent to server which is developed in php and is running on some laptop.
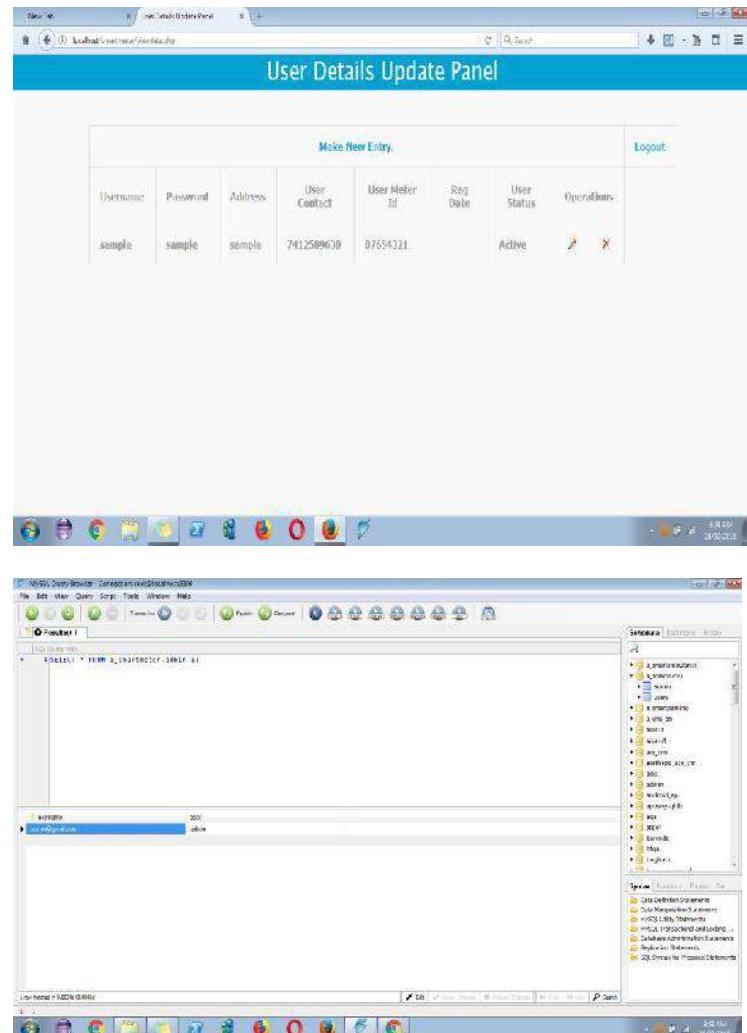
V.   RESULTS

In Smart Electricity Bill Generation system there are mainly three modules , the server module, the android module and the user module. The android device will be placed besides the digital meter and will fetch the readings using bluetooth connectivity. The readings fetched by the android device will then be transmitted to the server. Above figure shows the implementation of the server module. The server module contains the database and has consistency of data There is a sign in page for the admin where in the admin has been given all the privileges to view data of the registered users, remove and update the data. All the admin details i.e username and password will also me stored in the database. The server module has been designed in such a way that it provides consistency, flexibility, security, accessibility.

VI.   ANALYSIS

According to the papers studied and presented earlier below comparisons can be noticed:
The existing systems do not try to make the system completely digital. The existing systems do not give the power of automation to the complete process. The existing system do not have the provision to cut the electricity from the distribution centre itself, when the due date of paying the bills is crossed by customers. The existing systems do not have the provision of sending the notification to customers about their bill usage and due date prior to the date of paying the bills. We can use cheaper processors for each society and apartment in future and thereby reduce the cost.

CONCLUSION

In Smart Electricity Bill Generation project with the help IoT it is possible to avoid human intervention by reducing the visit and revisit of a person for recording the readings of each house. The consumer need not stand and wait in long queues of the Electricity Board Office to correct the faulty bill. This is avoided by taking digital unit count from the meter reading with unit storage of meter and sending these readings to server wirelessly, keeping the database updated. This is a real time system which enables to take accurate readings of a digital meter in a very less time. Also as customer is getting message of bill, printing can be avoided to reduce paper work. It is eco friendly system which eliminates the use of paper for bill.

FUTURE WORK

The proposed system now used Bluetooth for communicating from digital meter to the android processor.Later when the system is to be updated and supposed to be used in the real time environment, the system of Bluetooth communication can be eradicated and internal direct communication from Wi-Fi module to the server can be achieved.

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Comparative Study of UP Growth and Improved UP Growth

Aishwarya Walawalkar
Computer Engineering Department
Ramrao Adik Institute of Tech
Navi Mumbai, India
aishwaryawalawalkar@gmail.com

Apeksha Shetty
Computer Engineering Department
Ramrao Adik Institute of Tech
Navi Mumbai, India
apeksha.shetty08@gmail.com

Madhura Bhope
Computer Engineering Department
Ramrao Adik Institute of Tech
Navi Mumbai, India
mhbhope@gmail.com

Samruddhi Suryavanshi
Computer Engineering Department
Ramrao Adik Institute of Tech
Navi Mumbai, India
mans2346@gmail.com

Vimla Jethani
Computer Engineering Department
Ramrao Adik Institute of Tech
Navi Mumbai, India
vimlajethani@gmail.com

Abstract—Data mining is the process of examining large datasets in order to generate new information by discovering patterns in data set. Previous approaches of data mining such as Apriori algorithm faced problems such as multiple scanning of large datasets and excessive memory usage. Therefore, to avoid such problems UP growth and Improved UP growth algorithm were introduced which includes strategy of generation of enumeration trees using DGU, DGN. Subsequently Utility Pattern Growth and Improved Utility Pattern Growth, are considered as effective calculations for removing high utility itemsets. Here, the data of high utility itemsets is kept up in an efficient information structure named Utility Pattern Tree from which the hopeful itemsets can be produced without requiring various scans of datasets. There are several data mining techniques like association, classification, construction of decision tree for extracting sequential patterns but use of DGU and DGN strategies gives an advantage of obtaining high utility of itemset i.e. the usage of product above user specified threshold value, with minimum number of scans. Hence, it can fulfill the need of the user who is interested about finding the highly profitable itemsets and about the utilities of his products or items.

Keywords— Apriori, Utility Pattern, Mining, UP Growth, Improved UP Growth.

I. INTRODUCTION

Data mining is the process of examining large datasets in order to generate new information by discovering patterns in data set. Previous approaches of data mining such as Apriori algorithm faced problems such as multiple scanning of large datasets and excessive memory usage. Therefore, to avoid such problems UP growth and Improved UP growth algorithm were introduced which includes strategy of generation of enumeration trees using DGU, DGN. Subsequently Utility Pattern Growth and Improved Utility Pattern Growth are considered as effective calculations for removing high utility itemsets. Here,

the data of high utility itemsets is kept up in an efficient information structure named Utility Pattern Tree from which the hopeful itemsets can be produced without requiring various scans of datasets.

II. LITERATURE SURVEY

UP-Growth an Efficient Algorithm for High Utility Itemset Mining given by Tseng1, Wu1, Shie1, and Yu2 [4].
They have introduced a data structure named UP-Tree for maintaining the detailed understanding of the concept high utility itemset. From this, the potential high utility itemset can be generated with no effort from the UP-Tree which only requires two scans of the entire large dataset.

An Improved UP-Growth High Utility Itemset Mining given by O Shrinivasa and Krishna Prasad [6].
The updated calculation i.e. Improved UP-Growth calculation expect to viably recognizing high utility itemsets for better results.

R.Agrawal and R.Srikant, "Fast Algorithms for Mining Association Rules," [1].
They have discussed the very well-known Apriori algorithm, which is the traditional way for determining mining association rules from large datasets efficiently. It's a breadth-first algorithm for mining frequent patterns, which scans the disk-resident datasets as many times as the maximum length of frequent patterns.

R. Bayardo and R. Agrawal, "Mining the most interesting rules,"
They first proposed the concept of weighted items and weighted association rules. However, the overall frame of weighted rules present do not have Apriori properties, additions in the performance of mining is not observed.

R.Chan, Q.Yang and Y.Shen, "Mining high utility itemsets,".

IHUP (Improved High Utility Pattern), a tree based calculation which makes utilization of tree based structure to keep up the data about itemsets including thing name,respective utility esteems alongside the support count. High Utility Pattern calculation has following steps: (i) Construction of tree, (ii) Formation of high utilized itemsets. In step (i), items in transactions are rearranged in a particular way, for eg. according to support order or weighted utility descending order. All the changes made to the Transactions are added to the Tree. Using the threshold value, items which does not satisfy threshold value is removed, hence the search is reduced to some extent

III. UP GROWTH

We describe the details of UP-Growth for efficiently generating PHUIs(Potentially high utility itemset) from the global UP-Tree with two methods, namely DLU (Discarding local unpromising item) and DLN (Decreasing local node utilities).By using these two methods, the unpromising items having minimum utility are discarded from path utility at the time of the construction of a local UP-Tree.

Subroutine: Utility Pattern-Growth (UPx, HTx, Ix)
Input: A UP-Tree UPx, a header table HTx, for UPx and an itemset Ix.
Output: All PHUIs in UPx.
Procedure: UP-Growth (UPx, HTx, Ix)

i. For each entry ai in HTx do
ii. Generate a PHUI Y = Ix∏ai;
iii. The estimate utility of Y is set as ai's utility value in Hx;
iv. Construction of Y's conditional pattern base (Y-CPB).
v. From Y-CPB into HTy, add local promising items.
vi. DLU method is applied which reduces path utilities of the paths.
vii. Add paths into UPy after applying DLN strategy;
viii. If UPy≠ null then call UP-Growth (UPy, HTy, Y);
ix. End for

IV. IMPROVED UP GROWTH

In spite of the fact that DGU and DGN procedures decrease the quantity of items in Global UP-Tree. Be that as it may, they can't be utilized to develop the Local UP-Tree. DLU system (Discarding local unpromising items) performs by disposing of utilities of low utility item from path utility and DLN technique (Discarding local node utilities)

which disposes of item utilities of relative nodes at the time of the local UP-Tree development. Still the calculation faces some execution related issues in local UP-Tree. To defeat this issue of execution, maximum transaction weight utilizations (MTWU) are figured from datasets .And product of minimum_support as a user specified threshold value [5] is evaluated. Execution will be expanded after this alteration.

Input: Transaction datasets D and user specified threshold.
Output: high utility item sets.
Start
i. Scan datasets of transactions Td ∈ D
ii. In D, Identification of transaction utility of Td and WU of itemset (Ix) is examined.
iii.Calculate minimum_support= max.weighted.utility * user specified threshold.
iv. If WU(Ix) ≤ minimum_support then eliminate Items from transaction datasets
v. Otherwise add into header table HTx and arrange the sets in the descending order.
vi. Repeat step 4 & 5 until end of the D.
vii. Insert Td into global UP-Tree
viii. Applying DGU and DGN methods on tree will eliminate the unpromising items from global tree.
ix. Again create a UP-Tree
x. For each item ai in HTx do
xi. Generate a PHUI Y= Ix U ai
xii. Estimate utility of Y as ai 's utility value in HTx
xiii. From Y-CPB into HTy, add local promising items
xiv. Apply DLU to path utilities of the paths
xv. Add paths into Td after applying DLN strategy;
xvi. If Td ≠ null then call for loop
End for
End

Let I be the universe of items. Let D be a datasets of transactions (t1, t2, t3,..tn) where each transaction ti belongs to I. Each item in a transaction is assigned a non-zero share. Each distinct item has a profit independent of any transaction, given by an External Utility Table (XUT). The goal is to find all high utilized patterns.

Table 4.1 Transaction Table

TID	Items						
	a	b	c	d	e	f	g
T1	1		1		1		
T2	6	2	2			5	
T3	1	1	1	2	6		5

T4	3	1		4	3	
T5	2	1		2		2

Table 4.2 External Utility Table(XUT)

Item	Price
A	1
B	3
C	5
D	2
E	2
F	2
G	1

Consider the data of a supermarket. Table 4.1 lists the quantity (share) of each product (item) in each shopping transaction where I {a, b, c, d, e, f, g} and D {1, t2, t3, t4, t5}, and Table 4.2 lists the price (weight) of each product. For transaction t2 = {a, b, c, f}, we have $iu(a, t2)= 6$, $iu(b,t2)= 2$, $iu(c,t2)= 2$, $iu(f,t2)= 5$, $eu(a)= 1$, $eu(b)= 3$, $eu(c)= 5$, and $eu(f)= 1$. Here, $u(i, t)$ is the product of $iu(i, t)$ and $eu(i)$. Thus, $u(a, t2)= 6$, $u(b,t2)= 6$, $u(c,t2)= 10$, $u(f,t2)= 5$, and so on.

V. COMPARISON BETWEEN UP GROWTH AND IMPROVED UP GROWTH

Parameters	UP- Growth	Improved UP-Growth
Method	1.Construction of Utility tree 2.Generate Potential Utility Items. 3. Determine the high utilized data items.	1.Takingthreshold value into consideration, highly utilized transactions are computed. 2.Strategies applied 3.Tree constructed.

Strategy Used	Both DGU strategy and DGN strategy.	DLU strategy and DLN strategy.
Construction of trees	Global Tree	Global and also Local tree.
Time	More	Less

CONCLUSION

The algorithm reviewed in this paper shows that the method for getting all the transaction itemsets and calculating the High Utility pattern sets is used. This includes the use of enumeration tree and the various algorithms which helps us in successfully calculating the promising items of the transaction. The motivational research and modified existing technique is using Enumeration tree, UP growth algorithm, and working on the strategies such as DGU, DGN, etc. A UP- growth based approach eliminates the unpromising items and keeps the most efficient promising items which is obtained using one phase approach. From the experimental results, it is observed that proposed method has better accuracy than the Previous Apriori Approach. UP-Growth and Improved UP-Growth gives us the efficient and fast way to calculate and construct trees and high utility itemsets from large datasets. Different parameters has been discussed which are required for these algorithms to execute. A Comparative study shows us the advantages of different methods and techniques used by these algorithms.

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Hyperdroid

Virtual Smartphone over Cloud

Prasanna Shete[1], Raj J. Poladia[1], Nikhil M. Patel[1], Archish Thakkar[1], Ankita Darekar[2]

Department of Computer Engineering, K. J. Somaiya College of Engineering, Vidya Nagar, Vidyavihar, Mumbai 400 077, India

prasannashete@somaiya.edu, raj.poladia@somaiya.edu, nikhil.mp@somaiya.edu, archish.t@somaiya.edu, ankita.darekar@somaiya.edu

Abstract—In this paper we propose a solution to address the goal of experiencing power of cloud in palm of our hand. Proposed solution mitigates various issues persisting with smartphones. Shifting of computations to the Virtual Machines (VMs) in the cloud has resulted in drastic improvement of computational power of smartphones and a positive impact on battery life is observed. Proposed solution also virtually mitigates the issue of limited storage capacity of smartphone. Studying previous research and their limitation the proposed system is implemented, the architecture in Virtual Smartphone over IP [1] is modified to overcome the limitations of previous solutions. Performance of the system is quantified with the help of a specially designed benchmarking algorithm. Comparative study of detailed benchmark scores of several smartphone models and system validates superiority of the system in terms of computational power.

Keywords—Cloud; Cloud Computing; Android x86; Smartphone; Virtual Machine; Firebase

I. INTRODUCTION

Number of smartphones shipping every year is increasing exponentially, same is the scenario with smartphone applications. Apps are getting smarter and are becoming more resource intensive and power hungry. Smartphones are in the quest of replacing laptops in terms of mobile productivity but are not yet as powerful and as laptops. Although, modern apps are more sophisticated and can perform many productivity tasks but are not yet as capable as laptops. When it comes to proper business applications which requires serious computational power and huge amount of storage capacity smartphones struggle to perform.

To address the issues persisting with smartphones, we propose leveraging processing capabilities of cloud (remote server) for complex computations. Implications of this will be, less load on smartphone's processor which leads to reduction in battery power consumption. Since, the data resides in cloud, smartphone's limited storage capacity will not be an issue anymore. Rest of the paper is organized as follows: Section 2 presents related work. Sections 3 presents the proposed system. Section 4 describes the implementation. Section 5 is all about comparative analysis of benchmark scores of several smartphone models and the system. Finally, section 6 concludes the paper and incorporates future scope.

II. RELATED WORK

Cloud computing is an emerging computing paradigm that is continuously evolving. Invention of virtualization technology enabled us to run multiple virtualization concurrently on same hardware. Parallel and distributed computing technology has overcome the issue of limited hardware resources in terms of computational strength and storage capacity that persists with traditional computing.Oracle Virtual Box is an open – source hypervisor proposed to virtualize android x86 on cloud [3][4].

DroidVNC provides a client-server remote desktop sharing system which uses RFB (Remote Framebuffer) protocol [6][9]. DroidVNC also provides session management capabilities and uses Android VNC Viewer [9] application to gain access of the system and interact with it.Originally VNC was developed to interact with remote desktop with the help of mouse and keyboard. Popularity of touch screens and android lead the development of hybrid version of VNCfor interaction between android with through touch screen.By running a VNCserver command a VNC session is started on the remote machine. VNCviewer command is executed on local machine to view the shared screen.

Virtual Smartphone over IP [1] provides an architecture with inherent sensor support and comprises of Virtual Machine with specific task capability. System navigates to the virtual machine which matches requirements of user's task and then provides access to it. However significant increase in internet traffic may lead to increased response time and depreciate frame rendering speed. ViSP - A Cloud-based Virtual Smartphone Platform provides similar architecture with additional support for ARM Native code [7]. System also acknowledges screen update packets from client to deal with packet generation rate at server side.

Some observed drawbacks of the systems and models presented above are:

- Bottleneck may occur due to limited bandwidth availability with centrally managed data centre.
- Packet hop counts directly proportional to distance between client and Data centre.
- Functioning of entire system depends on Data Centre.

Scalable Cloudlet-based Mobile Computing Model presents integration between Cloudlet concept and the mobile computing [8]. Model considers mobility of devices and measuresto deal with it. Paper proposes two models centralized and distributed for dealing with handovers of mobile devices over the network/s.

Our work closely relates to overcome above-mentioned drawbacks by using a distributed architecture and centralized mobility management of android phones within the network boundary.

III. PROPOSED SYSTEM: HYPERDROID
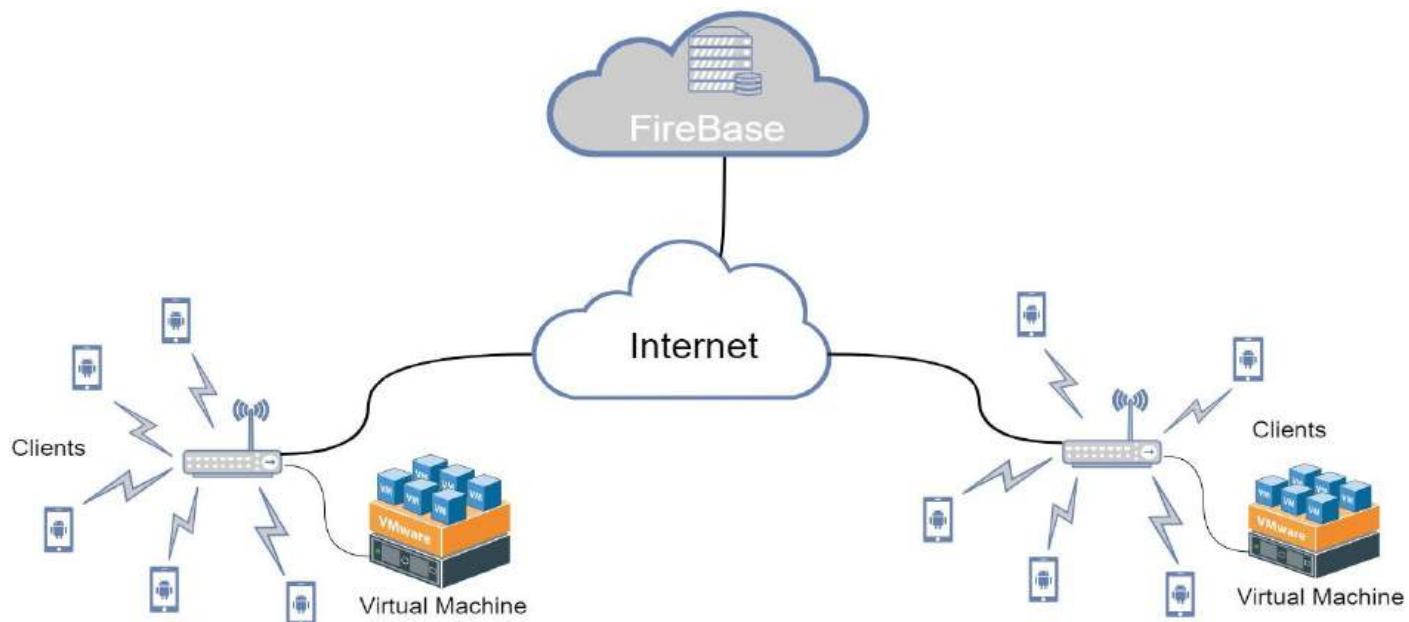
Fig. 1. Architecture of Hyperdroid

The idea of this research is leveraging massive processing power of cloud for complex computations of smartphones. Thus, we propose Hyperdroid – a virtual smartphone environment on cloud. Fig. 1 is the architecture of Hyperdroid. Linux based host machine runs multiple Virtual Machines,each Virtual Machine can only be engaged with a single user at a time. Firebase is used to store user's as well as VM's data. Detailed description of major components of architecture is as follows:

Firebase: Firebase is a mobile and web application development platform owned by Google [5]. Under the hood features of Hyperdroid such as user authentication,

virtual machine availability and dynamic allocation of virtual machines are implemented using firebase. User passwords are first encrypted using AES-128 bit algorithm and then are stored in database. A specially designed background service is responsible for capturing relevant objective information of VM in firebase. Objective information includes VM's status and IP address provided to VM.

Client: Term client means the smartphone which user owns. Hyperdroidclient app needs to be installed on client device to interact with VM. Frames are rendered on client app.

Virtual Machine: Virtual Machines are used to run android x86 images on the server. Each Virtual machine would be allocated to as single user at a time. If another user tries to connect to the engaged VM then the request would get rejected. Once the user logs out of the system VM gets free for another user. Allocation of VM to user is completely dynamic.Oracle Virtual Box is hypervisor used to manage Virtual Machines. Multiple Virtual Machines which may or may not have same specifications can be created and managed [4].

IV. HYPERDROID IMPLEMENTATION

Hyperdroidconsists of four main components viz. VNC Server, Background service, Client app, Benchmarking app.

A. Setting up VNC server.

VNCserver is used to share interactive UI of the system in the cloud. VNCviewer is used to interact with shared UI. VNC Client-Server provides facility to interact with remote system in the cloud. DroidVNC is used as VNCserver in Hyperdroidimplementation [6].

B. Building Background service.

Specially designed background service called "Hyperdroid Background service" is built using Android Studio to handle background task [2][3]. Background service checks the status of Virtual Machine and manages dynamic allocation of Virtual Machines to Users.

C. Building Client application.

Hyperdroid Client application is built using Android Studio to access the system from the user's smartphone [2][3]. User needs to install the application on the smartphone, application provides following functionalities:

- New user Registration: New User can register for service by entering the email ID and password in the app.
- User Login and Logout: User can login using the same email ID and password used during registration. User can logout from the system by pressing logout button in the menu.
- VNC Viewer: User can instantly open the VNC viewer by clicking the Connect button to access the VNC viewer. VNC Viewer is used interact with the system.

D. Building Benchmarking application.

A special benchmarking application called "Hyperdroid Benchmark" is developed using Android Studio to get performance score of various smartphone models andsystem itself[2][3]. Application would execute 4 algorithms. Each algorithm's execution time would be calculated for their respective worst-case input.System evaluation is based on comparative study and analysis of the scores of system and various smartphone models. Fig 2. Shows how the benchmark app (installed on VM)looks on client device. Fig 3. Shows detailed benchmark score of One Plus 3T and Fig 4. Shows detailed benchmark score of VM.


Fig 3.

Fig 4.

Fig 2.
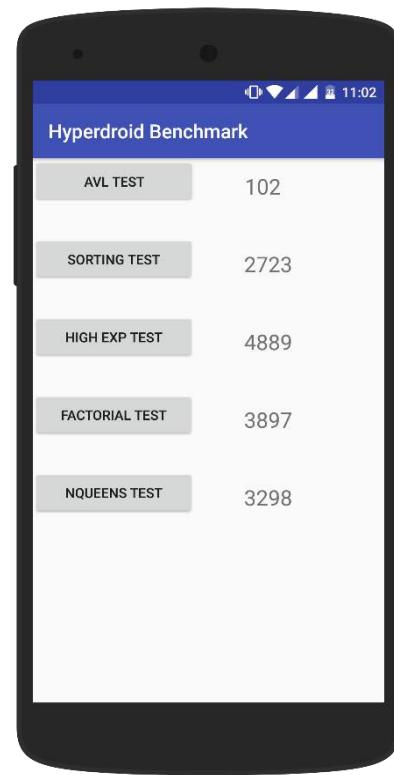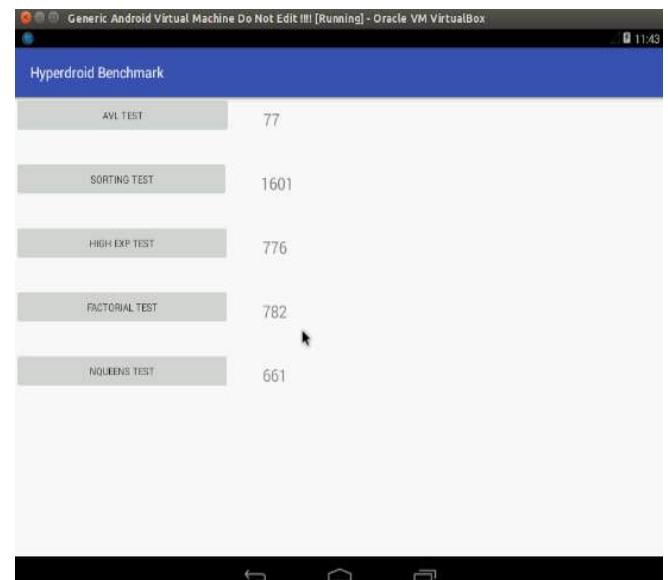
V. EXPERIMENTAL SETUP AND EVALUATION

Hyperdroid uses Oracle Virtual Box hypervisoron host machine running Ubuntu 16.04 Operating System (OS). The incubated environment incorporates two VMs run android open source project 4.4.4 rc4 x86. Each VM was statically allocated 2GB of DDR3 RAM, 2 processor cores

(description in TABLE I) and 16 GB of ROM. Hyperdroid uses bridged interface to interact with external network.

Performance evaluation of Hyperdroidis based on execution time of four algorithms viz. Bubble sort, Large Exponents, High factorials and N queens on worst case input.

Algorithm description:

- Bubble sort: Sorting of 30,000 elements is computed.
- Large Exponents: 10,000 power 10,000 is computed.
- High Factorial: 30,000 factorials is computed.
- N Queens: 10 Queens Problem was computed.

TABLE I. LIST OF DEVICES AND THEIR SPECIFICATIONS

Model	Processor	RAM	ROM	Battery
Virtual Machine	Intel Core i5 - 4200 1.60 GHz Turbo Boost 2.30GHz	2 GB	16 GB	-
Samsung S7 Edge	Exynos 8890 2.3 GHz (Quad Core) + 1.6 GHz (Quad Core)	4 GB	32 GB	3600mAh
One Plus X	Quad-core 2.3 GHz Krait 400	3 GB	16 GB	2525mAh
Redmi Note 3	Hexa-core (4x1.4 GHz Cortex-A53 & 2x1.8 GHz Cortex-A72)	3 GB	32 GB	4050mAh
Moto G4+	Octa-core (4x1.5 GHz Cortex-A53 & 4x1.2 GHz Cortex-A53)	3GB	32GB	3000mAh

Hyperdroid Benchmark app was executed on various smartphone models along with VM. The results were noted down and are represented with the help of graphs for better understanding ofperformance difference.TABLE II shows the details of tests performed. Hyperdroid is superior as compared to various popular smartphone models in terms of computational power.

TABLE II. RESULTS OF TEST.

Smartphone Model	Bubble Sort	Large Exponents	30k Factorial	10 Queens
Virtual Machine	1429	785	639	662
Samsung S7 Edge	2531	3104	1654	1357
One Plus X	2855	4319	3677	3239
Redmi Note 3	10398	2470	2417	2268
Moto G4+	11340	3471	2963	3194

Below are the graphs visualizing computational time of each algorithm on listed smartphone models and VM. X-axis

represents the device and Y-axis represents Response Time in Milliseconds.


Fig 5.

Fig 6.

Fig 7.
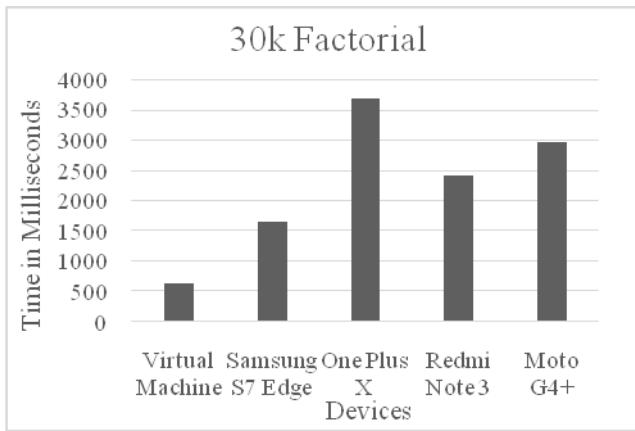
Fig 8.

Above graphs are the proof ofHyperdroid's superiority over popular Smartphone models.

VI. CONCLUSION AND FUTURE SCOPE

This paperproposed the solution to mitigate issues persisting with modern smartphones by leveraging massive processing power of cloud. Although,Hyperdroid has proved it's capabilities and superiority over modern smartphones but, there are some limitations of it. Currently all Virtual Machines are required to be started and running irrespective of them being used or not and allocation of resources is also static. We plan to add features such as multitouch and sensor support to improve the experience. Furthermore, we plan to replace Virtual Box with KVM [10] since it provides some advanced features which could help improve performance and user experience.

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Detection of Phishing Site Using URL Features

Prof. Vijaya Pinjarkar
Faculty KJSIEIT Mumbai
University Of Mumbai, India
vkhirodkar@somaiya.edu

Mohit Somaiya
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
mohit.somaiya@somaiya.edu

.   Bhavesh Solanki
U G Student, KJSIEIT, Mumbai
.University of Mumbai, India
bhavesh.solanki@somaiya.edu

Aditya Yadav
U G Student, KJSIEIT, Mumbai
. University of Mumbai, India
aadityayadav@gmail.com

Abstract—The phishing attack causing damage to User information is increasing day by day. Phishing involves sending an email or fake link to a user or inducing a phishing page to steal a user's private information. This type of attack can be detected by blacklist-based detection techniques; however, these methods have some disadvantages and the numbers of victims have therefore continued to increase. In this paper, we propose a phishing detection technique that uses uniform resource locator (URL) features. The features that phishing site URLs contain are identified. The proposed method employs those features for phishing detection. The technique was evaluated with a dataset of around 2,000 phishing site URLs and 2,000 legitimate site URLs. The results demonstrate that the proposed technique can detect more than 98.23 % of phishing sites.

I. Introduction

As the growth of the Internet and advancement available in web services is increasing, web attacks have increased in quantity and advanced in quality. Phishing is a type of social engineering attack that targets a user's sensitive information through a phony website that appears similar to a legitimate site, or by sending a fake email
[1]. According to research of the Anti Phishing Working Group (APWG), 85,062 phishing sites were globally detected in the second quarter of 2010; by the second quarter of 2014, 128,978 were detected. These figures mark an increase of 1.5 times the value that count of occurred phishing attack in one quarter [2,3]. In addition, annual damage caused by phishing was measured at $5.9 billion. Thus, phishing is a worldwide malicious activity that continues to increase.

In response to this increase in phishing attacks, phishing detection techniques have been the focus of considerable research. Traditional phishing detection techniques include the blacklist-based detection method. This technique maintains a uniform resource locator (URL) list of sites that are classified as phishing sites; if a page requested by a user is present in that list, the access to the site is denied[4]. This technique is commonly used and has a low false- positive rate; however, its accuracy is determined by the list of sites maintained. Consequently, it has the disadvantage of being unable to detect temporary phishing sites [5] The URL detection technique extracts phishing site features and detects phishing sites with the extracted features[6].

In this paper, we propose technique which is based on URL features, that resolves the limitation of the blacklist-based technique. We implemented the proposed technique and conducted an experimental performance evaluation. The proposed technique extracts features in URLs of user-requested pages and applies those features to determine whether a requested site is a phishing site. This technique can detect phishing sites that cannot be detected by blacklist-based techniques; therefore, it can help reduce damage caused by phishing attacks. The remainder of this paper is organized as follows. In Section 2, we present related works about phishing sites and phishing detection techniques.Thephishing detection technique that employs URL-based features is described in Section 3. In Section 4, we present the evaluation results. In Section 5, we provide our conclusions and describe future work.

II. Related Works

Phishing is an attempt to steal a user's personal information typically through a fraudulent email or website [1]. We conducted a study on phishing sites, which are either fake sites that are designed to appear similar to legitimate sites or sites that simply have phishing-related behaviours. Almost all phishing sites include the functionality in which users enter sensitive information, such as their personal identification, password, and/or account number. These sites can include links to connect to other phishing sites and malicious code that contaminates a user's computer.

Phishing detection techniques can be generally divided into blacklist-based URL-based approaches. The blacklist-based approach maintains a database list of addresses (URLs) of sites that are classified as malicious. If a user requests a site that is included in this list, the connection is blocked [4]. The blacklist-based approach has the advantages of easy implementation and a low false-positive rate; however, it cannot detect phishing sites that are not listed in the database, including temporarily sites [5].

The URL features based approach analyzes phishing site features and generates a classifier using those features [6]. When a user requests a web page, the classifier determines whether that page is a phishing site. This approach can detect new phishing sites and temporary phishing sites because it extracts features from the requested web page. Nevertheless, it has the disadvantage of being difficult to implement; moreover, generating a classifier is time-intensive. Thus, the two approaches have both advantages and disadvantages.

iii. Proposed Approach

A. URL Structure

A URL is the address of a World Wide Web page.
An example of URL is shown in the figure
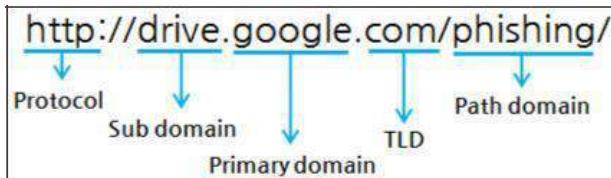
Figure 1. URL Structure.

In this study, the subdomain, primary domain, and TLD are collectively referred to as the domain. Fig. 1 depicts the individual components of a URL.

The protocol refers to a communication protocol for exchanging information between information devices; e.g., HTTP, FTP, HTTPS, etc. Protocols are of various types and are used in accordance with the desired communication method.

The subdomain is an ancillary domain given to the domain and has various types depending on the services provided by the domain page. The domain is the name given to the real Internet Protocol (IP) address through the Domain Name System (DNS). The primary domain is the most important part of a domain. The TLD is the domain in the highest position in the domain name hierarchy architecture; e.g., .com, .net, .kr, .jp, etc. [7]. We define features of each component of the URL; these features are used for phishing site detection.

B. URL Features

Table 1 shows 26 URL-based features that are used in the proposed detection technique.

- Features 1 to 6 relate to Google Suggestion. They return a suggested word when a user enters a single term. We analyze the results of Google Suggestion when entering the URLs of phishing sites and legitimate sites. If a search term is similar to a suggested result, input URL is doubtful because that site may be emulating an existing site. We use Levenshtein distance between the two terms—the Google Suggestion result and the search term—as a feature for detecting phishing sites [6,8]. In addition, if a suggested result is the same as that of a domain that is present in the trustworthy whitelist, that search term site may be emulating a legitimate site [8]. For this reason, we can detect phishing sites using this feature.
- Features 7 to 9 can be extracted through page ranking. The page rank is a numerical value that is calculated by the number of visitors and degree of popularity. Phishing sites have a very low page rank value or no value because phishing sites are not often visited by many people and they exist for a short time [9]. Therefore, if a domain page rank value is very low, it can be regarded as a phishing site.

- Features 10 to 14, and 16, 17, 19, and 20, are associated with suspicious URL patterns and characters. Characters such as '@' and '//' rarely appear in a URL. Moreover, URLs of legitimate sites typically have one TLD. Therefore, patterns of many TLDs in a URL signify a fraudulent site [10]. Therefore, in the above cases, we classify these sites as phishing sites.
- Feature 15 is defined for identifying newly created phishing sites with the proposed technique. Currently, to prevent a user from recognizing that a site is not legitimate, phishing sites typically hide the primary domain; the URLs of these phishing sites have unusually long subdomains. Therefore, we added a feature that calculates the subdomain length of a URL to determine if it is a phishing site. This feature can be additionally used to identify phishing sites that target vulnerabilities of smartphones, which have small displays that make it difficult to see the full URL.
- Feature 18 is another new feature that reflects current phishing trends. This feature includes eight words that are predefined as phishing terms. It is verified if a requested page's URL contains these phishing terms [12][1]. This feature worked well in previous studies; however, we determined that changes have occurred since the studies were conducted. Thus, through experiments, we identified eight new phishing terms[2] and we employ them in our phishing detection technique.
- Features 21 to 26 are characterized by URL property values. Because temporary phishing sites, as mentioned, often do not contain the required property values [11], property values can be used as features for identifying phishing sites.

TABLE I. URL-BASED FEATURES

No.	URL-based features	
	Feature name	*Description*
1	Alexa rank	AlexaRank value of domain
2	Alexa reputation	Alexa reputation value of domain
3	Via IP address	Whether domain is in the form of an IP address
4	Length of URL	Length of URL
5	Suspicious character	Whether URL has '@ ', '//'
6	Prefix and suffix	Whether URL has '-'
7	Number of subdomain	Number of dots in domain
8	Length of subdomain	Length of subdomain
9	Port number matching	Whether explicit port number and protocol port number are equal
10	Number of TLD and out of TLD position	More than one TLD in URL, and out of TLD position
11	Phishing words in URL	Whether URL has phishing terms
12	Primary domain spelling mistake	Whether primary domain is similar to whitelisted domains
13	Number of '/'	Number of '/' in URL
14	Country matching	TLD country, and domains country are equal or not
15	HTTPS protocol	Whether URL use https.
16	DNS record	Whether URL has DNS record
17	WHOIS record	Domain age in WHOIS record
18	Value of TTL	TTL value of domain
19	PTR record	Whether domain has PTR record

As noted above, our proposed method employs new features that have not been previously used in studies. IN addition, it advances features from previous works to provide better phishing detection performance.

C. *Architecture*

Fig. 2 illustrates the proposed phishing detection process, which includes two phases: training and detection.
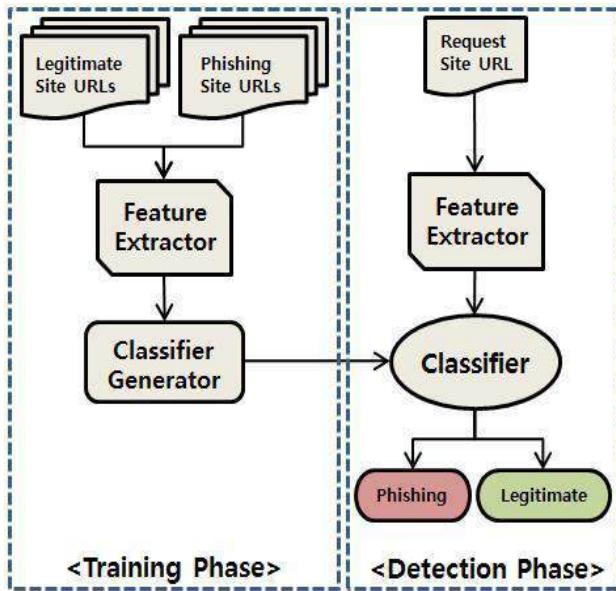

Figure 2. Process of proposed detection method.

We generate a classifier in training phase using URLs of phishing sites and legitimate sites collected.

The URL's selected are transferred to the feature extractor, which extracts feature values . The extracted features are stored as input and passed to the classifier generator, which generates a classifier by using the input features and the machine learning algorithm.

In the detection phase, the classifier determines whether a requested site is a phishing site. When a page request occurs, the URL of the requested site is transmitted to the feature extractor, which extracts the feature values. Those feature values are inputted to the classifier. The classifier then determines whether a new requested site is a phishing site based on learned information. It then alerts the page-requesting user about the classification result

Thus, many URL features exist that have been employed in several studies on phishing detection. In the present research, we incorporate features used in previous studies and define two new features for identifying existing phishing sites

D. *Algorithms*

To determine a classifier with the best performance for using URL-based features, we employed several machine learning algorithms: support vector machine (SVM), naive Bayes, decision tree, *k*-nearest neighbor (KNN), random tree, and random forest.

- SVM is a classification method that was introduced in 1992 by Boser, Gyon, and Vapnik [13]. It is a statistical learning algorithm that classifies samples using a subset of the training samples, called support vectors. SVM is built on the structural risk minimization principle for seeking a decision surface that can separate data points into two classes with a minimal margin between them [14]. The advantage of SVM is its capability of learning in spare high-dimensional spaces with very few training samples.

- Decision tree is a classification method that was introduced in 1992 by Quinlan [15]. It creates a tree form for classifying samples. Each internal node of the tree corresponds to a feature, and the edges from the node separate the data based on the value of the feature [15]. Decision tree includes a decision area and leaf node. The decision area checks the condition of the samples and separates them into each leaf node or the next decision area. The decision tree is very fast and easy to implement; however, it has the risk of overfitting.

- Naive Bayes is a classifier that can achieve relatively good performance on classification tasks. It is based on the elementary Bayes' theorem. On account of the conditional model's feature, naive Bayes is effectively trained in supervised learning. It provides the advantage of learning essential parameters using small training samples.

- KNN is a non-parametric classification algorithm It classifies the input data using *k* training data that is similar to the input data. KNN uses Euclidean distance to calculate the similarity between the input and training samples. Its performance is determined by the choice of *k*; nevertheless, choosing a suitable *k* value is not easy.

- Random tree is a tree-based classification method that was introduced by Breiman and Cutle [18]. A tree is drawn at random from a set of possible trees. ―At random‖ means that each tree in the set of trees has an equal chance of being sampled [18]. The random tree classifier takes as input a features vector and classifies it with each tree. The output is determined by the majority ―vote.‖ This algorithm can handle both classification and regression.

- Random forest is a classification method that combines many tree predictors; each tree depends on the values of a random vector that is independently sampled [19]. All trees in the forest have the same distribution. This algorithm can handle a large number of variables in the dataset; however, it lacks reproducibility because the process of forest building is random [20].

TABLE II.   TF, TN, FP, AND FN OF MACHINE LEARNING ALGORITHMS

Algorithm	Measurements			
	TP	*TN*	*FP*	*FN*
SVM	97.00%	94.90%	5.10%	3.00%
Decision Tree	96.90%	96.90%	3.10%	3.10%
Naive Bayes	90.90%	95.10%	4.90%	9.10%
KNN (*k* = 1)	96.30%	96.00%	4.00%	3.70%
Random Tree	96.10%	96.00%	4.00%	3.90%
Random Forest	98.10%	98.40%	1.60%	1.90%

In measuring the classifier performance, (1) was the equation of specificity, (2) was the equation of sensitivity, and (3) was the equation of accuracy.

IV. Evaluation

To conduct classifier training and evaluation through an experimental dataset, we collected the URLs of phishing and legitimate sites. We have gathered around 2,000 phishing site URLs from PhishTank and around 2,000 legitimate site URLs from DMOZ. The evaluation wasconducted using *k*-fold cross validation. *K*-fold cross validation divides the input data into *k*; *k* − 1 datasets are used for training, and the remaining one is used for validation. This process is performed *k* times, such as the number in the divided dataset, because all datasets can be used for training and validation. This method is typically used to evaluate the accuracy of the classifier with a small dataset. In this study, we used ten-fold cross validation to evaluate our detection technique. We performed the testing with the WEKA open-source machine learning tool, and we analyzed the performance of each of the machine learning algorithms noted in Section 3. The accuracy was calculated as TP (true positive), TN (true negative), FP (false positive), and FN (false negative). We compared the performance of each classifier using the calculated accuracy. Fig. 3 depicts the TP, TN, FP, and FN matrix.

$$Specificity = \frac{tp}{tp+fp}$$

$$Sensitivity = \frac{fp}{fp+fn}$$

$$Accuracy = \frac{tp+tn+fp+fn}{tp+tn}$$

We additionally used the specificity, sensitivity, and accuracy as measurements of the classifier performance measurement. Table 3 shows the specificity, sensitivity, and accuracy of each machine learning algorithm that we used in training.

TABLE III.   EXPERIMENTAL RESULTS OF ALGORITHMS

Algorithm	Measurements		
	Specificity	*Sensitivity*	*Accuracy*
SVM	96.93%	95.00%	95.95%
Decision Tree	96.90%	96.90%	96.88%
Naive Bayes	91.26%	94.88%	93.01%
KNN (*k* = 1)	96.28%	96.01%	96.18%
Random Tree	96.09%	96.00%	96.03%
Random Forest	98.10%	98.30%	98.23%

As a result of the experiment, we determined that the best machine learning algorithm, random forest, used URL features. This classifier detected more than 98.23% of phishing sites. The high accuracy shown in Table 3 and low false-positive rate shown in Table 2 meant that the proposed phishing detection technique can effectively classify sites as either being phishing or legitimate..

		Prediction		
		Positive	Negative	
Actual	True	True Positive	True Negative	
	False	False Positive	False Negative	

Figure 3.TP, TN, FP, FN matrix

TP is the ratio of the prediction that a determined phishing site is indeed a phishing site, and FN is the ratio of the prediction that a determined phishing site is actually a legitimate site. In addition, FP is the ratio of the prediction that a truly legitimate site is a phishing site, and TN is the ratio of prediction that a determined legitimate site is indeed a legitimate site. Table 2 shows the TP, TN, FP, FN ratios of each machine learning algorithm.

As a result of the experiments, we obtained TP, TN, FP, and FN ratios to calculate three measurements that we used to compare the performance of each algorithm. The first

V. Conclusion

In this paper, wehave proposed a phishing detection approach which employs URL-based features .The method combines URL-based features used in previous studies with new features by analysing phishing site URLs. Our method serves as the robust alternative tomany high cost web security applications.We expect the detection results to be comparable to previouslypublished work which would allow for new kinds of phishing warnings with better coverage, less false positives and explicit user recommendations how to avoid these critical situations.

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Gesture Control System

Siddhant Jhaveri[1], Mili Jain[2], Aditya Mali[3], Prashant Upadhyay[4]

[1,2,3,4]Department of Electronics & Telecommunication Engineering, [1,2,3,4]

K.J. Somaiya institute of engineering and information technology

Abstract- **Controlling home appliances, gadgets and other advanced machineries using pre-loaded code, switches, infrared remote control is what we have been doing since ages. Using gestures as control signals is a recent advancement made in the field. The motive of this new technique is to remove the need for handheld remotes thus providing more ease and flexibility to the users. Gestures are captured using a camera module, processed using various image processing algorithms and the control system is programmed in such a way that it recognizes gestures, differentiates between them and hence performs the respective pre-defined action.**

Keywords: human-machine interface; gestures; image capturing; image processing algorithms.

I. INTRODUCTION

In today's era, advanced machines have become a vital part of human lives, as all we are looking for is increased productivity. Our focus has always been on making machines do the work which is difficult for us to implement, hence the need for developing human-machine interface. Gesture controlled system is one such implementation. It has the potential to change the dynamics of the world we live in and increase the utility of the resources we use i.e. the system brings in increased user ease and reduced hardware requirement. We began our project by collecting data in the form of images captured via a webcam and then move on to detecting our object(palm region) by extracting it's features from the background and isolating it using various image processing algorithms. Once the isolating is done, our Region of Interest(ROI) is tracked, this tracking of gestures helps us to interact with the machines more easily. Now, every palm gesture signifies a predefined command and thus a corresponding action or task is performed.

Many algorithms were studied on OpenCV platform. It is an open source platform supporting various algorithms for computer vision and developing real-time image processing techniques. Languages compatible with it are C, C++. It also has interfaces with Python, Java and MATLAB. It supports all operating systems.

II. LITERATURE SURVEY

Detection of palm region can be done using various complex image processing algorithms. Some of the algorithms were studied and the ones providing robust output and simpler gesture extraction in compound background was chosen.

A. Scale Invariant Feature Transform

SIFT is an algorithm with high computational complexity. It uses key point matching technique. Firstly, a reference image (Fig 2.1) is stored in the database. The strongest key points (Fig 2.2) are extracted from the reference image and compared with the test image.(Fig 2.3)

The image is convolved with Gaussian filters at different scales, and then the difference of successive Gaussian-blurred images is taken. Key points are then taken as maxima/minima of the Difference of Gaussians (DoG) that occur at multiple
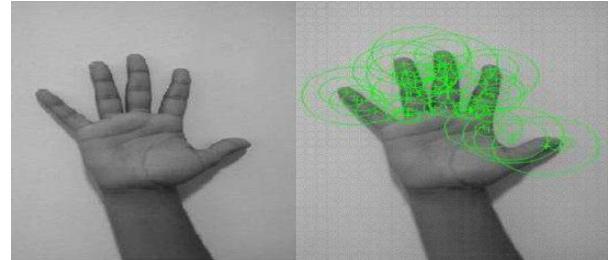

Fig 2.1 Reference   Fig 2.2 Strongest features
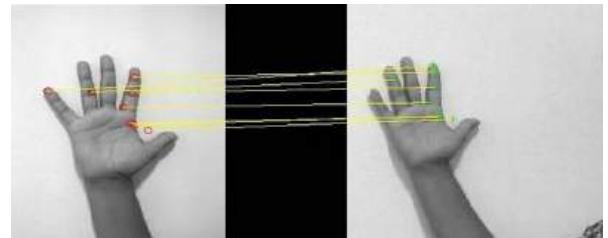
Fig 2.3 Matched points

scales. Specifically, a DoG image $D(x, y, \sigma)$ is given by,

$$D(x, y, \sigma) = L(x, y, k_i \sigma) - L(x, y, k_j \sigma)$$

where $L(x, y, k\sigma)$ is the convolution of the original image $I(x, y)$ with the Gaussian blur $G(x, y, k\sigma)$ at scale k σ

i.e., $L(x, y, k\sigma) = G(x, y, k\sigma) * I(x, y)$ Every key point of the reference image is selected and matched with the

test image to search for the gesture that has to be determined.[1]

B. Segmentation of region

Segmentation can be implemented using various techniques. Color recognition based- Here, color samples taken from the palm region are extracted from the background. The color samples taken are in HSV format. HSV format is used because they provide better representation of the color space than RGB. Summation of all the color profiles which are represented in binary format is done. For further accuracy, median blur is used to completely segment the palm region from the background.

Histogram based approach- Here, the histogram of the frame and the palm region is computed. It is then compared to separate our gesture from the background.

C. Contouring

Contour is simply a curve joining all the continuous points (along the boundary), having same color or intensity patterns. Contouring is effective for shape analysis and object detection and recognition. For finding contours, OpenCV uses Green's Theorem and image moment. For a 2D continuous function $f(x, y)$ the moment of order $(p + q)$ is defined as

$$M_{pq} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x^p y^q f(x,y)\, dx\, dy$$

for $p, q = 0, 1, 2, ...$

For better accuracy, binary images are used. So before finding contours, thresholding is applied.

Green's theorem is a vector identity. Over a region D in the plane with boundary ∂D, Green's theorem states

$$\oint_{\partial D} P(x,y)\, dx + Q(x,y)\, dy = \iint_D \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dx\, dy,$$

where line integral is equal to the surface integral. This can also be written compactly in vector form as

$$\oint_{\partial D} \mathbf{F} \cdot d\mathbf{s} = \iint_D (\nabla \times \mathbf{F}) \cdot d\mathbf{a}.$$

Green's theorem can be used to determine the area and centroid of plane figures solely by integrating over the perimeter. [2][3].

D. Convex hull and convexity defects

In the given Euclidean space, the smallest convex set that contains all the set of given points is the convex hull of those points. Convex hull is drawn around the contours of the palm such that all the contour points are enclosed within the convex hull. Minimum number of points are used to form a convex hull, such that all points are inside the region. Hence, the property of convexity is maintained. When the distance between the contours and the convex hull of the object is far away then convexity defect is formed as a vector. Simply, a

cavity observed in an object, segmented from the image is convexity defect. Using these defects, various gestures can be identified.

III. IMPLEMENTATION
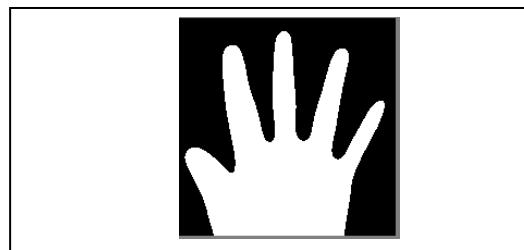


Fig. 3.1 Thresholding
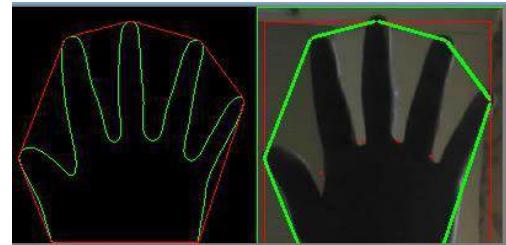
Fig 3.2 Contouring and Convex hull
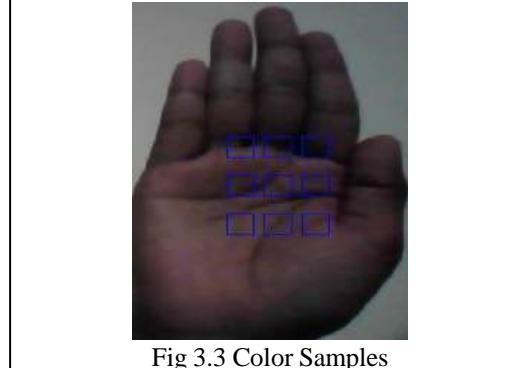
Fig 3.3 Color Samples

A region (rectangular frame) is defined within which all our further processing is done. Firstly, color samples in HSV format are taken from the palm region. These color samples help us to separate our ROI from the background. Once the separation is achieved, binary representation of the extracted palm region is done, followed by contouring which gives us a proper segmentation of the palm. For further smoothness and noise free representation of the palm non-linear median filter is used. Once the palm is detected by the system various gesture-oriented tasks are performed. With the help of convexity defects, number of fingers (our defined gesture) is identified. Also, with the help of contouring, a point is drawn on the fingertips. So, as the fingertips move in the video sequence, the point traces its previous positions and tracks movement with the help of the colored dot. Hence the fingertip acts as a pen and drawings are visible on the screen. [2][3]

IV. RESULTS

Identification of the number of fingers can be seen from the figure below (Fig 4.1, 4.2). Text indicating number of fingers is displayed. Thus gestures are identified.


Fig 4.1

Fig 4.1

V. FUTURE SCOPE

Gesture recognition, as of now, is at its primitive stage with vast possibilities of applications. Some of its applications are as follows:

Medical- Advanced machines with gesture recognition feature can be used to diagnose patients and minimize human errors.

Entertainment- Video games can be equipped with gesture sensors to enhance the gaming experience of users. Hardware used will be minimized i.e. the gaming consoles and the keypad.

Industrial- Equipments used can be implemented using gestures so that it increases its durability and precision. Various other interfaces used to interact with the system can be changed using gesture and movement recognition. Gesture recognition technology can eliminate a lot of manual labor and make life easier

VI. CONCLUSION

Video processing is difficult to implement on a highly detailed background and the processing algorithms used are environment sensitive. SIFT algorithm is better used for detecting objects. Also, due to its computational complexities, it is difficult to process images on a low speed processor like Raspberry Pi. Techniques were studied to solve the problem of poor illumination and get our gesture detected even in the noisy background.

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Variation Analysis Using Regression for Predicting Yield

Patel Shivang, Dave Maharsh, Patel Rahul, Prof. Vricha Chavan, Prof. R N Awale

Department of Computer Engineering

K J Somaiya Institute of Engineering and Information Technology, Sion, Mumbai

p.shivang97@gmail.com, maharsh.dave@gmail.com, ranchodp0497@gmail.com, vchavan@somaiya.edu,
rnawale@vjti.ac.in

Abstract: **Agriculture being an important aspect of any nation can largely benefit if the pattern of growth of a crop is identified. In this study, the relation between GNDVI (Green Normalized Difference Vegetation Index) and yield is studied to predict yield based on satellite imagery obtained from landsat8 program. To identify these patterns, machine learning can provide non-biased outputs which in turn provides better approximation of yield. GNDVI values can be used to derive leaf area index and "greenness" which indicates health of a plant. If leaf area index is high it denotes that there is more amount of vegetation present in an area. GNDVI values are directly proportional to health of a plant. In this approach Regression analysis is used in order to study the relation between GNDVI values and crop yield.**

Keywords: **remote sensing; regression; machine learning, GNDVI, yield;**

INTRODUCTION

In today's growing world more than twenty-nine million hectares of agricultural land is devoted globally to growing sugarcane, producing approximately 1.8 trillion tons of raw sugar each year. Accurate and timely prediction of yield offers the global sugar industry improved efficiency and profitability by supporting decision making processes such as crop harvesting scheduling, marketing, milling and forward selling strategies. The importance of remote sensing in today's world is far more than comprehensible to human world. The agricultural world finds many unimaginative roots to make increments in the yield of crop. Remote sensing helps the farmers in measuring the yield of the crop, monitor health of the crop and what measures are to be taken to increase the same. Regression analysis models the relationship between a response variable and one or more predictor variables [1].

Spectral vegetation indices that are based on green and near infrared reflections have the high correlation with leaf area index and canopy cover (Broge and Leblanc, 2000). However, in sparse vegetated areas, the reflection of soil and sand are much higher than reflection of vegetation and so detection of vegetation cover reflection is difficult. The GNDVI values measure the "greenness" of plant which in turn provides health of the crop. "NDVI is often used worldwide to monitor drought, monitor and predict agricultural production, assist in predicting hazardous fire zones, and map desert encroachment. The NDVI is preferred for global vegetation monitoring because it helps to compensate for changing illumination conditions, surface slope, aspect, and other extraneous factors" (Lillesand 2004).
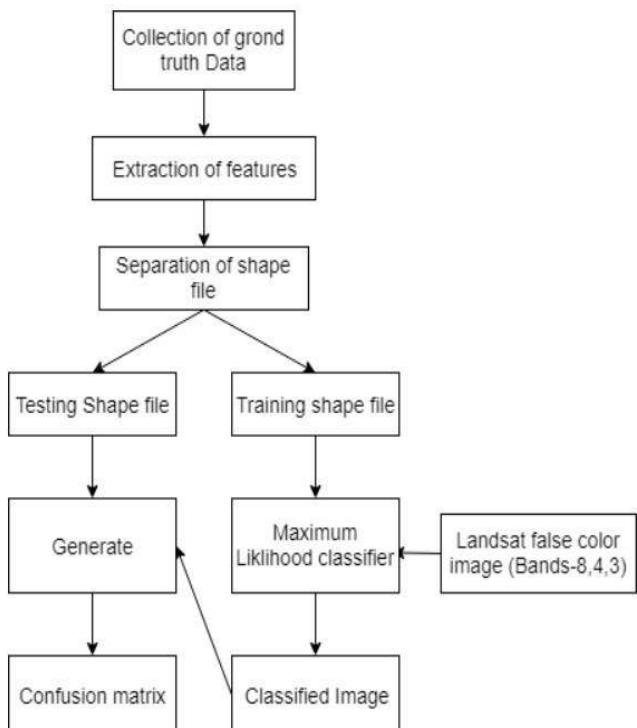

Figure 1: Generation of classified image

We aim to create a system where we can make prediction for the overall yield of the crop. The predictions would be for upcoming year. The major crop dependent for our paper is

sugarcane. The regression analysis takes GNDVI values and predicts the output between 0 to 1

To make our system more efficient we base our data on the ground truth points collected through a survey. The survey included relevant information like the crop name, age of the crop and previous crop
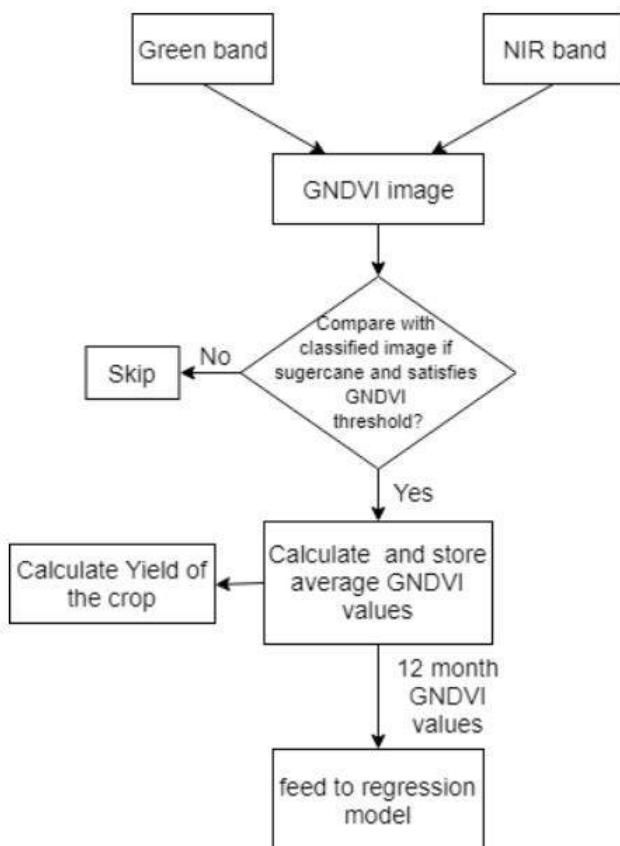

Figure 2: Calculation of average GNDVI values and yield for one crop cycle.

Study Area:

The study was carried out at Bagalkot cane growing region located in the situated-on branch of River Ghataprabha in Karnataka State of India. The area is located at 16.1817°N 75.6958°E, covering an area of 49.06 km2. The soil type in this area varied enormously due to climate, substance of parent material and topography. The mean annual rainfall of the area was recorded to 318 mm in 2016. The region received less rainfall than usual as a result of that farmers faced drought.

Implementation:
A. *Generate classified image:*

1. *collection of ground truth points:*

   The survey was carried out for sugarcane fields in Sameer-wadi. The survey consists of capturing sugarcane field locations and crops surrounding the target fields. These points were used as the basis for the classification of the images. The collection of ground-truth data enables calibration of remote-sensing data, and aids in the interpretation and analysis of what is being sensed [2].

2. *Feature extraction:*

   The ground truth tracks are in the form of polygons, these polygons are georeferenced and placed on the satellite image. After georeferencing these files, they are converted into shape files which contain labelled data and georeferencing information. These files are later used for classification process.

3. *separation of shapefiles:*

   The maximum likelihood supervised learning algorithm in ArcGIS is used for classification. As we know that supervised learning required two types of input i.e. training and testing data. The shape files are divided into two types data in training sample manager, 70% data are given as training data and remaining 30% data as testing data to the algorithm. The training data is used to train the system which would in turn help to provide us the required results for the crop. The testing data helps to identify whether the implemented algorithm works properly.

Figure 3: Separation of shapefile.

4. *Classification in ArcGIS:*

Landsat 8 imagery consists of 11 bands out of which three bands are used namely NIR (Near Infrared), Red and Green. The composite false color image is formed using these bands and provided as input for the classification process. Maximum Likelihood supervised learning algorithm is applied for classification in ArcGIS. The shape files generated in previous step are converted to signature files, it contains information about the target classes such as covariance and mean. The input to the algorithm consists of a composite raster image and a signature file. The basic formula that the algorithm follows is given as:

$$P(v|\omega_i) = (2\pi)^{\frac{-N}{2}} |\Sigma_i|^{\frac{-1}{2}} \exp\left\{ \frac{-1}{2} (v - \omega_i)^T \Sigma_i^{-1} (v - \omega_i) \right\}$$

$P(v|\omega_i)$ is known from training data.
N dimensional space.
ω_i and Σ_i is mean vector and covariance matrix of the data in class ω_i.
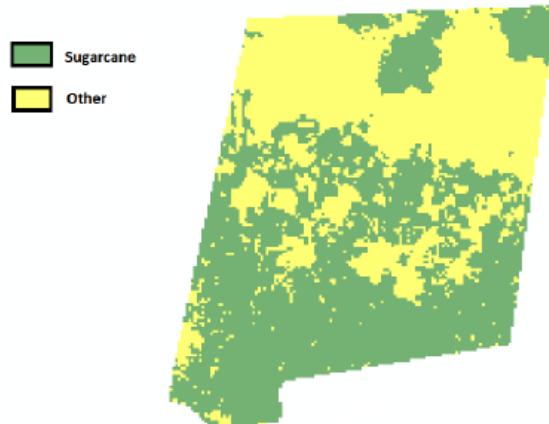

Figure 4: Classified image

5. *Confusion Matrix:*

This involves identifying a set of sample locations that are visited in the field. The ground truth point collected from the field is then compared to that which was mapped in the image for the same location. The comparison is done by generating confusion matrix (error matrix) [3]. The classified image and testing shape file are given input to the confusion

matrix tool. In predictive analytics, a table of confusion (sometimes also called a confusion matrix), is a table with two rows and two columns that reports the number of false positives, false negatives, true positives, and true negatives. The figure-5 shows that how many time sugarcane class is identify as sugarcane class and how many other class identify as other class. Which finally results in the accuracy of the algorithm used in ArcGIS.

ClassValue	Sugercane	Other	Total	U_Accuracy	Kappa
Sugercane	216.00000000000	0.00000000000	216.00000000000	1.00000000000	0.00000000000
other	17.00000000000	267.00000000000	284.00000000000	0.94014084507	0.00000000000
Total	233.00000000000	267.00000000000	500.00000000000	0.00000000000	0.00000000000
P_Accuracy	0.92703862661	1.00000000000	0.00000000000	0.96600000000	0.00000000000
Kappa	0.00000000000	0.00000000000	0.00000000000	0.00000000000	0.93136526598

Kappa coefficient is the measure of agreement between two binary variables. If kappa coefficient equals to 0, there is no agreement between the classified image and the reference image. If kappa coefficient equals to 1, then the classified image and the ground truth image are totally identical [4]. So, the higher the kappa coefficient, the more accurate the classification is.

$$K = \frac{p_0 - p_e}{1 - p_e} = 1 - \frac{1 - p_0}{1 - p_e}$$

B. *Regression analysis:*

Regression analysis is widely used for prediction and forecasting, where its use has substantial overlap with the field of machine learning [5]. Green vegetation reflects more energy in the near- infrared band than in the visible range. Leaves reflects less in the near-infrared region when they are stressed, diseased or dead. Features like Clouds, water and snow show better reflection in the visible range then the near-infrared range, while the difference is almost zero for rock and bare soil. Regression analysis is also used to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships GNDVI is a modified version of the NDVI to be more sensitive to the variation of chlorophyll content in the crop. It is useful for assessing the canopy variation in biomass and is an indicator of senescence in case of stress or late maturity

stage. This index can be used to analyze crops in mid to late growth stages.
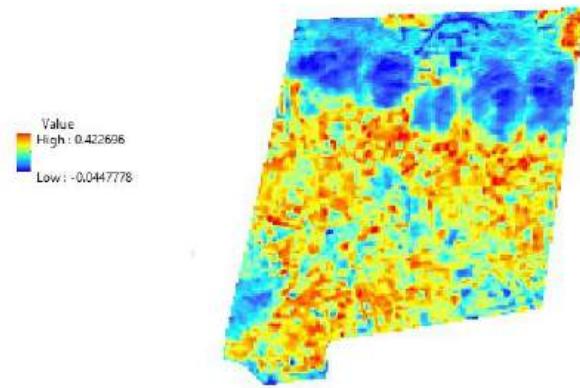
Figure 6: GNDVI image

NIR and green bands are used to form GNDVI image using the formula

$$GNDVI = \frac{(NIR - R)}{(NIR + R)}$$

GNDVI values range from -1 to 1.

The figure-6 shows the GNDVI image which formed after applying GNDVI formula shown in above equation. After creating the GNDVI image it is compared with the classified image pixel by pixel, during this comparison the GNDVI values of area where sugarcane is identified are stored and later fed to the regression model to identify growth pattern, along with-it misclassification of rivers, barren land and urban structures such as roads and houses are removed by using a threshold on GNDVI value. It is known that values ranging from -1 to 0 does not denote vegetation but it is observed that barren lands and urban structures can have GNDVI values ranging between 0 to 0.25 hence a threshold to accept pixels or area having GNDVI values greater than 0.25 is applied. This classification provides yield in acres, it is calculated as

Yield (in acres) = number of pixels identified as sugarcane*900*0.000247105

The model derived GNDVI values were plotted over the calculated GNDVI values from Landsat images. The model was shifted vertically in each year to pass through the calculated GNDVI value acquired near or at the maximum period of sugarcane. The highest GNDVI value from the model was regressed against the final average crop yield measured in that year. From the model, the maximum GNDVI

values for some months were 0.51, 0.58, 0.55 and 0.58 respectively.

The model represents maximum GNDVI in the month of September where the sugarcane yield is maximum for the year 2017
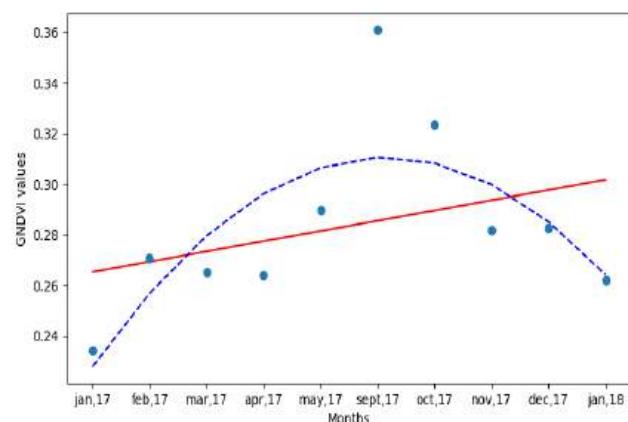

Figure 7: Regression graph

Conclusion:

Since the classified image produced by maximum likelihood classification has low accuracy, hence a threshold on GNDVI value is applied such that it rejects misclassification of barren lands, urban area, roads, rivers and lakes. The plant growth pattern of one year (2017-2018) is identified as shown in figure-7, as observed the plant growth increases and then after some amount of time it decreases again this denotes a complete cycle of sugarcane crop growth, the decreasing values show that the crop has reached its maturity and is ready to be harvested. The calculated yield based on one-year analysis is 1643(in acres) whereas the actual observed yield is 1409(in acres), it means there is an overestimation of 234(in acres). To minimize this error large amount of historical data regarding actual yield and satellite images are required. Due to lack of resources the analysis period in this paper is limited to one year (2017-2018) which is not enough data to precisely analyses the relation between yield and GNDVI values.

Future scope:

Provided that large amount of historical data is available regarding yield and satellite imagery, it is possible to identify crop growing patterns for better accuracy. The average GNDVI values can be plotted against observed yield to study the variation in yield due to changing weather conditions which affect the plant growth and in turn GNDVI values. Various other machine learning techniques can also be used to learn the growth pattern.

Limitations:

The supervised algorithm maximum likelihood does not provide accurate results; hence it affects the approximation values obtained while comparing classified/ observed values with actual values. Also lack of data/ resources becomes a hurdle as machine learning require huge amount of data for learning.

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Determining Image Integrity using Passive Approach for Detection

Prashali Shah, Devanshi Sheth, Priya Jain, Prof. Jyoti Wadmare
Department of Computer Engineering
K. J. Somaiya Institute of Engineering and Information Technology, Sion 400022.
University of Mumbai

prashali.s@somaiya.edu , shethdevanshi04@gmail.com , pjain8943@gmail.com , jyoti@somaiya.edu

Abstract — **Over the past few years, various efforts were taken by image forensics to detect the manipulated images and to trace the tampered region. Images are manipulated using various different techniques and algorithms due to easy to use photo editing software and it has been very difficult to develop a single algorithm that deals with detecting all types of forgery. This proposed work is an attempt to design an efficient image tampering detection and localization system that can be used by the Image forensics department to detect the integrity of images. As lots of research is carried out in this domain, the objective of this paper is to highlight the outcome of the fusion of various algorithms so that a sound and complete application is developed that deals with all sorts of image forgery detection which improves the results considerably. The proposed system design takes into consideration the effects of Copy-Move Technique and Image splicing technique.**

Keywords — **Image forensics, Integrity detection, Forgery localization, Copy-move , Splicing**

I. INTRODUCTION

The availability of various software both in smartphones and computers allow almost everyone to modify the image and publish them publicly. Image forensics mainly deals with verifying if the image is fake or pristine. With the increasing use of sophisticated easy to use photo editing software it has become difficult so as to identify if the image under consideration is real or pristine. Mischievously tampered images may lead to some very serious outcomes in our daily life. Digitized images are a well known source of information and it is very important that it must be genuine. Therefore, image forensics has become very important during the past decade.
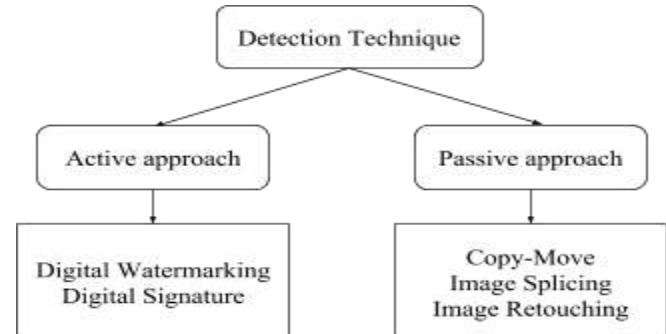

Fig. 1 Techniques of forgery detection.

Basically, the are main problems in image forensics is forgery detection and forgery localization[1]. Forgery detection mainly deals with determining if image is edited by using editing tools and performing operations such as image splicing and copy move method whereas forgery localization deals with pointing out the area in a fake image which is manipulated. Image forgery detection is done considering two

approaches that is Active Approach and Passive Approach[2].

Active Approach: Active approach is also known as non-blind method. It includes a) Digital Watermarking and b) Digital signature. Watermarking is a mark that is embedded into an image. This is like signing an image stating that it is a real image. Digital signature is used for validating the authenticity of an image. It uses public and private key algorithm for signature generation. It has certain drawbacks and this is the only reason we use passive approach in order to verify whether the images are manipulated and if they are manipulated then by what means.

Passive Approach: Passive approach is also known as blind approach. In this, one does not compulsorily have the information about the original image. Detection is done directly on the image and based on the pixels and the sharpness of the image, detection is performed and manipulations are detected.

In this paper, we are focusing mainly on the passive approaches of image forgery detection as they are more efficient and output the forgery done with effective results.

II. LITERATURE REVIEW

Passive detection is tricky because we don't have any information of the original image such that it can be compared with the tampered image. Using passive detection we can check for tampering like copy move, splicing and image resampling.

Copy Move Forgery Detection:

Copy and move forgery detection is one of the frequent type of forgeries. In this, a section of any image having any size or shape is duplicated and pasted over that self same image at any location of that particular image, pasting can be one or many, actuality of that copy and paste is that it performed over same image in order to conceal or handle some important features of image. Here source

and destination image of forgery is single image[3]. Various techniques used to detect the number of forgeries in images.

Copy and Move Forgery Detection Methods:

Block based detection:

The input image is split into multiple overlapping blocks, the features of the block are extracted and stored in a feature matrix. Finding similar blocks can be done by using lexicographical sorting and connection in row vectors of that matrix[3].

Using Feature Key points:

In this method the forged image is taken as input and the extraction of features can be done using SIFT. The key points obtained can be clustered by the use of k means clustering algorithm. The features are matched and similar regions are highlighted[4].

Image Splicing Detection:

Image splicing is a method of integrating two or more images in order to make it composite. When images are spliced resulting image shows edges, regions and blur at the point where they are spliced but editing tools have made it easy to remove those traces, thus it has become very difficult to detect image splicing.

There are several techniques to detect splicing

Using correlation among pixels:

The method is based on stability check of color dispensation in the vicinity of edge pixels. Hue histogram entropy is then figured out to capture deformity of color distribution at these partitioned. Instability of color dispensation among various edge pixel vicinity is used to confine the splicing border[5].

Using Illuminant Color Inconsistency:

Image is split into multiple overlapping blocks, then a classifier is used to adjusting select illuminant estimation algorithm based on block content. Illuminant color is determined on each block, and the dissimilarity between them is calculated. Incase the dissimilarity is larger than a

threshold, the equivalent block is categorized as spliced block[6].

Using block DCT coefficient:

DCT coefficients contain useful information which can be used for detection of image splicing. A new selective feature representation is been put forward based on the analysis. Based on the practical results, it is noticed that this new feature representation can attain better performance (91.06%) in comparison with the traditional approach as mentioned [7].

Using correlation among the pixels:

Most digital cameras use a single sensor in combination with CFA(color filter array) and then interpolate to obtain a three color channel image. This introduces certain correlation that get disturbed on modification of these images[12].

Image Retouching Detection:

Image retouching is another kind of image forgery detection and can be used in economical as well as aesthetical applications. This approach is followed in order to upgrade or degrade the quality of any image. Retouching can also be done in order to make a fusion of multiple images that may entail various effects such as resizing the image, stretching or compressing an image or rotating the image in any dimension. Copy move detection and splicing method are used to determine the Local image retouching. While Global image retouching includes changing contrast and illumination[8]. These global retouching can be detected using algorithm in it also suggests methods for histogram equalization[9].

III. PROPOSED SYSTEM

The method involves blind detection of forgery in image. Two main categories of forgery i.e. copy move forgery detection and splicing detection can be implemented using this approach. The proposed method includes detecting copy move

forgery and splicing as well as analyzing and comparing them to obtain better results. In this method the first step is to collect datasets which includes gathering images which are original, images on which copy move forgery is performed, images on which splicing is performed. The input image then undergoes various preprocessing operations that removes noise from the image and enhances its quality. The image will then be tested for copy move technique. It is then analyzed to detect copy move using block based and key points based approach. Images from dataset will be tested for copy move technique in which part of the image is pasted to another location by copying the corresponding image. The next step will be to detect if splicing i.e. image formed by combining two or more images. The method works on the basis of correlations between different pixels. Incase of any tampering detection, the forged area will be localized and highlighted.

PART I. Block based approach

We implemented the copy move forgery detection using block based technique. The steps to detect that are as follows:

Step 1: The image is cut into predetermined size overlapping blocks.

Step 2: DCT is applied to each block and these blocks are traversed in a zigzag order to improve performance.

Step 3: Use K means clustering algorithm to sort it into classes 1,2...n.

Step 4: Calculate relation between the sorted blocks and if it exceeds a given distance highlight the result.[10]

PART II. SIFT based copy move detection

Step 1: Dividing the image in non overlapping irregular adaptive blocks.

Step 2: Extract the feature key points using SIFT

Step 3: The features are matched with one another.
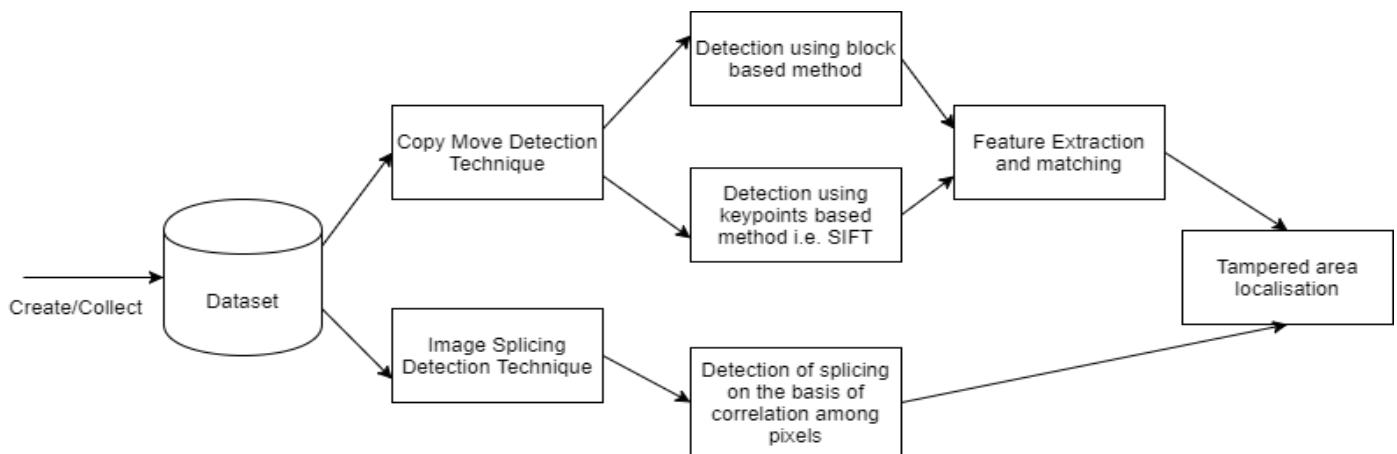
Fig. 2 Proposed Methodology for Forgery Detection

Step 4: The forged region is then localized using forgery region extraction algorithm[11].

PART III. Image splicing detection

Step 1: By applying bilinear interpolation is the raw image is first preprocessed

Step 2: Probability of each and every sample considering all the models will be estimated by applying EM algorithm by using E step.

Step 3: Specific type of correlation between the samples is estimated in the M step.

Step 4: High pass filter is then applied on the result obtained to remove low frequency noise and then show the results[12].

Combining all the methods and creating a hybrid system gives better results than applying only a single technique. In this paper the focus is on increasing the efficiency of detection by fusing the methods that give great results individually. The accuracy of forgery detection is improved as we get results of all the methods combined together. The system will thus be complete as it will be used to identify two most common image forgery techniques.

IV. EXPERIMENTS

(a)   (b)   (c)
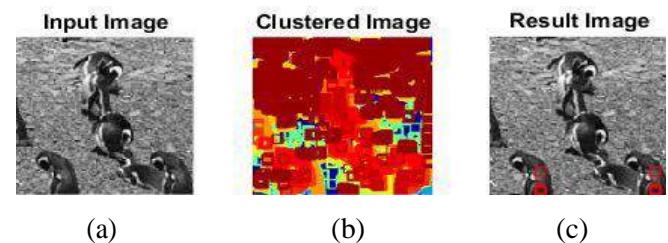
Fig. 3.1 (a)The input tampered image. (b)The image obtained after clustering using k means. (c)Areas of two similar blocks are highlighted.


(a)   (b)   (c)
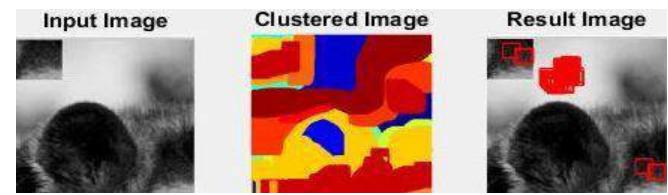
Fig. 3.2 (a)The input tampered image. (b)The image obtained after clustering using k means. (c)Areas of two similar blocks are highlighted.


(a)   (b)
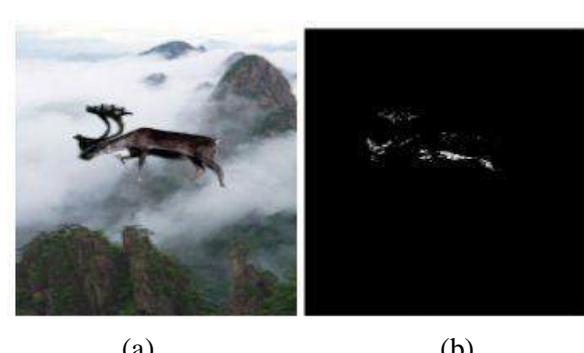
Fig. 3.3 (a) Input Spliced Image. (b) Localized forged area after splicing detection.

V. CONCLUSION

With the increasing use of image editing tools, forgery detection has become a mandatory need. In this paper, the proposed system does forgery detection as well as forgery localization. This paper focuses on a fusion method of Copy-Move and Image Splicing Technique so that we can have a complete single system that detects two very common manipulations in an image. The images are subject to manipulation by copying a part of that particular image or by cutting a part of the other image in order to make a misleading image. Therefore, there is maximum need for various forgery detection techniques that can detect every kind of forgery. Precise and automatic detection of manipulations by learning from past experiences will be discussed in our future work.

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Vehicle Security & Monitoring

Shreyans Shroff, Ashutosh Singh, Himanshu Tawde, Prof. Jyoti Wadmare

K. J. Somaiya Institute of Engineering & Information Technology, Sion 400022

Shroffshreyans7@gmail.com,ashu20071@gmail.com,tawdehimanshu21@gmail.com,jyoti@somaiya.edu

Abstract—**Our project is to develop and provide effective security mechanism which delivers a high-performance system tailored for two wheelers. This document represents the requirements analysis effort to define technical process and requirements for Vehicle Security & Monitoring. The resulting software and hardware product will be 'Vehicle Security & Monitoring' which willhelp the consumer to track their vehicle with the help of an android smartphone in the case of theft by mapping the location of the vehicle on to the map on the smartphone. This software makes us aware about the various threats and vulnerabilities encountered in our day to day lives of using internet and other accessories connected to the web. Given the right circumstances, these vulnerabilities are capitalized on with full immense and shoved to exploit our every resource. Hence, this tool provides us with every measure we can take to annihilatethese situations.**

Keywords — **Global Positioning System (GPS), Global System for Mobile Communications (GSM), Arduino board, Relay switch, Bluetooth, Tracking.**

I. INTRODUCTION

The security locks provided in the vehicles (two wheelers) by the companies are just a key and a lock (with integrated ignition system) which is fixed in a vehicle. The lock acts as a switch for the engine. The lock is connected to the engine via copper wires which are not even properly concealed. The key is used to unlock the vehicle and switch on the ignition. Technically these kinds of locks are easily hackable. [5]
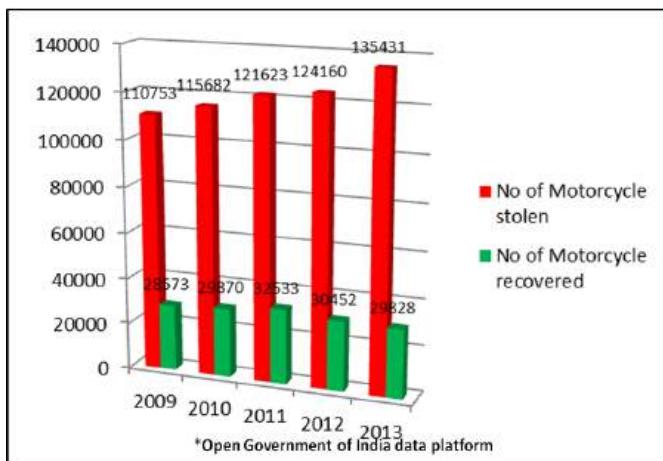
Fig1: Theft statistics in India

To overcome this security flaws IOT based automobile security and monitoring system is used. Basically, this system provides security to the vehicle with the help of a GSM module, relays and Arduino board fixed in the vehicle which acts as a switch [5] which can be turned on and off via phone calls. The system also consists a motion detector and buzzer which add to the security of the system. It also helps to monitor the vital factors such as engine temperature, fuel level, tyre pressure, etc. This system also helps the consumer to track their vehicle with the help of an android smartphone

in the case of theft by mapping the location of the vehicle on to the map on the smartphone.

The significant increase in world population has led to a proportional increase in the demand of vehicles as a necessity of life. With a plethora of vehicles on the roads, news of deaths occurring due to road accidents have become very common. Similarly, increase in crime activities has also led to vehicles being stolen more often. [5] Vehicle Tracking Systems are an important precaution that should be considered for ensuring life and vehicle security since they are equipped to keep the user informed about the vehicle's location through telecommunication.

Vehicle tracking systems are of two types, Passive and Active. Passive systems are the simplest trackers which record the position of the vehicle. These trackers can be later removed and transferred to a computer for storage and analysis. Active car trackers are the ones more commonly used and presented in this paper. These systems possess the ability to transmit the vehicle's location in real time to a central location. However, in most cases the GPS coordinates directly received by the system from the satellite can be somewhat inaccurate and have to be processed or compared with sources containing accurate positioning data to determine the actual location of the vehicle. Most tracking systems [2] employ different map matching techniques to achieve this accuracy.
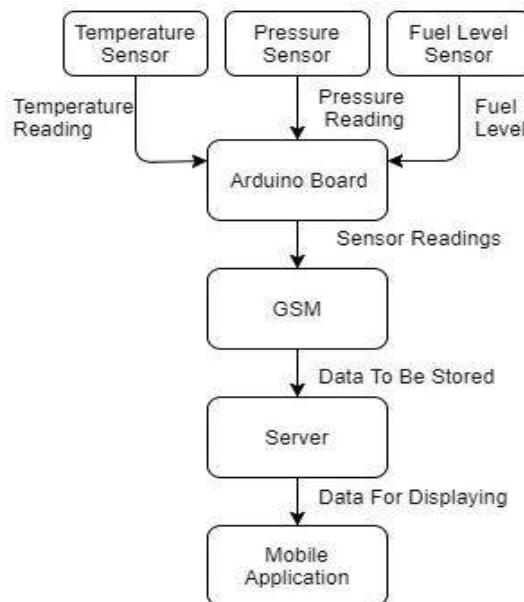

Fig 2: Data Flow

The monitoring process involves getting vehicle's currentstatus,getting history of the vehicle`s whereabouts or real-time monitoring of the location. Also, to receive SMS alerts, notify events, the system can also be used to prevent vehicle theft by combining the device with the buzzer notifier andgetting a map with the vehicle location in case of robbery of the vehicle. This system uses a good range of technological aspects to track and monitor every movement

and alterations to the vehicle. Some of the used modules are Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Internet or the Web and Global Positioning System (GPS). [4]

II. LITERATURE REVIEW

With the already increasing demand of vehicle tracking (two-wheelers specifically), quite a few systems have been proposed and implemented.The already available applications provide the user with their services, either through a website or an installed software application. A GPRS device is used to obtain the data of several monitoring values present in the vehicle which has another device for reading these values. Thisinvolvesa map which tracks the user's current location and maps it into the application, also other monitoring reports are sent to the user [1].A few other functionalities are provided by some other systems such as viewing the history of vehicle's movements for a certain period of days, search for a specific route while in the vehicle and move to a destination [2]. A different way this system can be used is to have a main server located within the administrator which calculates the travelling distances responding to the requests and reports to the user's application, which may or may not be in real time [3]. The co-ordinates of the vehicle are sent to the user's system through the GPS in form of messages, which can be received by the owner and then mapped into any local, usable map application such as Google Maps. There is a tonne of technological development in the field of vehicle theft protection and many of them have succeeded to an appreciable level. The extra module used is the accelerometer which majorly contains the MEMS sensor which offers a low price for good quality.An already existing and published system[3] uses a pass filter and is used forTap Detection, Shake Detection and Orientation Detection. An additional use of temperature sensor is carried out with a specific purpose to obtain the vehicle's engine temperature which changes over the course of utilized period and this estimation of temperature is transmitted to the system by converting it into electrical signal.

III. PROPOSED SYSTEM

The main purpose of this proposed system is to make the application of tracking vehicles much more adaptable and efficient to any individual or concerned institution. In addition to the server or web-based tracking system, this system also provides a mobile application that allows a wide range of users to receive various tracking services. This system allows users to track their vehicle's exact position, speed and movements. This feature is specialized in scenarios where any other person is driving the user's vehicle, so that the owner can easily track and monitor the vehicle. [1]

The major services provided by this system are categorized into the following sections:

A.Security: This system provides security to the vehicle with the help of a GSM module, relays and Arduino board fixed in the vehicle which acts as a switch which can be turned on and off via phone calls.

The system also consists a motion detector and buzzer which add to the security of the system.
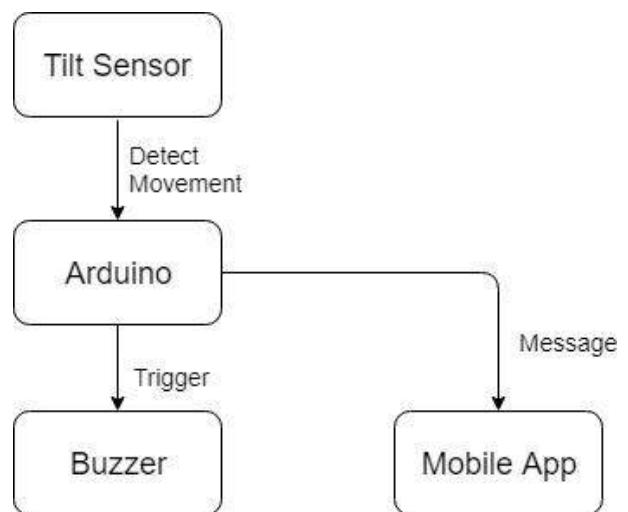

Fig 3: Alert for Movement
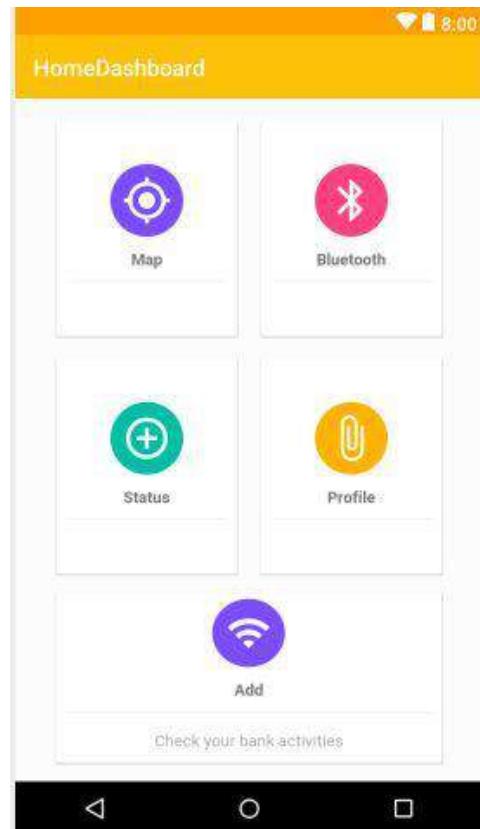
Fig 4: Application Menu Drawer
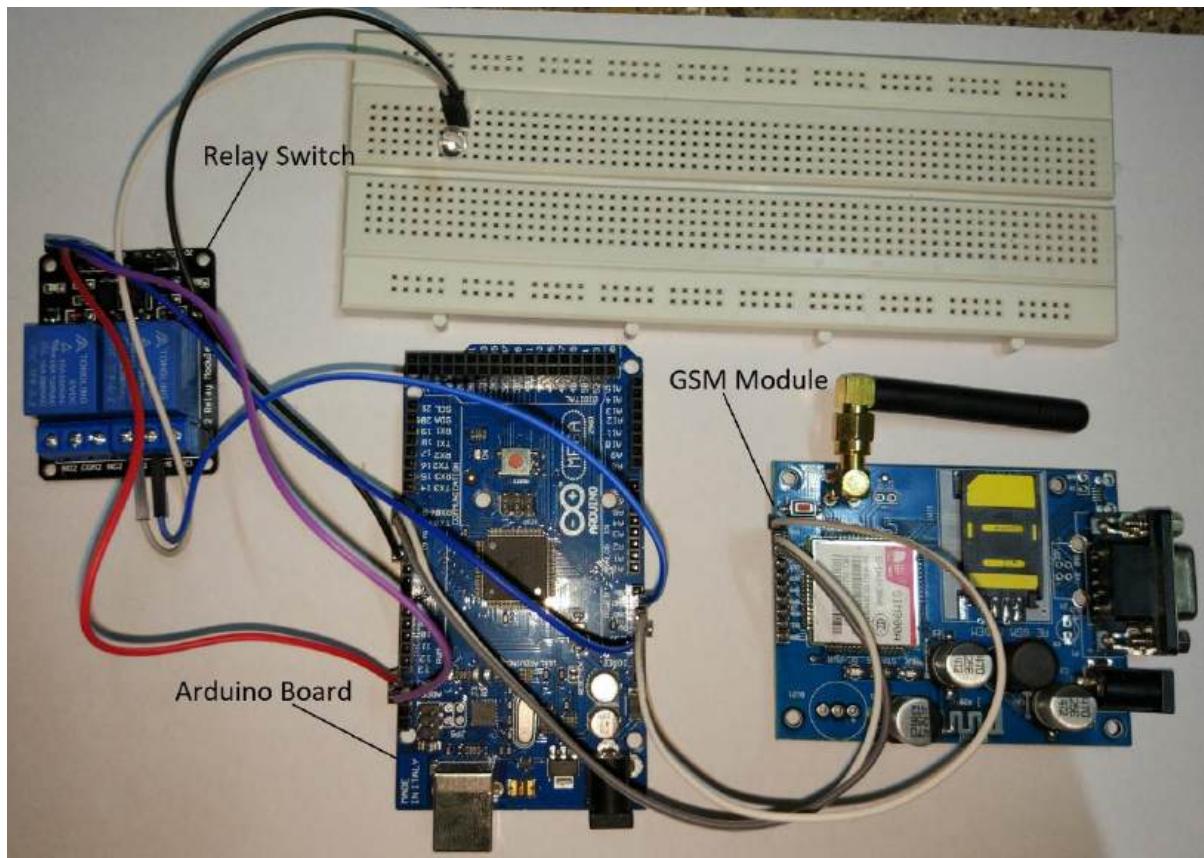
Fig5: Circuit Setup

B. Tracking: This system helps the consumer to track their vehicle with the help of an android smartphone in the case of theft by mapping the location of the vehicle on to the map on the smartphone.

C. Monitoring: It also helps to monitor the vital factors such as engine temperature, fuel level, tyre pressure, etc. All these data can be viewed using mobile application
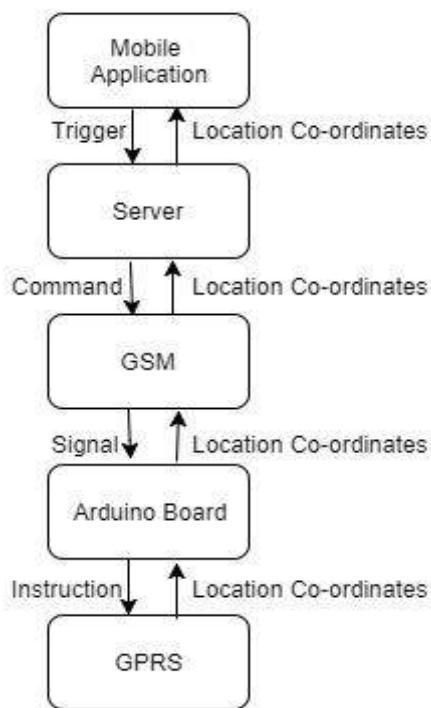

Fig6: Tracking Architecture
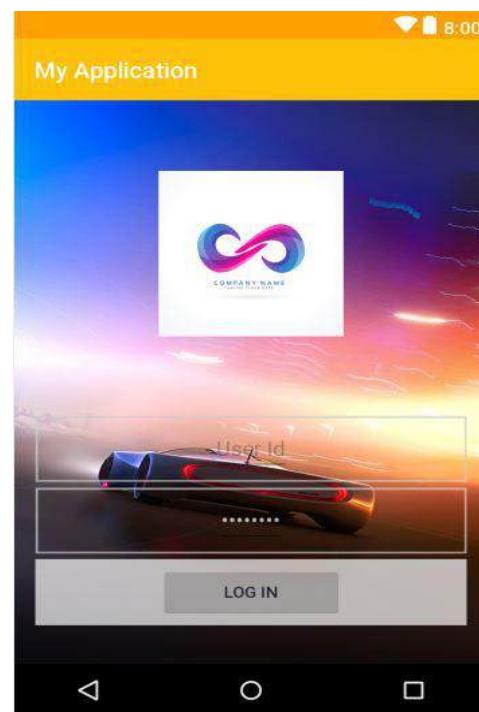
Fig 7: Application Login Page

IV. Conclusion

It is strongly believed that the development of a nation could be done only through progressive development of all class of people. Hence this vehicle tracking system which not only proves to be effective but also cheap would definitely help a great deal in bringing down expenses, ensuring the safety of the vehicle be it 2 or 3 or 4 or even higher wheeled vehicles.

Technology achieves success only when it meets every stratum of people. Apart from the various GPS tracking devices this project introduces a first of its kind vehicle tracking system that works only using GSM technology, which would be the cheapest source of vehicle tracking anti-theft system. It is a small kit that consists of a GSM module and several other components. [5] The system can be switched ON by an SMS from the owner, which in turn instructs the microcontroller to turn OFF the vehicle, receive information about the vehicle's current location or more.

V. Future Scope

This is a very promising aspect in the field of security which is growing in the internet industry ever since the beginning It can prove to be an exceptional result for the money value put in on a scalar basis.It can be very well integrated with almost any security application interface.Given the circumstances, it can prove to be very useful for the simple user.Also, due to the Arduino board having modularity, several components can be attached or integrated with this microcontroller in the future if need be. [3] This advantage is emphatic in terms of re-evaluation. In this field of technology, the ever-growing sense of adaptability and innovation is inevitable. Thus, a modular system, not only gives us the chance to adapt to and integrate new system within the current system, but also eradicate the vestigial and unoptimized modules from within the system. [2]

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ABHIGYAAN: Source of knowledge for visually impaired using vibrations

Nidhi K Bhatt
U G Student, KJSIEIT, Mumbai
University Of Mumbai, India
nidhi.b@somaiya.edu

.   Harsh U. Rajgor
U G Student, KJSIEIT, Mumbai
.University of Mumbai, India
harsh.ur@somaiya.edu

Yash B. Gajara
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
yash.gajara@somaiya.edu

Prof. Sarita P. Ambadekar
Faculty KJSIEIT
.   University of Mumbai, India
sarita.ambadekar@somaiya.edu

Abstract- **In this world there are many people who are visually disabled. In our daily life our eyes play an important role in guiding us through all activities but what about the unfortunate people who are not able to use their vision, Abhigyaan is a low cost educational device that will help the visually impaired to gain knowledge with ease. Knowledge is the key to life, without knowledge it is difficult for a human to live life at par. It is very important to get the formal education to withstand the pressure of society. The gap between the knowledge and the visually impaired people can be solved with the help of Abhigyaan. Abhigyaan is a tablet like device specially designed for blind people using the braille technology. The user will be able to navigate through millions of pages of information just at one place, they can navigate easily with the buttons provided on the device. Abhigyaan comes with an audio output where the audio clip of text can be heard. Abhigyaan comes with predefined study material which can be accessed anytime. With this device we are trying to bridge the gap between knowledge and visually impaired people. Abhigyaan being a low-cost device, easy to use by the visually challenged. It completely fits as a solution in terms of features and money factor. Also, the design is portable and not complex. The main objective is to build a source of knowledge for visually impaired people.**

Keywords: Visually Impaired People, Braille, DC Motor, Audio, Refreshable Braille.

I. INTRODUCTION

The project Abhigyaan is a tablet for blind, which consists of dots for braille, buttons for next and previous text and a file selection system on the main display. The visually impaired will sense and navigate through the vibrations of the DC motor dots. These vibrations denote a word, an alphabet or numbers. External storage option will also be available for reading the files through memory card. An output in the form of sound will also be available for previously stored files. Headphone jack will be on the device to listen to file. The device can operate in 3 modes.

1. Serial Data mode – in this mode the data is transferred from laptop or a computer to the device using USB cable. The device is connected to the computer with a USB cable. Arduino IDE serial monitor can be used to send data to Arduino for braille conversion. Using the Serial monitor the data is transferred to the device, device will convert the data in braille format and it will be available for reading.

2. External Storage Mode – A micro memory card slot will be available on the device. This slot can be used to get the data from the external source. All the files should be in the text format, device will read the files and convert it line by line and make it available for reading in braille format.

3. Pre-defined Data – In this mode the data from the device itself will be displayed. The device comes with all the necessary information for education to a level. The predefined data fulfils the basic need of information.

II. PROBLEM STATEMENT

According to world health organization Factsheets 1.285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision. 2. About 90% of the world's visually impaired live in low-income settings. 3. An estimated 19 million children are visually impaired. Of these, 12 million children are visually impaired due to refractive errors, a condition that could be easily diagnosed and corrected. 1.4 million are irreversibly blind for the rest of their lives and need visual rehabilitation interventions for a full psychological and personal development.

With all the facts seen above what they miss out is the education. The current education system has braille system but the printing cost and the availability are some factors that affect the education. For the past few years many technologies have emerged out of which refreshable braille is the one but the concept is still under development and has production flaws. Our concept for the refreshable braille will solve out the production cost factors and will be developed according to all the needs of the targeted society.

Problem 1 – Education – Primary education is considered to be a basic right and a basic need for everyone. But visually impaired people miss out on education. no proper study material is available for them. The technology used for study material is braille printer, braille books. But the problem with it is cost and availability. The study material is not easily available for them.

Problem 2 Dependency – With missing out on education they have to depend upon others, the dependency factor increases.

III. FEATURES

1. Refreshable braille – The braille data can be refreshed infinite times; all the information can be read at one place.

2. External memory card slot – external media can be used as source for data, a memory card with data can be plugged in and information can be read in braille format.

3. Headphone jack – Stored information have audio clips with it, while reading the audio of that data can be heard.

4. Operates in 3 Different mode – Abhigyaan supports 3 different data sources serial data from computer, external data and stored data.

5. Low in cost – the cost of the project is very less as compared to other similar technologies available in market.
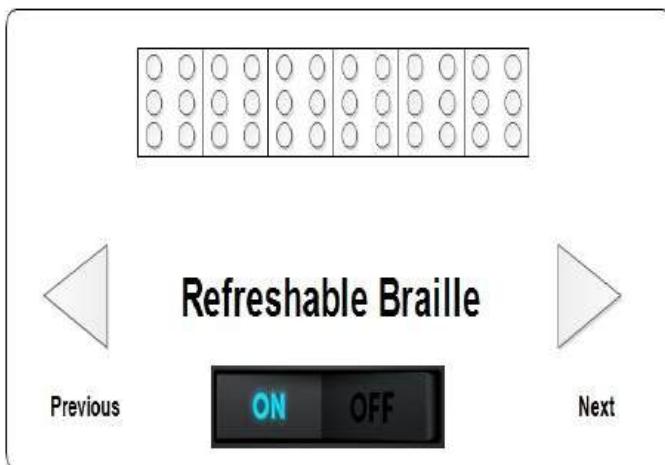
Fig. 1. ABHIGYAAN Device Outer Layout.

The Layout of the device is shown in Fig. 1. The user will be able so sense the dots on the top side of the device as shown in Fig. 1. There are 2 navigation buttons Next and Previous on the device. There is an ON/OFF switch that is used to switch on and off the device.

IV. TECHNOLOGY REQUIRED

HARDWARE

1. Arduino Board – It is a microcontroller board that is used for controlling the DC motor array and buttons.

2. Link it one board- It is a advanced microcontroller board that is used to control the device, it will act as main board of the device.

3. DC motors – The DC motors are used to form a cell of 6 motors. The data is displayed in the form of braille using DC motors.

4. Push buttons – The Push Buttons are used for navigation to fetch next and previous data.

SOFTWARE

1. Arduino IDE – The serial monitor for data transfer, code uploading and board controlling is done using Arduino IDE.

2. Link-It One Compiler – This is an add on compiler for Link-It one that is used with Arduino Ide to control Link-It One Board.

V. METHODOLOGY

1. Connect Power Supply to the device
2. Switch on the device
3. Use navigation button to get access to stored data.
4. Connect device to computer to use serial data.
5. Open Arduino serial monitor and send data
6. Read data on the device
7. Insert memory card in memory slot
8. Read the converted braille data on the device
9. Connect headphone in audio jack to listen to audio clip of words and alphabets.
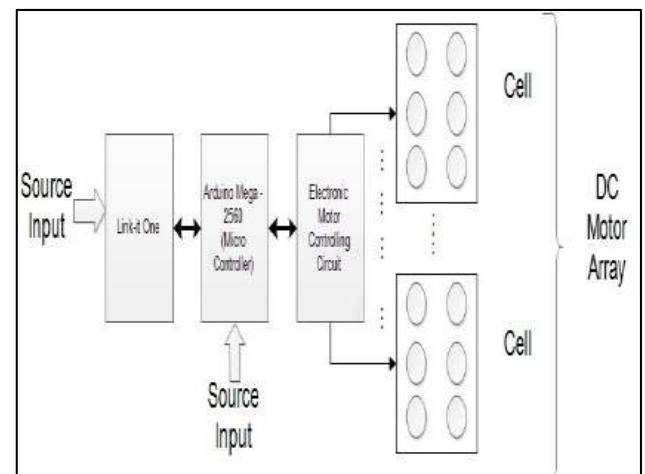
Fig. 2. ABHIGYAAN Block Diagram.

The block diagram of the system is shown in Fig. 2. The diagram shows the detail layout of each component and the flow of working. As shown in the layout 2 sources of input the third one is pre-defined or stored in the board itself. The link it one board is the main board the controls the system. The device will have 2 controlling board. These Controlling board are used to take input and give output. The main board controls the Arduino board. On other hand Arduino board controls the motors with the help of electronic circuit.
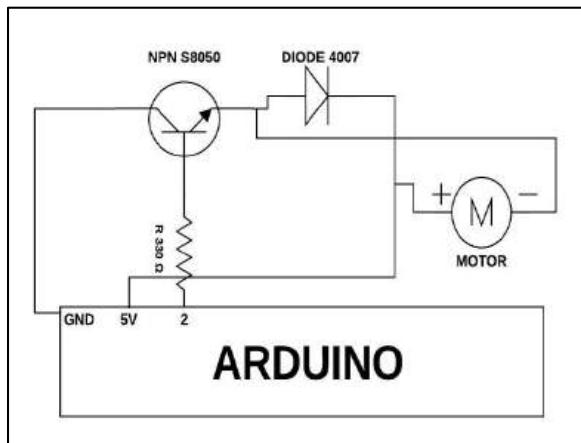
Fig. 3. Circuit diagram for motor controlling

The circuit connection of controlling one DC motor using Arduino is shown in Fig. 3. Circuit diagram for motor controlling. The digital pin from Arduino that is pin 2 is used to control the motor. The motor value ranges from 0 to 255. This value is passed from pin number 2 to the transistor. The transistor required is NPN bipolar junction S8050 transistor. The data pin output from Arduino forms input for the transistor. To keep the current flowing in only direction diode is used. We have used the diode of family 4007. Both the ends of diode are connected to the motor. The final output to the motor goes from diode. A resistor of 330 ohms is used. The color band of resistor orange, orange, brown and gold.

Systems point of view:

The output is displayed in the dc motor array, the input from 3 different sources are always in text format. The input of text format is converted into the motor data and is mapped to cells. At the same time the audio is played of the displayed data. One controlling board acts as main board that controls the other board. The second controlling board is used for the output of dc motors. The device on the system side will receive the data in string format. This string data is divided into words. Then words are checked for the stored commands corresponding to it. Then the corresponding output is given to the specific cell in the device. The power supply source part consists of Voltage reducer and Alternate Current to Direct Current converter. The output from the converter is +5V and 1amps output. The converted current goes as the input to the printed circuit board where the motors are connected. The printed circuit board also gets input from the Arduino digital pins.
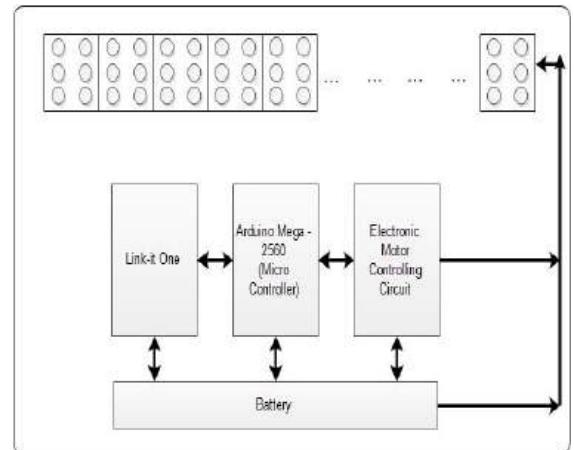

Fig. 4. ABHIGYAAN System Flow.

The system flow of ABHIGYAAN is shown in the Fig. 4. Link − it one board is the main controlling board the gets its power from battery or external source. Link it one board is connected to Arduino 2560 board. Link it one board acts as master and Arduino board acts as slave. Arduino board gets its power from battery or external source. Arduino board is connected to the electronic motor controlling circuit. Arduino gives input to the circuit board. Circuit board control all the motors and it also supplies power to all the motors. The motors vibrate as per the use and give the output.

Users point of view:

The device works in 3 different modes, user can either use the stored data, USB slot for serial data from computer or external storage memory slot. All the input data will be converted to the braille and will be displayed on cells. The audio of the data will be played, user can use the headphone jack to listen to it. Next and Previous button can be used to navigate through files.
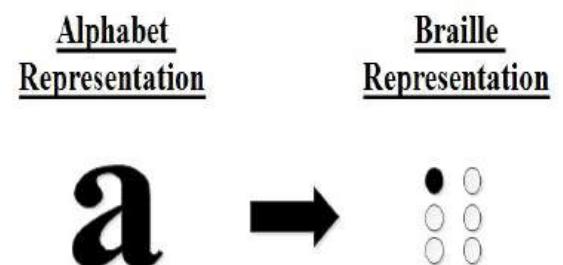

Fig. 5. Alphabet Representation into Braille

Braille language is predefined for blind people in which all the alphabets, numbers, some words and special character are represented in braille format. Braille format consist of 6 dot representations. The numbering of the dots starts from left hand side to right hand side starting from 1 ending to 6. As shown in the Fig. 5. The alphabet "a" is convert in braille format. For character "a" out of 6 dots only one dot is high all other dots are low. The 1st dot of cell is on that is darken and all other are low that is white.

VI. APPLICATION

1. <u>Educational Centre</u> – The device can be used in schools where visually impaired people can learn and start their learning from alphabets, numbers and then sentences.

2. <u>Boot camps</u> – Special events to pass the knowledge and primary education for blind can be provided.

3. <u>Blind People and Blind Deaf People</u> – the device can be used by blind and blind deaf people.

VII. RESULT AND DISCUSSION

On Normal basis for a sentence of 10 words it takes 45 to 60 seconds for beginners. With increasing familiarity with the device and the language the time can be reduced. The constant audio frequency is found to be optimal for the user. The works perfectly in all the three scenario- SD CARD input, Serial input and predefined database.

VIII. CONCLUSION

Our objective of developing a device that will help visually impaired people to gain knowledge is complete. Abhigyaan solves the above stated problems and is efficient. It can be used in schools, boot camps and blind and blind deaf people to gain knowledge. The user can use the device in any mode from the serial mode, external storage mode and stored data mode. The device bridges the gap between education and visually impaired people.

ACKNOWLEDGMENT

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Seed Identification and Crop Disease Detection Using Machine Learning

[1]Avinash Nera

IT Department,
K J Somaiya Institute of Engineering & IT, Sion,
Mumbai, India.
avinash.nera@somaiya.edu

[2]Yash Jethva

IT Department,
K J Somaiya Institute of Engineering & IT, Sion,
Mumbai, India.
yash.jethva@somaiya.edu

[3]Prashant Sawant

Asst. Professor, IT Department,
K J Somaiya Institute of Engineering & IT, Sion,
Mumbai, India.
prashant27@somaiya.edu

Abstract— **India is an agriculture based economy whose most of the GDP comes from farming. In an economy where most of the produced food is from agriculture, the crop disease are a major threat, and their rapid identification remains difficult due to the lack of the necessary infrastructure. To cater to this problem we are implementing a method to identify the disease of the crop by the visual effects on the leaves. By this the identification of the diseases would be easy by using technology as the use of Smartphone is increasing recently. This would ultimately result in an increase in the crop yield and decrease in the suicide rates of the farmers.**

Keywords —Machine Learning, Farming, Crop Disease Detection, Android, Neural Network, Seed Selection.

I. INTRODUCTION

Agriculture plays an important role where economic growth of a country like India. In a scenario where crop yield is decreasing day by day, it is necessary to find a smart system which can solve the problem. According to the recent statistics , the farmer suicide rates have ranged between 1.4 and 1.8 per 100000 total population, over a 10-year period through 2005. Therefore to resolve this problem we are implementing this system to increase the yield rate by providing a way to identify the type of disease the crop is effected by and provide a remedy for that disease.

The project will be an android application that would be used to capture the image of seed and identify the type of seed. It would then display the procedure for growing that seed. The second feature is the detection of the plant disease by capturing the image of the leaf of plant. It would identify the disease based on the visual features. The application will give the remedy and prevention technique for that disease.

For the detection of seed and identification of the disease the Machine Learning will be used to accomplish this. Convolutional Neural Network (CNN)[3][5] model is used. CNN is a powerful model that achieves impressive results for image classification. In addition pre-trained CNN could also be used

to train the model to extract and map the useful features. It works by training itself layer by layer extracting, mapping and optimizing itself to give accurate classification.

II. COMPARISON BETWEEN EXISTING SYSTEM & PROPOSED SYSTEM

A. Existing System

In a developing country like India, farmers may have to go long distances to contact experts, this makes it difficult form them and costly for the farmers and time consuming. The major problem is the identification of the crop disease. This results in the crop yield to decrease which effects both to the farmers and the consumers.

B. Proposed System

Proposed System aims to solve this problem by identifying the disease based on the colored patterns formed on the leaves of the effected crop. Generally most of the diseases of the crops could be found by the leaves and stem.

We have chosen the following approach. The stepwise representation of the approach is as follows:

Step 1: Image acquisition:

The digital images are acquired from the android application by the user and then feed to the classifier algorithm for classification.

Step 2: Classification:

In this step the image is fed to the classifier for classification. CNN is used for the classification which is trained and model is created which is used validating with the image.

Step 3: Provide Result:

Based on the result of the classification it would provide the remedy for the disease.

Below figures show the training and testing approach.
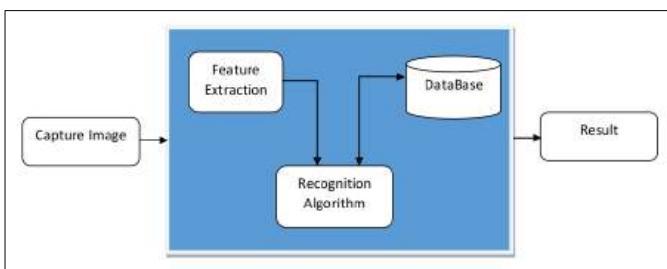
Figure 1: Classifier Training
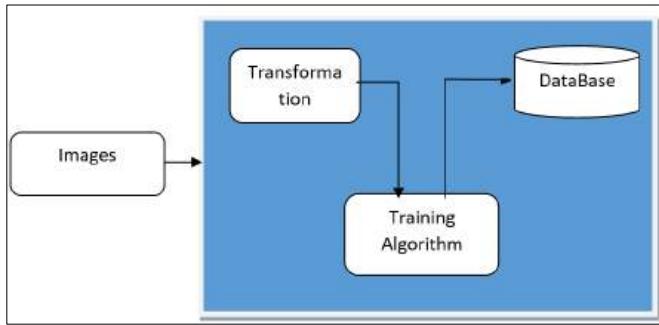
Figure 2: Classifier Validation

III. SYSTEM ARCHITECTURE
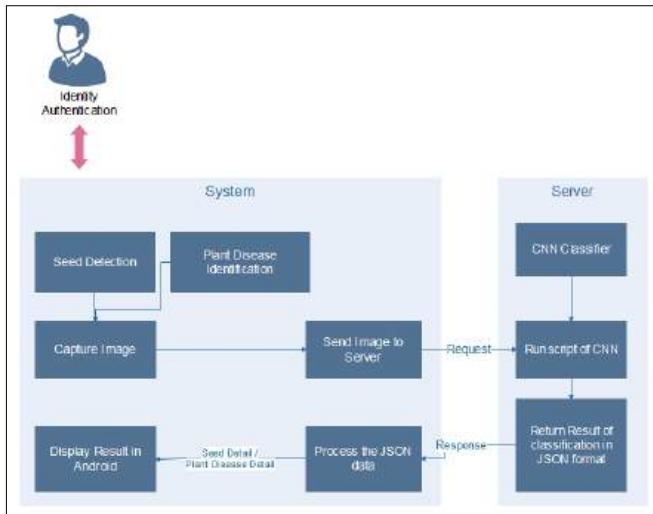
Figure 3: System Architecture

1. System:

System will capture the image of the seed and plant leaf. It sends the image to the server for the classification. The response will be in a JSON format. The JSON data then processed and the result is displayed on an android application.

2. Server:

Server gets the image from the system. On the server it will run the python script to classify the image. It created the JSON formatted output to give response to the system. The trained classifier are stored on a server which contains all the feature set that would be used for validation of the image.

IV. SYSTEM MODULES

Image Processing:

In this module, the Convolutional Neural Network is used to train the classifier to recognize the image. For training the classifier the image set is given as input to the classifier which extracts the features and uses it to recognize the given image.

Android Application:

The Android Application is a way for the user to access the functionality of this project. The user will be provided with a camera application for capturing the image and will get the output. Some of the screens are login, registration, seed recognition, disease identification.

V. METHODOLOGY

To train the classifier from imageset first we have to specify the image height, image width, path of training and validation imageset,no of images used in training and validation images and no of epochs(The 1 epoch is completing the complete training processes from start to end. At the end of 1 epoch the error between the actual output and neural network output is calculated and based on that error further epochs are performed). Now we have to specify the data format of images. There are to formats as "channel_first" and channel_last". "channels_last" uses (rows, cols, channels) while "channels_first" uses (channels, rows, cols) format. Now to receive information about input shape we have to specify the model. Now to train a model using a dataset we have to add Conv2D() method to the model. The Conv2D() will take the input dataset and gives the tensor of output. After getting output from a Conv2D() the Relu Activation function will used. The relu function gives the output x if x is positive and 0 otherwise. Now we have to add MaxPooling2D with the pool_size as (2,2). The MaxPooling2D will take the max of the filter region and create a new output matrix where each element is the max of a region in the original input. Then we use add a flatten to the model. The Flatten() function will create a single long feature vector. To create a tensor of image data we use ImageDataGenerator() method. It will perform rescale,shear, zooming ,horizontal_flip on the images. Now to train the final dataset we use a fit() method. After training model the weights of the trained dataset will be stored in the H5 file using a model.save() method.

Specify the image height and width. Give the path of the training dataset as train and validation. Specify the no of images are used for training and validation. Specify the no of epochs. The 1 epoch is completing the complete training processes from start to end. At the end of 1 epoch the error between the actual output and neural network output is calculated and based on that error further epochs are performed.

To train the classifier from image set first we have to specify the image height, image width, path of training and validation image set, no of images used in training and validation images and no of epochs(The 1 epoch is completing the complete training process from start to end. At the end of 1 epoch the error between the actual output and neural network output is calculated and based on that error further epochs are performed).

if K.image_data_format( ) == 'channels_first':
input_shape = (3, img_width, img_height)
else:
input_shape = (img_width, img_height, 3)

Now we have to specify the data format of images. There are to formats as "channel_first" and channel_last". "channels_last" uses (rows, cols, channels) while "channels_first" uses (channels, rows, cols) format.

model = Sequential( )

Now to receive information about input shape we have to specify the model.

model.add(Conv2D(32, (3, 3), input_shape=input_shape))

Now to train a model using a dataset we have to add Conv2D() method to the model. The Conv2D() will take the input dataset and gives the tensor of output.

model.add(Activation('relu'))

After getting output from a Conv2D() the Relu Activation function will used. The relu function gives the output x if x is positive and 0 otherwise.

A(x) = max(0,x)
model.add(MaxPooling2D(pool_size=(2, 2)))

Now we have to add MaxPooling2D with the pool_size as (2,2). The MaxPooling2D will take the max of the filter region and create a new output matrix where each element is the max of a region in the original input.

model.add(Flatten( ))

Then we use add a flatten to the model. The Flatten() function will create a single long feature vector.

train_datagen = ImageDataGenerator(
rescale=1. / 255,
shear_range=0.2,
zoom_range=0.2,
horizontal_flip=True)

To create a tensor of image data we use ImageDataGenerator() method. It will perform rescale,shear, zooming ,horizontal_flip on the images.

model.fit_generator(
train_generator,
steps_per_epoch=nb_train_samples // batch_size,
epochs=epochs,
validation_data=validation_generator,
validation_steps=nb_validation_samples // batch_size)
Now to train the final dataset we use a fit() method.

model.save('first_try.h5')

After training model the weights of the trained dataset will be stored in the H5 file using a model.save() method. We start up with making the image set for training the neural network. For that a directory is created which contains set of images of the particular seed and store it in different directories for each seed as shown in figure 4.
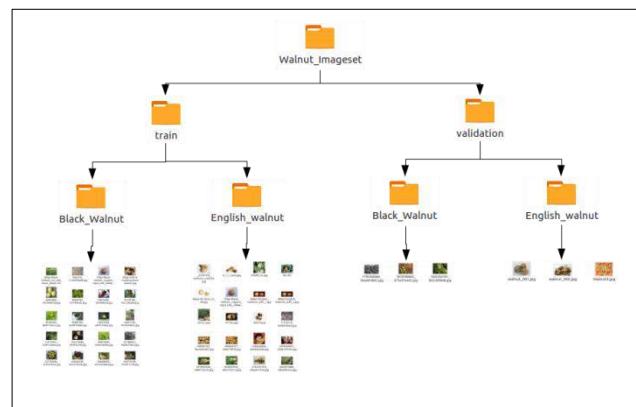

Figure 4: ImageSet Hierarchy

To train the model we give the imageset to the training code. The images are given to the Convolutional Network which takes the inputs and applies the filter on it. Here filter is random matrix of 2 x 2 or 4 x 4. Based on the matrix size the processing is done. The matrix multiplication between the filter and the part of the image scanned is calculated. This is like holding a flash light and moving from top left corner horizontally scanning every line to the bottom right. The displacement of the filter is based on the stride specified. Stride 1 means the filter will move 1 pixel to the right and filter is captured.
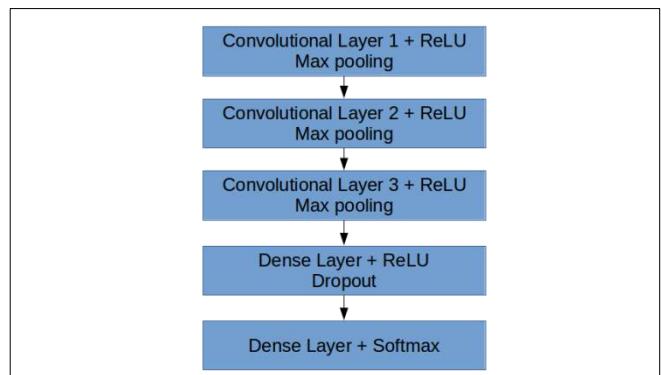

Figure 5: CNN Architecture

After applying the Convolution Layer it is given to the activation layer. Here ReLU as an activation function because it makes the training process faster. Basically, ReLU changes the negative values to zero and keeps the positive values unchanged. The convolution Layer can repeated according to the need of the neural network.

Figure 6: Output of CNN Layer

Max pooling is the next function which is a sample based discretization process. The objective here is o reduce the dimensionality of the input which helps reducing over fitting and also reduce the computational cost. If the max pooling filter is 2 x 2 then the 4 values will be replaced with the maximum of the 4 values.

The output from the above layers is given to the flatten layer. The flatten layer will create a single vector data from the given input data. After this the model is trained with the fit method. The Fit method will process the data and save the weights on the model. The data is stored in a H5 file.

To save the final model we use model.save() method. By using the generated H5 file we could do the validation of the neural network. The image is captured from the mobile device and sent to the server for validation.

Figure 8: Sample Image captured from mobile device

At the server the image is stored temporarily and given to the trained model which predicts and returns the output in JSON format which is sent back to the mobile device.
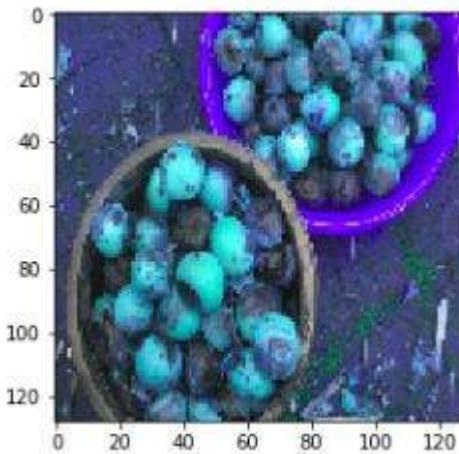

Figure 9: Image being processed for validation

VII. CONCLUSION

Successfully integrating machine learning with agriculture in selecting of crop seed and predict crop diseases, can lead to further advancements in agriculture by maximizing yield and optimizing the use of resources available.

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Blood Donors Around Us

Neha Solanki
Department of Information Technology,
K.J. Somaiya Institute of Engineering and IT, Sion,
Mumbai, India
neha.solanki@somaiya.edu

Aboli Tupe
Department of Information Technology,
K.J. Somaiya Institute of Engineering and IT, Sion,
Mumbai, India
aboli.tupe@somaiya.edu

Padma Anaokar
Department of Information Technology,
K. J. Somaiya Institute of Engineering and IT, Sion
Mumbai, India
padma.anaokar@somaiya.edu

Prof. Vaishali Gaikwad
Asst. Professor, Department of Information Technology
K.J. Somaiya Institute of Engineering and IT, Sion,
Mumbai, India
mohite@somaiya.edu

Abstract: **Blood donations are conducted in India by several organizations and hospitals by organizing blood donation camps in rural as well as urban areas. Even after so many blood donation camps carried out throughout the country the entire year, the major problem of shortage of blood still arises. As a seeker (a person who want a blood) , it is important for him or her to receive the safest blood possible as soon as possible. We know that blood banks play a major role in this task, but today even blood banks are facing problems such as storage of blood, i.e, whole blood can be stored up to 35 days, when kept in CPDA anti-coagulant solution and refrigerated at 2-4 deg C. Due to lack of storage facilities blood bank is not able to store enough amount of blood. Another major problem faced by many blood banks is getting donors for platelets as common people are not aware of plateletpheresis. Our implemented system is an android app which makes direct contact between donor and seeker where donors are filtered based on required blood group, donors last donation date and seekers current location. The filtered donors are notified via SMS. The App acts as a platform to make people aware of plateletpheresis and myths and facts related blood donation. A common man willing to donate blood or platelet can register himself through our App and get further notification of notification.**

Keywords:CART, Seeker, SMS, Donor, Plateletpheresis

I. INTRODUCTION

As a seeker (a person who want a blood) for a blood transfusion, it is important for him or her to receive the safest blood possible form the blood bank. All we know that the major task is done by the Blood bank is to provide the blood to seeker when they required.

Problem 1: Whole blood can be stored up to 35 days, when kept in CPDA anti-coagulant solution and refrigerated at 2-4 deg C. Few blood banks are using Whole blood for preparing components such as Packed red cells (PCV),Fresh Frozen Plasma (FFP)& Random donor platelets (RDP) from single blood donor. Packed red blood cells can be stored for 35 day using CDPA and for 42 days if SAGAM solution is added. But blood banks today face the problem of getting donors for bloods and platelets during emergency cases especially in dry seasons like Diwali and summer.

Problem 2: Another major problem faced by many blood banks is getting donors for platelets. Because of the fact that people are not aware of what is Plateletpheresis.

Problem 3: Another problem is there is no direct contact between donor and seeker. If a seeker who is need of blood can make contact with donor only through blood banks or through NGO's.

Problem 4: People today are also not aware of myths and facts related to blood donation.

What is Plateletpheresis?

The process of removing the whole blood from donor and separating it into its various components, keeping the platelets and returning the other components back to the donor is termed as Plateletpheresis. The various components of blood include plasma, red cells, white cells and platelets. Plateletpheresis can be beneficial while treating serious lifesaving issues from bleeding and haemorrhage in patients who have disorders manifesting as thrombocytopenia (low platelet count) or platelet dysfunction. This can also be used to treat patients who have high platelet count i.e. thrombocytosis.

The paper is categorized into several module.The IInd module contains the literature survey and contains information of various papers that we referred. The IIIrd module is a comparison between our system and the existing systems. The next module i.e. IVth module describes the System architecture of our system. The Vth module explains the methodology of the system workflow. The VIth module contains the conclusion of the we have achieved.

II. LITERATURE SURVEY:

It is important that as the seeker of the blood it is necessary for him or her to receive safest blood as soon as possible. There are many existing system. Some of which to described are as follows:

The paper **"Blood donor information filter based on seeker voice"** describes an android application which works are as follows, when a seeker required the particular blood group at the time of casualty seeker used this voice based application in this proposed model seeker just ask the keyword in our model we are used "HELLO" followed by the blood group like "B". So complete word is "HELLO B" when a seeker required a B group. So the Licensed blood bank is server send the 10 to 15 donor contact number to seeker. In this system
Donors data is filtered only based on one parameter that is required blood group and donor's contact is given to the seeker no other process of contacting donors[1][3].

The paper "**Design and Implementation of Automated Blood Bank using Embedded Systems**" describesthe communication takes place via SMS (Short Messaging Service) which is compatible with almost all mobile types. "Automated Blood Bank" proposes to bring voluntary blood donors and those in need of blood on to a common platform. This project is originated on an android APP, this will help to find the donors. Blood donor will participate in donor list using APP. Suppose if any need in blood, will get the donor list in this APP. Here in this APP, only 3 Blood group (A+, B+, O+) Data base is established. The recent interested donor number will be available in the data base. This project uses GSM modem interfaced to the controller i.e. LPC2148. GSM is interfaced through the MAX232 to the Controller. This app helped to get limited Number of blood group donors of three blood groups. It used an embedded system for getting the information [2].

The paper **"Automated Online Blood Bank Database"** describes a system which basically overcomes communication barriers between donors and seeker by providing a direct call routing technique using Asterisk hardware. A blood bank database is created by collection of details from various sources like Blood banks, NSS, NGO's, hospitals and through web interface. The data collected will be maintained in a central server. This central server will be associated with a Toll free number that can be used to connect to it. An algorithm will be defined based on the various parameters that need to be accounted for, before blood transfer is done. The willingness of donor and the closeness of the donor to the place from where the call is coming are also accounted for in defining this algorithm. Based on the algorithm the most eligible donor is found out. From the

server the call from the required person is routed to the eligible donor's number. Such a system considerably cuts down on the overheads involved in referring to an online database and then calling the donors and verifying their willingness at a time when there is a critical need for the blood. The system used high speed server to handle large user traffic. It also tackled fake calls[4][7].

The paper "**The Development of Web-Based System for Blood Requisition within Blood Supply Chain"** has described web-based system for blood bag requisition was designed and developed to reflect the real practice of the blood bank and hospitals in the blood supply chain network. It enhances information flow among all members within the supply chain and improves communication for making blood requisition more rapidly and accurately. Blood bank staffs are able to obtain the precise information regarding blood requests from the hospitals and make appropriate distribution. The system created a connection between the donor and seeker via blood banks. The hospitals had an online portal in order to search the blood required[9][13].

The paper **"Data Analysis for Healthcare: A Case Study in Blood Donation Centre Analysis"** describe the process in identifying the best location for Hong Kong Red Cross Blood Transfusion Service to establish a new blood donation centre based on past donation datareceived. Our analysis is divided into two parts. The first part focuses on data analysis which studies the context of data itself. We have identified the relationship among donor's age, gender, blood type and frequency of donation, the relationship between donation frequencies and distance from the donation centre, the characteristic of different donation centre, and the trend of blood donation. The second part focuses on new centre analysis which applies the findings derived from the first part in identifying the best location for establishing a new blood donation centre[8] [12].

The paper "**A Dynamic Blood Information Management System Based on RFID**" has objective in ensuring quality of blood. .In the Proposed model author are used the fingerprint sensor for identifying the blood donor .GPRS General Packet Radio Service is also applied in this Process model that help to transform the real time data to bloodmobile and centre via wireless internet .In this model each donor have smart card in this card all the information are stored this smart card have inbuilt memory card this is include the basic information about the donor and blood donation database, donor place, time etc. .This process model working is registration based it means donor first Register in the system this system is basically used for maintain the donor information in a card. [10] [14].

The paper **"Development of Blood Donation Activity Support System on Service Design"** describes

a framework that focuses on service design and has developed a blood donation promotion application along with a donor support system. The application was able to construct a donor support system based on the overall nature including stakeholders that could not be derived from the conventional planned behaviour of the model. They also conducted a survey on awareness concerning blood donation promotion application.This paper uses Heuristics function and human factors for to plan a behaviour pattern [13].

The paper "**Banking on blood [electronic donor card system**" recommends an electronic donor card system, which can optimise the blood donation procedure and also enhance the satisfaction of blood donors. Such system facilitates information acquisition and production during the registration of donors As in todays world of information Technology donors would prefer electronic donor card. Hence, the QoS of a blood centre will be enhanced with the introduction of an electronic donor card system [16].

The paper "**Bloodhub: A context aware system to increase voluntary blood donors participation"**describes that the two main reasons of why people do not donate blood are they are too far from thelocation of blood donation and other is that they have never been asked to donate blood so toovercome this problem they implemented a smart phone application which uses gamificationtechnique to increase the participation of blood donors. It is a context aware system, means that thesystem is aware of its location and current time which are the features widely used in smart phones today. The system only gives relevant information of blood donation to the donors who are currently presentat that location where blood is needed [12].

The paper **"Design and implementation of short message service (SMS) based blood bank"** describes a system based on GSM modem, smart card CPU-Raspberry Pi 2 kit and IR sensors Zigbee module. This system works as follows the receptor simply sends the SMS in a predefined format, the system than checks the availability of required blood at blood banks if the blood is available than the receptor will be given the details of that blood banks otherwise he or she gets the contact details of registered donors at local database [17].

III.EXISTING SYSTEM v/s IMPLEMENTED SYSTEM

The Table 1 shows the comparison between the Implemented system and the Existing system. The comparison is done based on the research work done.

Implemented System	Existing System
1. Data is filtered based on 3 parameters i.e. required blood group, seeker's current location, donors' last donation date.	1. In existing system data is filtered based on only one parameter i.e. required blood group.
2. In proposed system also makes people aware of what is plateletpheresis.	2. Existing system does not consist of such activity.
3. In proposed system, a person who is wishing to be a donor can voluntarily register themselves as donor to receive further notification	3. Existing system does not have such facility.
4. Proposed system not only store details about donors but also seeker who uses our app	4.Existing system stores information only about donors.
5. If a seeker doesn't gets a donor within certain amount of time than proposed system also has facility to again run the algorithm with increased radius.	5. Existing system does not have such facility.
6. Proposed System also keeps option to contact blood banks if no donors available.	6. Existing System do also have a facility to contact blood banks.

Table 1: Comaparison b/w Existing and Implemented System

IV. SYSTEM ARCHITECTURE

The Figure1 shows the block diagram of the system which explains the working of our system. It also gives small glimpses of the system forbetter understanding of work flow.

Fig 2. Donors List
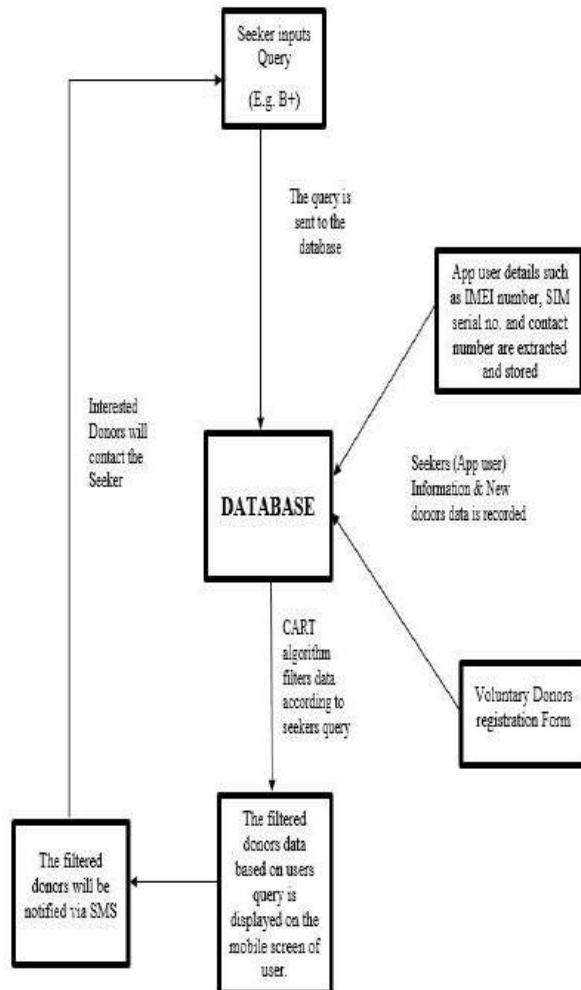
V. METHODOLOGY

Working Phases of App:

Phases 1:

The phase 1 c _{Fig 1. System Architecture} ated to donors.

The Figure 2 consists of the database which stores donors details such as Name, Contact Number, Address, Blood Group, Date of Birth and the donors Last Donation date.

Phases 2:

The seeker will type or speak the required blood group. The donor's data will be filtered using CART algorithm according to the following parameters, required blood group, donors last donation date and seekers current location and then the filtered donors details such as Name and Contact No. will be displayed on the screen along with that instant SMS containing seekers' details will be sent to filtered donors.

For security reasons, we store details such as IMEI No., Mobile No. and Sim Serial No. in our database.

The Figure 3 shows the list of all the donors with O+ blood group.

After certain amount of time if the seeker does not get any donor then the seeker has an option to notify the donors again but this time larger area is covered.

Even after this if seeker don't get any donors then he will be given options of various blood banks.

The same procedure will be followed by the Hospitals and Blood banks who also act as a seeker.

Fig 3. Filtered Donors List

Phase 3:

We are also making people aware about Plateletpheresis so there is be section in which information about plateletpheresis and option for users of app to register themselves voluntarily as a platelet donor as well as blood donor. The section includes information regarding Plateletpheresis, the myths related to the same. As not many people are aware of donating platelets, this section will help people make aware. Also we are providing a form for voluntarily be a donor and the information will be stored in the database.

The Figure 4.1 and Figure 4.2 explains the section in which there is information regarding Plateletpheresis and the Donors registration form respectively. Donors Registration Form allows people to voluntarily register themselves as a donor so that they can receive the further notifications for donations.


Fig 4.1: Awareness about Plateletpheresis

Fig 4.2 Donors registration Form

Phase 4:

We are also providing a section which will provide information related to myths and facts about blood donation.

Phase 5:

A person who as downloaded our app can also add people, who according to him can be a donor or the one who can need this app in his contacts i.e. in his phone book.
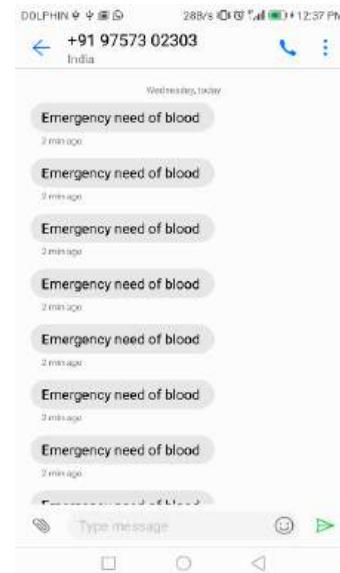

Fig 5. The message received by the donor

The Figure 4 shows the message that is received by the donors when the data is displayed on the seekers screen. An immediate message from the seekers phone is sent to the donor.

VI. CONCLUSION:

The availability of blood at the time of emergency is a major problem faced by many hospitals and blood banks today. We propose an Android App that would make direct contact between the Seeker and the Donor. The app will not only be beneficial in urban areas but also will be useful in various remote areas.

For the above system we conclude that this app can be used by common people in urgent need of blood to get donors contacts directly without going through the blood banks. Not only donors theapp also gives details of blood banks a person can contact in case no donor is found. Apart fromthis it also brings voluntary donors through registration. Due to this more donors can be obtainedby blood banks as well. The App will also act as a platform for making people aware of Plateletpheresis aswell as myths and facts related to blood donation.

Another major thing related to system is that donors arenotified of blood donations even if they do not have our app installed on their smart phone as the notificationsare done via SMS.

The App will also act as a platform for making people aware of Plateletpheresis as well as myths and facts related to blood donation.

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VSMS- A Survey on Voice based SMS system

Prof. Aarti Sahitya
Faculty KJSIEIT Mumbai
University Of Mumbai, India
aarti.sahitya@somaiya.edu

Kamakshi Thakkar
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
kamakshi.thakkar@somaiya.edu

Isha Havaldar
U G Student, KJSIEIT, Mumbai
University Of Mumbai, India
isha.havaldar@somaiya.edu

Darshan Gondalia
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
darshan.gondalia@somaiya.edu

Abstract

Speech recognition has been a wide area of research and development over years.Due to easy usability and high efficiency , it has gained a great importance in the field of technology. Before a decade speech recognition was difficult but with the growth of technology many new algorithms , techniques and tools have been implemented successfully, some of which include HMM framework , deep learning algorithms, etc. SMS has been the second largest element used for communication. This paper elaborates an idea of building an 'SMS System' for senior citizens, illiterate individuals,etc. in order to make the process of communication easier and better for them. Right from selection of the contacts to sending the message, the whole process will be performed with the help of voice commands. The basic objective is to develop an offline SMS system in which the speech recognition would be performed in an efficient manner. Multiple contact selection, low frequency voice recognition, external noise elimination would be some features of the system.

Introduction

With advances in the field of information technologies, mobile devices have become important tools to connect individuals over long distances within a few seconds. People with physical disabilities or senior citizens find these technologies as a curse because most of them cannot use it or even if they can, they are unaware of their functionalities. Such devices and its services are often unavailable because they require proper adaptive tools and some special interfaces in order to use mobile phone devices in an conventional manner. There are times when physically handicapped want to communicate but are unable to do so through any of its medium that is neither by call nor by SMS. The Voice based

SMS system will provide a platform for such users to send messages through simple voice commands which will reduce the efforts of the handicapped as well as senior citizens and thus would be of great use to them.

While there are various algorithms for speech to text conversion available, each of them do not have proper word conversion accuracy. Also, the noise elimination is improper and there is a narrow range of voice frequency detection i.e it is unsuitable for constantly changing modulation of sound. There are cases where the speakers may have different accents, the pronunciation of a particular word may vary from person to person or there may be difference in the style and rates in which a particular person speaks. In such cases, filtering noise and bringing the frequency of sound to a particular level becomes important as the conversion of speech to text depends on these early stage filtrations and modifications. In addition to human errors and variations caused by human voice, factors like the background noise, echos, the different types of microphones used and the recording devices cause problems in the conversion of speech to text.

Literature Survey:

Various papers on speech to text conversions were studied and certain observations were made about how the existing system is and how it works.

The first paper highlights the use of Kalman Filter and also states the use of it. The main purpose of the Kalman Filter is elimination of background noise to enhance the quality of the words spoken. The main objective of this paper was to invent a

new system that would recognize speech in better way than the HMM model which is used at a large scale in various applications.

The second paper states the objective of speech recognition system which would extract the voice, characterize it and then recognize the information about speech. It uses MFCC i.e Mel-Frequency Cepstral Coefficient feature extraction technique. Initially Voice signal is compressed into features and then the features are used for recognition. MFCC is used to filter out the background voice in the input voice command. It takes place in two phases Training and Testing phase.

The third paper concentrates on the division of the speech recognition process in different phases and gives detailed explanation of each phase. The focus of this system is the development of an online speech-to-text engine. It provides a future scope of developing a system which will process words of different mother tongues.

The fourth paper discusses about how deep learning algorithms of machine learning are used instead of the usual Gaussian mixtures. The main objective of this paper is to apply deep learning algorithms which include (DNN) deep neural networks and (DBN) deep belief networks for automatic and continuous speech recognition.

Among the various techniques and models used, Hidden Markov Model is known to be the best. It is known as the base platform of Speech recognition as most of the developers use it as the native model. It is used in the speech recognition phase which is known to be the most important as it performs the conversion of speech to text. The reason why HMM is used in such a wide range is because a speech signal can be divided into short-time stationary signal and it can be approximated while it is divided into intervals. Each divided part of the signal is considered to be a state which consists of many different hidden states. Then each HMM state utilizes a mixture of Gaussian to model a spectral representation of the sound wave. However, one of the main drawbacks of Gaussian mixture models is that they are statistically inefficient for modeling data that lie on or near a non-linear manifold in the data space. Also HMM uses MFCC in which the frequency bands are equally spaced on the scale. It approximates the

response of the human voice more accurately than the linearly spaced frequency bands like in MFC.

Methodology

Workflow of a system is the most important aspect of any system as it provides the roadmap of developing the system. It acts as a blueprint for the developer while implementing the system. The overall design of our system is shown if fig. below .As shown the whole system is divided into three phases. Each phase has its own purpose and describes the work involved in it.The whole system works serially. All the three phases are equally important as each one of them is dependent on the previous one. The output of the previous phase acts as the input to the next phase. Thus, implementation can be considered to be the most critical stage in developing a successful new system and in giving the user confidence that the new system will work and be effective. The diagramatic representation of the three phases are as follows:
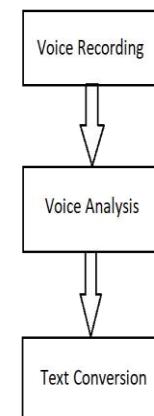

Fig: System Architecture

The above diagram represents the overall architecture of the proposed system . The functionality of each of these three phases are as follows:

1.Voice Recording Phase: In this phase the voice command is recorded using the audio source and stored for future use. A number of classes and methods were used in this phase and involves processing of the recorded voice and storing it as well. The classes used were the MediaRecorder class and the MediaPlayer class. These methods are

used to record an audio and play the recorded audio. The methods used under the MediaRecorder class to record the audio includes setAudioSource(), setOutputFormat(), setAudioEncoder(), setOutputFile(), prepare(), start(), stop(). The methods used under the MediaPlayer class to play the recorded audio includes setDataSource(), prepare(), start(), stop(), release(). Each of these method has its own purpose, setAudioSource() method is used to set the input source from which the signal would be feeded. setOutputFormat() is used to set the audio format in which we want to store the signal. setAudioEncoder() is used to select the encoding algorithm through which we want the input audio must be encoded. setOutputFile() is used to select the file in which the fetched voice command need to be stored. prepare() is used to allocate the resources and keep the system ready for recording the voice command.start() is used to start recording the command and stop() is used to end the recording and deallocate the allocated resources.
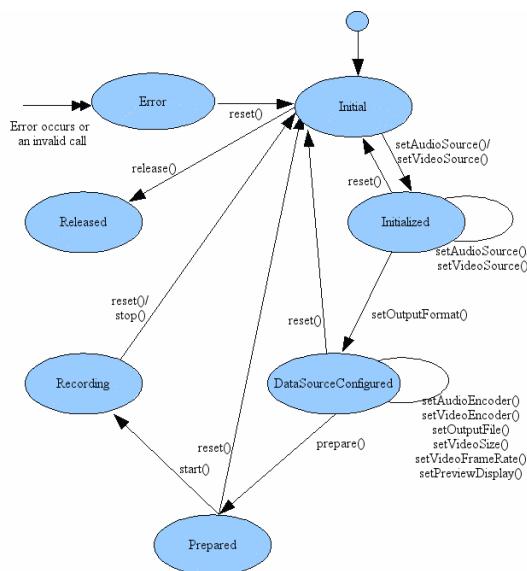

fig: MediaRecorder state diagram

2.Voice Analysis Phase: In this phase the recorded voice is filtered and the unwanted voice is removed. This phase deals with deletion of the noise, echos and also the background gitter of things around. To do this we have used NoiseSuppresor class, AcousticEchoCanceler class and AutomaticGainControl class. Each of these classes share the same methods namely create(int sessionid) and isAvailable(). Both of the methods are static and can be called using the Classname. create method is used to create the instance of the class through which it is called. It intakes a parameter of session id which represents the unique identification number assigned to each of the audio files by the system.Thus the return type of create method is the object of the class calling the create method. isAvailable() is used to check whether the requested class instance is free or not. It returns true if the instance is available or else it would return false. After creating the instance of the required class it is attached to the signal which needs to be filtered using getEnabled() method.It attaches the instance to the voice source and performs the required filtration where and when required. VoiceSupresor class instance remove the unwanted noise and filters the command.AcousticEchoCanceler removes the echo if the command echo gets created during the recording phase. AutomaticGainControl is used to balance the frequency of the voice signal i.e. it amplifies the frequency if it is below the specified band or it would reduce the frequency if it is higher than the specified band.

3.Text Conversion Phase: It would be the final output phase of the system . It would provide us the desired output required by the user. It would convert the filtered voice sample in to text format. HMM methodology would be the bridge which would be used for conversion. It would classify the filtered voice into small samples which would be stationary in nature. These samples are then classified and the hidden samples are identified for recognition. The converted text would be then supplied to the messaging application through intents and on the command the SMS would be sent.

Proposed System:

There are many systems available in the market currently but each of these applications have some or the other drawbacks within them. Our System has some features embedded with the functionality

of the system which are unique from the rest of the as-is system available in today's world. The available systems mostly are online in nature i.e. the conversion is performed on some remote location and Internet is mandatorily required for performing conversion.Also these systems do not allow to send SMS to multiple contacts at the same time. These would be the foundation of the developing system. Our system would be fully an offline system which would entirely function on the user side. The overall functionality would be installed while the application gets installed for the first time in the user's device. Preprocessing of the lower frequency voice signal would be performed and then the conversion would take place. The overall user interaction towards the application can be diagrammatically represented by the following fig.
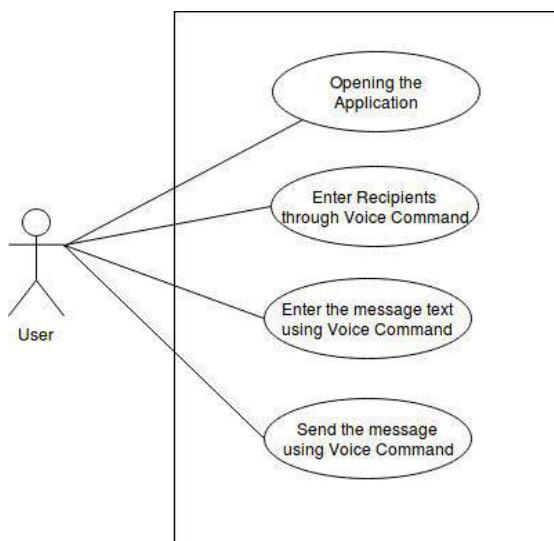

Fig. Use-Case Diagram

Conclusion

In this paper, we analyzed the problems faced by senior citizens and have made the SMS system which will simplify the task of sending messages and also provide a better and easier platform for communication through voice commands. Our

system would work in three phases namely the voice recording phase, voice analysis phase and text conversion phase. The voice recording phase uses the MediaRecorder class and MediaPlayer class for recording and storage of the voice commands. In the voice analysis phase, the background noise, echos and the frequency standardization would be done. This would be performed using the NoiseSuppresor class, AcousticEchoCanceler class and AutomaticGainControl class. The last phase involves the conversion of speech to text using the HMM based algorithm. The proposed system will be completely offline i.e it will not require internet connection for its functionality. Also, multiple contact selection and frequency standardization would be some of the additional features of the developing system. Thus we can conclude that our proposed system will be acting as a boon for the senior citizens, illiterates as well as physically handicapped individuals.

Future Scope

Additional features can be added in the current system nearly in future. One of it is that the entire system can be simulated i.e right from starting the application from the background to sending the message will be done through voice commands. Furthermore, multiple languages can be embedded to expand the system to remove language dependency. This system can also be expanded by including the facility of MMS communication.

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Visionary Glass

Prof. Jyoti Wadmare
Faculty KJSIEIT Mumbai
University Of Mumbai, India
jyoti@somaiya.edu

Nimish Bandivadekar
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
andivadekar@somaiya.edu

Priyanka Avhad
U G Student, KJSIEIT, Mumbai
University Of Mumbai, India
priyanka.avhad@somaiya.edu

Siddhesh Panchal
U G Student, KJSIEIT, Mumbai
University of Mumbai, India
panchal.s@somaiya.edu

Abstract-- Blind people are significantly more likely to experience unfair treatment at work compared to others. Almost all the blind people find it difficult to do their daily work; it also takes extra time and effort for them to perform their daily work and activities. It is difficult for the blind person to cope up with their normal life. Visionary Glass is a project made for the blind people. With this project 'Visionary Glass', will help the blind people to read text. A camera will be attached to the glasses of a blind person, through that camera images will be captured and sent to the microcontroller. And the audio output of OCR performed on the captured image will be received by the blind person. Visionary Glass is a solution to the society needs, since the current state does not fulfil the needs of blind people. Visionary Glass is a new concept that solves some of the problems faced by blind people in their day to day lives.

Index terms—OCR (Optical character recognition); TTS(Text to speech);

I. Introduction

We live in a digital era with advancement in information and communication technology. Approximately 285 million people are visually impaired in the world. In which approximately 39.50 million of that population are blind and about 246.34 million people have low vision.[12] Blind people can only read Braille script. Imagine the blind person being able to walk around a building and order the computer to read the nameplates on doors. The camera actively looks for doors, captures the image, and proceeds to recognize the text written on them. Imagine a blind person going to a restaurant and being able to read all the dishes in the menu, or the label of a bottle. This is what we exactly want to achieve in our project, that is to build a portable reading system for the blind. To improve the learning process of blind people we have developed an innovative device for them which can capture the image through a camera and convert the image not only into text but also into speech. By using this device any blind person or a visually impaired person can easily be able to read a text. the visually challenged person face plenty of problem in communicating with others in day to day life. These people are not involved with the social world because of their disabilities. Unintentionally, they are treated in an unusual manner by the rest of the society. A lot of research is going on image based approach because of an advantage of no need to wear devices like hand gloves and helmet etc. like in sensor-based approach. We propose a system Visionary glass which helps normal and visually challenged people to effectively communicate with the written, typewritten and paper text.[1]

In resolving these difficulties with visually impaired people, we are using a tiny credit card size computer named Raspberry Pi. We provide the solution for visually challenged people by using this device. For blind people, the image is captured using a camera which is converted into text using *OCR* and the resulted text is converted into speech using *TTS* which gives an audio output through the device and can be given out using either any compatible earphones or any compatible audio speaker. Visionary Glass is a project made for blind people. There will be a camera attached to the glasses the blind person will be wearing, through the camera the images/video will be captured and sent to the microcontroller. And the audio output of the captured image/video will be received by the blind person.[5]

II. Literature survey

Humans are able to see because eyes convert light into signals that are understood by brain. Human eye is made of various components which includes but are not limited to the Cornea, Iris, Crystalline lens, Retina, Optic nerve, Focal point together light rays and passes through pupil the opening of iris through which it enters eyes. The light rays pass through the eyes crystalline lens, after passing through the iris. These electrical impulses are carried to the brain through optic nerve which are converted by the retina. We can say, a thought of an electronic retinal implant was proposed by Graham Tassicker, who in 1956 described how a photosensitive selenium cell attached behind the retina of a visually impaired person which resulted in formation of phosphenes. Later, between 1960 and 1980, Brindley and Dobelle took this research of Artificial Vision forward by introducing the concept of electrodes by embedding into the visual Cortex. Until 1990s, nothing much happened in the

field of artificial vision. Later, preclinical studies executed in this decade would lead to the large number of clinical demonstrations in this decade between 2000 to 2010.[11] The current Retinal Prosthesis System uses a spectacle mounted camera to capture the scene which sends signals to electrodes; it is meant to provide electrical stimulation of the retina to induce ability to see in visual impaired people. The 100 electrodes are used in this system. The no of electrodes used here are insufficient to get clear vision. This will allow visually impaired people to see difference between light and dark. The proposed system also uses spectacle mounted camera to capture the scene which sends information to electrodes. The quality of vision depends on the no of electrodes. The current system got up to 100 electrodes, enough for building a shape. The proposed implant will have more electrodes which will produce 1000 pixels, enough for clarifying the object. But even after increasing the no of electrodes we are not getting the vision as clear as human eyes do. Therefore we are introducing a new technology which uses detection algorithms to help the visually impaired person to read.[6] On doing our survey on *OCR* we came to know that *Optical character recognition* is a method that converts a scanned image into text. On scanning a paper, it typically stores it as a bitmapped file in TIF format. The image file can be read after it has been displayed on the screen. This displayed image is just a series of black and white dots to the computer. The computer does not recognize any "words" on the image. This is how *OCR* works. *OCR* looks at each line of the image and attempts to determine if the black and white dots represent a particular letter or number. *OCR* was initially developed to assist sight-impaired individuals with low vision to gain access of the printed information. That same *OCR* technology has been updated and improved and is now used to read computer files.[7] Text processing and speech generation are two main components of a text to speech system. The main objective of the text processing component is processing the input text and produce an output of an appropriate sequence of phonemic units. These phonemic units are realized by the speech generation component either by selection of a unit from a large speech entity or by synthesis from parameters. To produce a natural sounding speech synthesis, it is crucial that the text processing component should produce an appropriate sequence of phonemic units corresponding to an variable input text. The goal of Text-to-Speech (TTS) synthesis is to convert variable input text to comprehensible and natural sounding speech so as to transmit the information from a machine to a person.[8] Currently there are three systems which provide the solution to visually impaired people but

the only drawback those system have is the cost factor and time required for processing the image.

Optacon: In Optacon the user moves his/her camera module across a line of printed article and an image of an area about the size of a letterspace is transmitted via the connecting cable to the main electronics unit.

Optophone: Optophone is a device that is used by the blind people that scans text and produces time-varying chords of tones to identify letters. It is one of the prematured known applications of sonification.

Orcam: The OrCam MyEye consists of two main components: the head unit and the base unit. The head unit consists of a camera and a microphone, and is mounted on the frames of a pair of eyeglasses. The box-like base unit contains the algorithms and processing components that give the device its functionality, and can be clipped to a belt or left to rest in a pocket. The head unit and base unit are adjoined by a connecting cable.[10]

III.　　Proposed System:

With the help of this system, the target users will be able to read the text in an audible format. Currently the system is divided into two modules i.e

Module 1. Converting an image file into a text file.

Module 2. Converting that text file into an audible output.
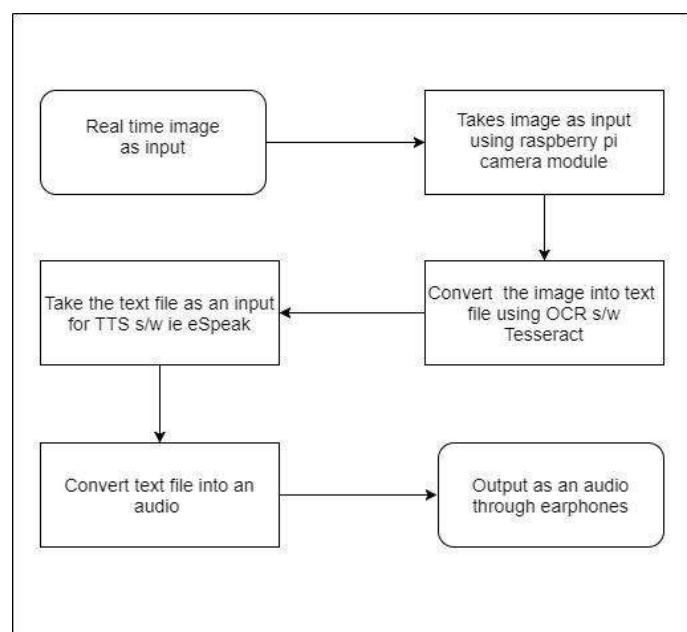
Fig.3 Flow diagram of Visionary Glass

Module 1. Converting image file into text:

In this module the camera will capture an image and that image will be an input to the *OCR* which will then give an output in the form of a text file.

Module 2. Converting Text file into Audio:

In this module the text file will be converted into an audio output using text to speech.

Fig(3.1)Shows the working of the system.

IV.   Techniques Used:

●   *OCR (Optical Character Recognition)*: *Optical character recognition* is typically an abbreviation for *OCR,* it is the mechanical or electronic translations of images/pictures and written text , typewritten or printed text. *Optical character recognition* belongs to the family of techniques in which it performs automatic identification of the image file. There are different methods that are stated below. The Characters in a image file are of different shapes, size, structures. Text extraction may employ binarization or directly processing the original image. It consist a survey of existing techniques for page layout an analysis. *OCR* is basically the procedure of translating scanned images of typewritten text into machine editable information.[2]

●   *Text to Speech(TTS)*: The *Text to Speech* technique is used to convert the input text file into an audio file . All margins, column widths, line spaces, and text fonts are prescribed; these cannot be changed as prescribed. You may note abnormalities. For example, the head margin in this template measures symmetrically more than is customary. This measurements and other things are intended, using specifications that anticipates your paper as a single part of the complete proceedings, and not as an independent document.

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Accident Prone Area Classification Using Data Mining

Priyanka Bhatt, Natasha Mane, Mrs. Jignasha Dalal

Dept. Computer Engineering

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai -400022

priyanka.bhatt@somaiya.edu, natasha.mane@somaiya.edu, jignasha@somaiya.edu

Abstract— Globalization has affected many countries leading to increased consumption of resources including vehicles causing traffic and road accidents. The frequency of the road accidents at different locations have to be identified in order to reduce the accidents, but due to exponential increase in the data of road accidents and heterogeneous nature of it, it is difficult to analyze and identify the locations on the basis of frequency of road accidents.

In this paper we are using road accident dataset of Mumbai of the year 2016- 2017. We are going to apply clustering techniques to characterize the locations on the basis of high frequency, low frequency and moderate frequency of road accident. However, to overcome the problem of heterogeneity of the data, data segmentation will be used widely.

Our project proposes a framework which uses k-means clustering as its primary technique for data segmentation. Further trend analysis will be performed on all the clusters and entire data set to find different trends of road accidents which will help to avoid road accidents in future. The obtained results will then mapped on our Google maps application using data overlay feature of Google maps to give real time safety notifications to users.

Keywords— Data Mining, Road accident analysis, clustering, Road Accident, Road Safety

I. Introduction

Nowadays road accidents are a major issue in Mumbai due to which many people lose their lives. The various reasons responsible for road accidents are ignorance of traffic rules, bad road condition, and alcohol consumption while/before driving. It is necessary to identify locations of road accidents on basis of frequency in order to avoid them. So for that, suitable data mining approaches has to be applied on collected data.

Data mining comprises many techniques, such as preprocessing, clustering, association, prediction, classification, and so on. To analyze the data we will make a framework. Data preprocessing is a task of data mining. Data pre-processing mainly deals with removing noise, handle

missing values, and removing irrelevant attributes in order to make the data ready for the analysis. In this step, our aim is to pre-process the data in order to make it appropriate for the analysis.

Our project proposes a framework which uses clustering as its preliminary technique for data segmentation. The objective of the clustering algorithm is to divide the data into different clusters or groups such that the objects within a group are similar to each other, whereas objects in other clusters are different from each other. Clustering does not depend on predefined classes. We will use the clustering technique to group the data set into an individual division. For that, we are using the k-means clustering technique.

II. Data Mining

Data mining is process of sorting datasets to identify the pattern and relationships between data, to solve problems through data analysis Data mining tools predict future trends, allowing businesses to make proactive, knowledge-driven decisions. Data mining involves technique such as Data Cleaning, Data Integration, Data Transformation, Pattern Evaluation and Data Presentation. We can use data mining for market analysis, fraud detection, customer retention, production control.

A. Clustering
- A cluster is a set of objects which are "similar."
- A set of objects such that the distance between any two objects in the cluster is less than the distance between any object in the cluster and any object not located inside it.
- A connected region of a multidimensional space containing a relatively high density of objects.

Clustering is forming a group of a particular group of objects based on their characteristics, aggregating them according to their similarities. Regarding to data mining, this methodology partitions the data implementing a specific join algorithm, most suitable for the desired information analysis.

More specific divisions can be possible to create like objects belonging to multiple clusters, to force an object to participate in only one cluster or even construct hierarchical trees on group relationships.

There are many different ways to implement this partitioning, based on distinct models. Distinct algorithms are applied to each model, differentiating its properties and results. These models are distinguished by their organization and type of relationship between them. The most important ones are:

- Centralized - each cluster is represented by a single vector mean, and a object value is compared to these mean values
- Distributed – the cluster is built using statistical distributions
- Connectivity – he connectivity on these models is based on a distance function between elements
- Group – algorithms have only group information
- Graph – cluster organization and relationship between members is defined by a graph linked structure
- Density – members of the cluster are grouped by regions where observations are dense and similar.

III. BACKGROUND AND MOTIVATION

Analyzing dataset of road traffic accidents to generate important rules and to obtain hidden information about accident will help in reducing the number of traffic accidents by undertaking necessary precautions by observing the information generated for the dataset. To process such a large datasets which is heterogeneous in nature, clustering is used. Clustering will help generate different clusters of same type of data.

IV. REVIEW OF LITERATURE

Ela Etrunç et al. [1] in their paper have used Arc Map and ArcGIS for analysis of road accidents; they have done analysis on various factors such as type of intersection, month of accident, year of accident, tourist seasons and timings. Through their application they have identified that in intersection accidents, intersections with most accidents are "four-way" intersections. 60% of total accidents have occurred in at these intersections. 41 hotspots were identified in Antalya province center. The main advantage of the analysis system built in this paper is that it is very quick to detect the cause while its major disadvantage is that it mainly focuses on road accidents occurring at intersections, due to this other major causes of road accidents can be missed.

Salvatore Cafiso et al. [2] have used fuzzy pattern recognition algorithm in their paper. In this paper accidents are classified according to their actual conditions and rules of the factors such as vehicle factors, driver factors, road factors and environmental factors. The paper helped to identify the factors causing road accidents and effect environment have on road accidents.

Addi Ait-Mlouk et al. in their paper [3] have discussed various techniques for road accident analysis and have examined association rule mining technique which helps in predicting accidents in advance and allows the drives to avoid the dangers. The integration of the association rules technique within multi-criteria decision analysis contributes to a better understanding of the dynamics of road accidents and can provide meaningful information to help decision makers and logistics managers to improve performance in terms of transport quality and road safety optimization. The major advantage of this paper is Mining and visualization of association rules Management of the interest level of association rules Reduction of the large number of extracted rules

Sachin Kumar et al [4] in their paper have used k-means clustering algorithm to classify the locations on the basis of high frequency, low frequency, and moderate frequency of accidents. They have used gap statistics to find value of k for k-means algorithm. They then applied association rule mining on the clusters to generate important relationships and patterns between the accidents which occur in same clusters.

In paper by J.M. Manasa et al. [5] Spatial decision trees are used as a primary method to retrieve important information from real world accident data; also various trends of accidents at different locations were identified. Using this data they have also identified accident hotspot in order to reduce frequency of accident in future.

In paper by Ayushi Jain et al. [6] they have used clustering (K-means) for making groups of similar objects of heterogeneous data and classification (Decision tree) for predicting causes of accidents. Using cluster analysis they determine the areas having more average of accidents than other.

This study by Eyad Abdullah et al.[7] presents a very important application tool for using big data for storing, integrating, and analyzing the traffic accidents using Mahout Data Mining as a part of big data ecosystem. Very large and real traffic data sets from New York's traffic collisions dataset is used as source of data for the developed application. The developed application consists of several functions and web services to analyze and visualize the major traffic accident information. The developed application stores the massive traffic data on Hadoop with a parallel computing framework for processing and mining based on Map-Reduce technique, then uses Web services interface to support developed mining application.

In this paper by Liling Li et al.[8] the statistics, association rule mining, and the classification, the environmental factors like roadway surface, weather, and light condition do not strongly affect the fatal rate, while the human factors like being drunk or not, and the collision type, have stronger effect on the fatal rate. They have used naive Bayes classification

technique and advantage is that it only requires a small number of training data to estimate the parameters necessary for classification. Also they used k-means clustering which tends to find clusters of comparable spatial extent. Here apriori algorithm is used which uses large item is set property, easily parallelized, easy to implement.

In this paper by Suwarna Gothane et al. [9] they evaluated attribute importance based on information gain attribute evaluator approach to know which factors are accident oriented and to apply apriori technique with a property all nonempty subsets of frequent item sets must also be frequent. With support and confidence measure level wise approach they found out best rules to their frequent pattern. In this paper they used information gain attribute evaluator which solves the drawback of information gain. And also helps to identify which attribute is most relevant to related database also they used weka tool of data mining which have a comprehensive collection of data pre-processing and modeling techniques.

The paper we have studied have implemented different techniques to analyze road accidents, in this paper we are proposing a framework which uses k-means algorithm to characterize locations on basis of frequency of road accidents by cluster analysis; further trend analysis will be carried out on each clusters to find monthly trends of road accidents at different locations. We are also going develop an android application similar to Google maps which will give travelers real-time notification if they are entering a accident prone area.

The paper is organized as follows: in section 'Development Methodology' description of technologies used for development of our project is provided. In section 'Proposed System' a framework is proposed In order to characterize road accidents. In section 'Implementation' implementation steps and output are shown. The last section 'Conclusion and Future scope' describes results and the future scope of this project.

V DEVELOPMENT METHODOLOGY

A. Python

Python is open source software .Python is most powerful language. Python is very simple, platform independent , interactive programming language it can be understood by non technical person as well It has grown to be one of the most important language for data mining. By using python language and its libraries we can extract information and hidden relationships from large databases it helps companies and their employee to focus on important information in data warehouse. Python libraries specifically targeted numerical computation.

Python is dynamic type and automatic memory management type system. Python serve as scripting language for many web application. For scientific computing NumPy, SciPy, and Matplotlib these libraries are used in python. Python is highly used in the information security industries.

Python have large standard libraries and it is one of its biggest strength.

B. K-means Clustering Algorithm

K-means clustering is one of the unsupervised learning algorithms which is useful to cluster data without any labels. The algorithm forms groups from the data. The numbers of groups formed are represented by a variable K. The algorithm assigns each data point to different clusters based on the features which are provided. the clusters are formed on the basis of similarity of features of the data points.

The K-means clustering algorithm gives following results as output:

- centroid of clusters which will help in labeling the data
- labels for training data

Each centroid which is obtained after clustering which will help in defining the groups in the data. By examining the feature weight of centroid we can qualitatively interpret which kind of data is represented in different clusters.

VI. PROPOSED SYSTEM

One of the key objectives in accident data analysis is to identify the locations on basis of frequency of road accidents. However, heterogeneous nature of road accident data makes the analysis task difficult .The proposed system we use a framework that is based on the cluster analysis using K means algorithm. Using cluster analysis as a primary task can group the data into different homogeneous segments. Also trend analysis will be performed to understand the accident trends in a particular location at a particular time. The result of the analysis will help us provide useful information about the accident to the users and also provide necessary precautions for it. Our findings will then be mapped in our application using data overlay feature of Google maps to give real-time notification to the user about the safety of the current location.

Fig.1. shows the architecture of proposed system, the bottom layer consist of different data sources from which data is extracted, data preprocessing is performed on this data which forms the second last layer of our architecture, after the data is preprocessed it is stored into different data warehouse (layer 4) for further use. The data from data warehouse is then supplied to data mining engine which will perform cluster analysis, next trend analysis will be performed on the formed clusters to find trends of road accidents (layer 2). The data from layer trend analysis and Data mining engine is stored In knowledge base to access when required. The results obtained after clustering (layer 3) and trend analysis (layer2) will be passed in our application (layer 1) though data overlay feature of Google maps which will enable us to display the results to users and give them real time notification if the road they are travelling though has high frequency of accidents.
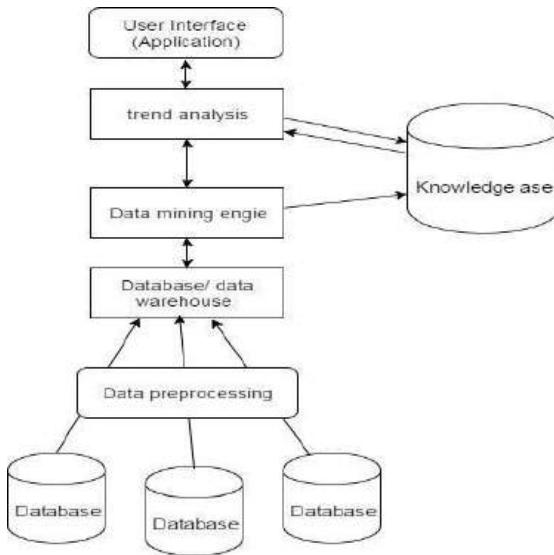
Figure 1 System architecture

Advantages of Proposed system:

1. Give real time location update to the user
2. Give real time road safety notification to the user

VII. IMPLEMENTATION

The Implementation methodology that we have followed for our project is as follows:

A. Data preprocessing

Data preprocessing is one of the important tasks in data mining. Data preprocessing mainly deals with removing noise, handle missing values, removing irrelevant attributes in order to make the data ready for the analysis. In this step, our main objective is to preprocess the accident data in order to make it appropriate for the analysis. The data which we had obtained from road traffic control headquarters of Mumbai was bilingual which we converted into English for further processing. After translation we will encode the dataset on basis of time and location which will help us in forming clusters of the data sets on basis of time of accident and the location of accident.

In Fig.3 is the python code we have used for data preprocessing, Fig.2 shows the data set before preprocessing and Fig.3 shows preprocessed data set which does not contain any unwanted data.

Fig.1. Python code used for Data Preprocessing

Fig.2. Data before preprocessing

Fig.3. Data after preprocessing

C. Clustering

After the data is preprocessed, clustering algorithm is applied to the data to form clusters. Clustering is nothing but forming groups of data having similar attributes, it helps in characterizing the data into different groups. In our system we are going to use K-means using python clustering algorithm for generating clusters of the dataset.

With help of clustering we will be able to form clusters of datasets on basis of time and location of accidents, this will help us to not only find frequency of road accident at a particular location but will also help us to find frequency of road accidents at a particular location at particular time. For example location A is low frequency accident location between 10:00 am and 13:00 pm and is high frequency accident location between 20:00 pm and 22:00 pm.

D. Android Application Development

For developing our application we are using android studio 3.0, Android Studio is the integrated development environment for Google's Android operating system, The application which we are developing is a basic Google map application with login and register facility for the user. The results obtained by clustering ad tend analysis will e mapped in our application which will help in identifying different categories of accident prone locations.

This application will be able to track the user movement on the map In real time; also the user will be able to enter his trip information such as starting location of the trip and the end

location of the trip in order to get notification about accident prone location beforehand which they will have to cross during their trip. This will help the rider to take precautions before had to avoid accidents.

E. Trend Analysis

In trend analysis For every cluster and EDS, we performed a trend analysis on monthly road accident counts for each cluster.

F. Application Modules

We will build an application where user can register, login, Get real time location updates and Get real time Road safety updates. Our application will be built in android using android studio. Following are the modules which our application will contain.

1. Register
   In this module user will be able to register on our website by entering his detail.
2. Login
   In this module user can login to our website using information he used for registration
3. Get real time location updates
   The user will be able get his current location displayed on the map
4. Get real time Road safety updates
   User will get real time updates based o accident frequency of the location.
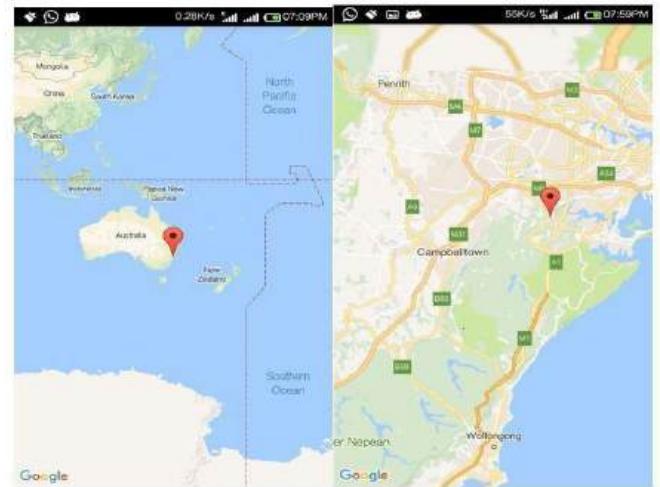
Fig.4. displaying map on our application

VIII. CONCLUSION AND FUTURE SCOPE

Road accident is a major issue which causes thousands of people to lose their lives daily. To derive conclusion or to determine the reason causing road accident analysis Many authors have implemented different kind of techniques such as fuzzy model, k-means algorithm etc. Here in our project we will be using k-means algorithm which will help in clustering road accidents on basis of time and locations, also we are

going to perform trend analysis on the clusters and Entire Data Set in order to find different trends in road accidents basis of time. The results obtained by clustering and trend analysis will be mapped in our application to give user real time notification on safety of location they are about to enter into. More information about the cause of the accidents could be identified if more features associated with the accidents; this will help in giving cause specific precaution notification to avoid accidents in future.

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Bon Vivant: An Artificial Intelligence Cooking App

Dimpy Ghaswala
IT Department
KJSIEIT, Sion
Mumbai, India
dimpy.ghaswala@gmail.com

Harita Kundalia
IT Department
KJSIEIT, Sion
Mumbai, India
harita.kundalia@somaiya.edu

Prof. Prashant Sawant
Asst. Professor, IT Department
KJSIEIT, Sion
Mumbai, India
prashant27@somaiya.edu

Abstract— **In account to the number of ingredients we consume, the combination of these could be of order 10 to power 15. Yet a very small fraction of the total is known to us. This suggests the need of a principle to organize ingredients so as to yield unique flavor combinations. The background for this project is the hypothesis of food pairing which states that combination of ingredients sharing same chemical flavor components produce delightful delicacies. Bon Vivant is a cooking recipe app based on Flavor Network and Principles of Food Pairing. It allows users to discover unusual flavor combinations and ingredient substitutions. Also, our recommender system allows users to explore nutritious recipe varieties based on their flavor preference and nutritional requirements.**

Keywords— ingredients, recipe, food pairing, flavor network, nutritional requirements

I. Introduction

Web provides us amazing facility of sharing knowledge and searching any information from any corner of the world. Recipe websites are good examples of knowledge sharing platforms. One finds millions and trillions of recipes online. Recipes sites flourish as people are keen on sharing their recipes, from family recipes that had been passed down for generations. With too many ingredient pairings and recipes available online people often find it difficult about how to start and what to use and whether it fits their nutritional requirements. Also, if one is lacking a certain ingredient, can a substitute be found among supplies at hand.

Thus, finding a recipe that not only satisfies individual's nutritional requirements but also takes into consideration their flavor preference and provide ingredient substitutions is a colossal task and this is where our proposed system kicks in. Bon Vivant is an interactive platform that allows users especially molecular gastronomy geeks to discover flavor pairings based on flavor compound analysis. Ingredients, recipes, regional cuisines and flavor compounds, can be mapped, to enable users explore surprising flavor combinations or ingredient substitutions. One can experiment with mapping flavor profiles within the context of a given cuisine through combinatorial analysis. For example, "ginger" in Italian cuisine and "ginger" in Indian cuisine both have varied ingredient combinations. The system combines user's flavor preference with user's body requirements and suggests recipes. One can make healthier food choices satisfying your taste buds.

II. Literature Survey

A. Food Pairing

In 1992, chefs Heston Blumenthal and Francois Benzi introduced the food pairing hypothesis. The hypothesis states that ingredients sharing common flavor compounds taste well together [2]. In 2011, a group of scientists extended their research over this food pairing concept. Scientists Yong-Yeol Ahn, Sebastian E. Ahnert, Albert-László Barabási and James P. Bagrow [1] in order to analyze the impact of flavor compounds on ingredient combinations introduced a network-based approach. The outcome of their approach proved that Western cuisines were more inclined towards the hypothesis of food pairing than compared to the East Asian cuisine.
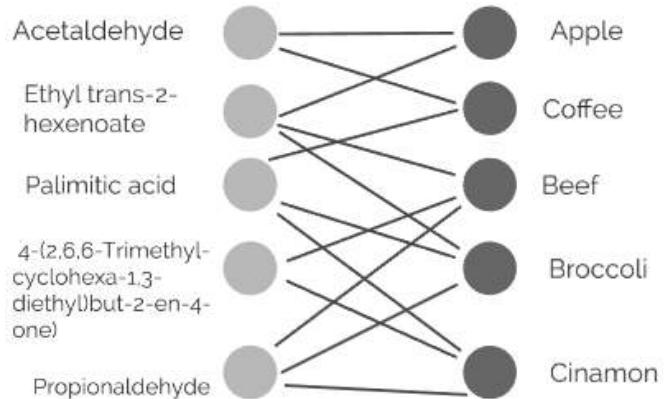

Fig. 1. Bipartite Network

Also, Lav R. Varshney, Kush R. Varshney, Jun Wang, and Daniel Myers [3] compared the Modern European recipes with the Medieval European recipes and came to a conclusion that Medieval cuisine tend to share more compounds than the modern cuisine.
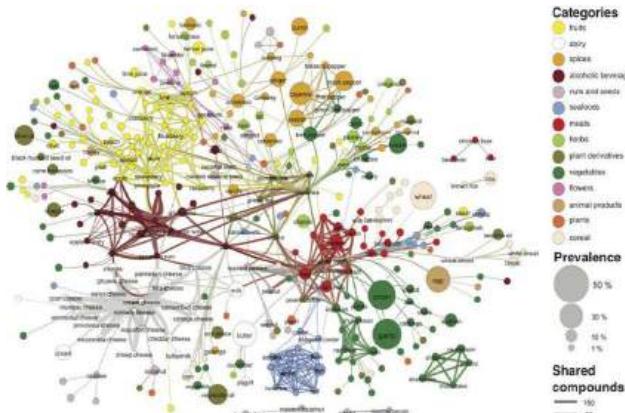
Fig. 2. Flavor Network

B. Recipe Dataset

BigOven [4] provides 350,000 recipes; in REST JSON and XML format. Also access to thousands of photos is available. Search by title, ingredient, keyword, nutritional information is possible. Yummly [5] provides 1 million recipes along with their ratings, ingredients in REST JSON output; Academic plan is available with 30,000 lifetime calls. Yummly API can be easily used to integrate recipes and recipe search into your websites or mobile applications Food2Fork [6] is a socially ranked recipes database with ingredient search functionality. GET and POST calls over HTTP is supported. Responses are JSON formatted. Spoonacular [7] provides 350,000 recipes in UNIREST JSON format; Free hackathons and academic plans are available. Free and collaborative Kaggle's Open Food Facts [8] dataset can be used to collect nutrition value of ingredients and food products. Recipe aggregator sites such as menupan.com, allrecipes.com and epicurious.com can be used to scrap recipe data. Ingredient-compounds dataset and recipe-cuisine dataset is publicly available on Yong-Yeol Ahn [1]. The data can be characterized as –

- 1507 Ingredients
- 1107 compounds
- 36781 edges in I-C network

C. Estimated Energy Requirements

In order to measure dietary intake of user's which satisfies their daily nutrition goals, a widely accepted and known Estimated Energy Requirements(EER) equation [9] can be used. Based upon user's gender, age, weight, height and level of physical activity consistent EER can be determined. EER is calculated as:

1) For men 19 years and older
$EER = [662 – (9.53 * Age)] + PA * [(15.91 * wt) + (539.6 * ht)]$

2) For women 19 years and older
$EER = [(354 – (6.91 * Age)] + PA * [(9.36 * wt) + (726 * ht)]$

where wt= weight, ht= height and PA = Physical Activity Factor.

TABLE I. PHYSICAL ACTIVITY (PA) FACTORS FOR EER EQUATIONS

	Men	*Women*	*Physical Activity (PA)*
Sedentary	1.0	1.0	Typical daily living activities
Low active	1.11	1.12	Plus 30-60 minutes moderate activity
Active	1.25	1.27	Plus ≥ 60 minutes moderate activity
Very Active	1.48	1.45	Plus ≥ 60 minutes moderate activity and 60 minutes vigorous or 120 minutes moderate activity

Physical activity level(PAL) [10] is used to describe and account for user's physical activity habits. We can get daily nutrients goals for a particular user by the calorie level accessed [11]. Using these statistical methods, we can calculate user's daily nutrition requirements.

D. Recipe Recommender

The goal of a recommender system is to provide recommendations to users for products as per their interest [12]. For example, suggesting movies on Netflix or recommending books on Amazon [13]. The domain and characteristics of data available determines the design of such recommendation engines. Based on how recommendations are made, recommender systems are usually classified into the following categories [14]:

1) Content-based recommendations: Recommend items based on user's past preferences.

2) Collaborative recommendations: Items are recommended to users based on the items liked by people having similar taste and preferences as that of user.

3) Hybrid approaches: It is combination of collaborative and content-based methods.

III. COMPARISON BETWEEN EXISTING SYSTEM & PROPOSED SYSTEM

A. Existing System

There are colossal of recipe websites and apps available online where one can get tons of suggestions and search results in a single click. Most of these are simple recommender systems that recommends recipes based on rating and comments. These systems provide basic functionalities to users such as exploring various cuisines, dish types, uploading recipes, commenting and so on. It is observed that most of these lack the significance of being unique which might set them apart from others. To elaborate the idea of existing system, two apps are considered, namely

1) Cookpad: Cookpad recipe app allows a user to search recipes from a vast collection of recipes. App provides recipes from Indian chefs which can easily be made at home. App has a wide range of cuisines from which the user can select their recipe. Step by step illustration of the recipes is given. Cookpad provides categorized search for the user based on

titles, ingredients and cuisine type. Well instructed and stepwise recipe cooking procedure is provided.

2) Allrecipes: Allrecipes dinner spinner is an app which provides fascinating recipes from the chefs. This app is a review analysis-based system and recommends the user recipes according to the reviews and interests of the user. Optimized and improved search options. To choose multi-cuisine options based on the keywords and ingredients. Step by step illustration of the recipes is provided. The application also grants the user to take a glimpse through Chefs profiles.

B. Proposed System

Bon Vivant is an interactive platform that allows users especially molecular gastronomy geeks to discover flavor pairings based on flavor compound analysis. Ingredients, recipes, regional cuisines and flavor compounds, can be mapped, to enable users to explore surprising flavor combinations or ingredient substitutions. Bon vivant app claims to satisfy individual's nutritional requirements. Stepwise illustration for recipes from regional cuisines. Recommendations based on the nutritional requirements and flavor network. A user can elect for a healthier lifestyle. This app also provides ingredient substitution and thrives to grant the user a better and healthier recipe.

TABLE II.   EXISTING SYSTEM V/S PROPOSED SYSTEM

Existing System	Proposed System
Existing system does not integrate the concept of flavor pairing.	Proposed system is an interactive platform that allows users to discover flavor pairings based on flavor compound analysis.
Recipes apps like Allrecipe dinner spinner suggests recipes based on the ratting and comments.	Bon Vivant takes into consideration user's flavor preference as well as nutritional requirements to suggest recipes.
Existing system doesn't provide ingredient substitution	Proposed system provides ingredient substitution.
Existing system uses keywords of recipe names or ingredients to search for recipes	Our proposed system uses clustering to decide which recipes are similar to each other; compound and flavor network are really convincing.

IV. ALGORITHM

A. Tidier Drawings of Trees (Reingold-Tilford)

Reingold-Tilford algorithm [15] is a well-known tree visualization algorithm. Wetherell and Shannon [16] introduced an algorithm for producing "tidy" drawings of trees-drawings that satisfies certain aesthetics and even use little space. Aesthetics of node-link tree algorithms describe properties that improve the perception of the data that is being laid out. The goal of this algorithm is to make optimized use of space, maximize density space, maximize density and symmetry. Originally for binary trees, extended by Walker [17] to cover general case. This extension was corrected by Buchheim et al [18] to achieve a linear time algorithm.
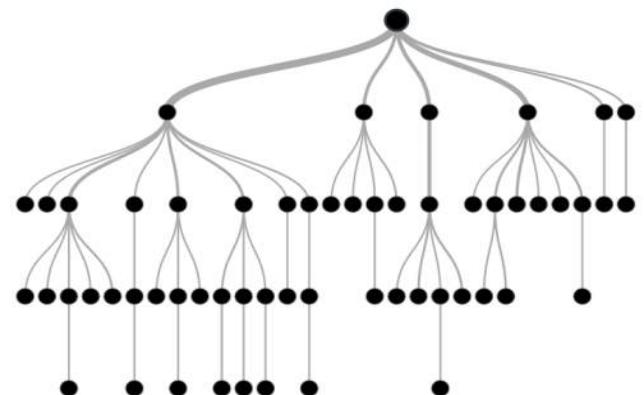
Fig. 3. Reingold-Tilford Tree

B. Hierarchical Agglomerative Clustering

In data mining and statistics, hierarchical clustering [19] is a method used to build a hierarchy of clusters. The agglomerative clustering algorithm proceeds by placing each item in its own cluster. Then it searches for best pairs to merge so as to form a new cluster. This is repeated until all clusters are fused together.
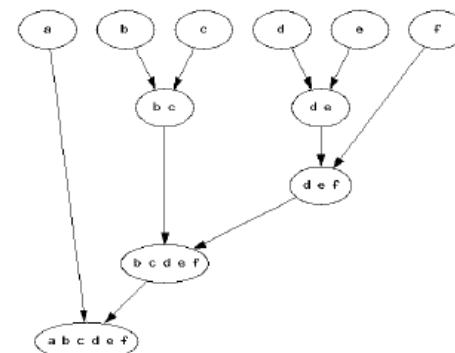
Fig. 4. Agglomerative Clustering

C. DBSCAN

DBSCAN was proposed by Martin Ester in 1996. The algorithm forms clusters by considering density of points. The region where points are closely dense is considered as forming a cluster. Whereas points lying in low-density regions are considered as outliers. DBSCAN is most commonly used clustering algorithms used for large noisy datasets.

V. CONCLUSION

This proposed system will help user to discover unusual flavor combinations and ingredient substitutions. Our recommender system would enable users to explore nutritious recipe varieties based on their flavor preference and nutritional requirements. The system takes in user's age, height, weight, gender and physical activity level and recommends recipes appropriate to achieve their nutrition goals. It is an integrated

approach towards machine learning and food pairing. One can make healthier *food* choices satisfying their taste buds. Lastly, we hope that this kind of system could contribute to the evolution of Food Science.

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Fingerprint Based Patient Information System

Prof. Sarita G. Rathod
Department of Information Technology
K.J.Somaiya Institute of Engineering and Information
Technology
Everad Nagar, Sion East Mumbai, Maharashtra
sarita.s@somaiya.edu

Divya Jain
Department of Information Technology
K.J.Somaiya Institute of Engineering and Information
Technology
Everad Nagar, Sion East Mumbai, Maharashtra
divya.jain@somaiya.edu

Priyanka Babu Kachare
Department of Information Technology
K.J.Somaiya Institute of Engineering and Information
Technology
Everad Nagar, Sion East Mumbai, Maharashtra
priyanka.kachare@somaiya.edu

Vedanti Suhas Mahulkar
Department of Information Technology
K.J.Somaiya Institute of Engineering and Information
Technology
Everad Nagar, Sion East Mumbai, Maharashtra
vedanti.mahulkar@somaiya.edu

Abstract—**Fingerprint Based Medical System introduces the efficient way to store patient's clinical records. It is used to determine the patient's past health record quickly and easily by using the fingerprint recognition technology. The medical information system which will enable a reliable electronic medical record system stored in the database. To provide security to the information many cryptography algorithms are introduced. This system replaces the conventional paper-based medical records with electronic medical record system**

Keywords—Biometrics, AES/MD5

I.   INTRODUCTION

Biometrics is a method of recognizing a person's unique physiological characteristic or behavioural characteristic. It is used for providing data privacy as well as the privacy of the confidential financial transactions. The different biometric techniques include the face, iris, fingerprints, hand geometry, handwriting, and voice. Fingerprint scanning technology is one of the oldest biometric sciences and uses different fingerprint features to identify and verify the identity of the individuals. Every fingerprint has unique patterns and characteristics. Fingerprint pattern consists of lines and spaces. The lines are known as ridges whereas the space between the ridges is called the valley. This pattern of the ridges and valleys are used for the verification and the authorization of the fingerprints.

II.   FINGERPRINT SCAN TECHNOLOGY

There are five vital stages of the fingerprint scan technology which are the fingerprint image acquisition, image processing, and location of distinctive characteristics, template creation, and template matching. The main aim of fingerprint-scanning technology is to acquire the good quality of fingerprint which can be further used. Fingerprint images having 500 dots per inch (DPI) is the standard forensic-quality.

- Image acquisition is the process of acquiring the fingerprint images of the person which is unique and differs from person to person.
- Image processing is the method of converting the fingerprint image into a specific usable format. Image enhancement plays a vital role to reduce distortions like cuts, scars and dirt.
- Location of distinctive characteristics is the next step. Fingerprint has many different patterns like
- swirls, loops and arches which is used by the fingerprint technology.
- Fingerprint template is used to remove distortions from the image such as scars or dirt. This is done by using specific algorithms.
- The last step is the template verification and authentication.

A. *Fingerprint as a biometric*

Fingerprints are considered to be the best and fastest method for biometric identification. Fingerprints are unique to everyone and do not change with time. Fingerprint recognition is widely used nowadays everywhere. Fingerprint biometrics is the most commonly used biometric technique used. It is much faster than any other techniques and the consumption of the systems is also less.
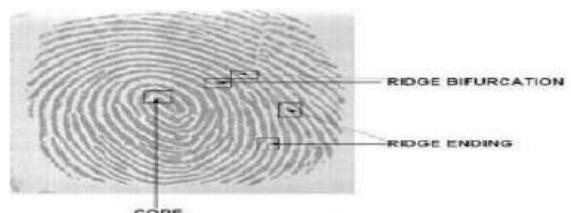

Fig 1 Fingerprint Image

Everyone has unique fingerprints. Traditionally, fingerprint patterns were taken by the ink impression on the paper

which was then matched and verified. Nowadays different sensors are used to provide different patterns by using the digital images. Mouse and keyboards computer peripherals act like the sensor which is used to incorporate the data into the computer, thus making the mode of identification a very attractive proposition thus authenticating the fingerprint based system.

B. Techniques of matching fingerprints

The different techniques of fingerprint matching include:

1) Correlation-based matching: It is to superimpose two fingerprint images and then the relationship between the pixels is then computed.
2) Minutiae-based matching: It is one the most popular techniques. Minutiae are taken from different fingerprints and it is stored in the 2-D plane in the form of different sets of points. This technique is to match the candidate fingerprint with the template fingerprint image template.
3) Pattern-based matching: It is used to match the patterns such as whorl, loop, and arch from the previously stored fingerprint templates. Pattern-based matching algorithms use the central point from the image and compare the stored image with the fingerprint image of the candidate. Minutiae based matching technique is one of the most important feature for the recognition of the fingerprint.

III.   SYSTEM ARCHITECTURE
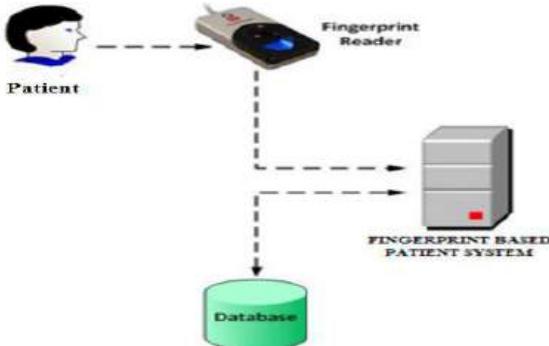
Fig 2: System Architecture

To develop an ease system in the medical field, we are developing such a system. In this, there will be a doctor and a patient. When the patient visits the doctor for the 1st time, the doctor will make registration of the patient by using his fingerprint. The registration form contains the basic details of the patients and along with that some other details like blood group, sugar level, applying for medical claim allergies present or absent, etc. Next time when the patient visits the doctor, the doctor will scan his fingerprint, based on his fingerprint his details will be retrieved from the system. The doctor can view the patient previous reports, upload new reports to the system, these report details will be sent in the email of the patient. The data which is stored in the database stored in encrypted format. For the encryption of data, we will be using AES/MD5 ALGORITHM. The

doctor can generate the analysis graph of the patient based on the report of the patient.

IV.   ALGORITHM USED

A. AES Algorithm

Advanced Encryption Standard (AES) is one the most popular symmetric encryption algorithm. It is about six times faster than triple DES.

AES steps of encryption for a 128-bit block are as follows:

1. From the cipher key derive the set of round keys.
2. With the block data initialize the state array.
3. To the starting state array add the initial round key.
4. Of state manipulation perform nine rounds
5. Of state manipulation Perform the tenth and final round
6. Out as the encrypted data copy the final state array

AES features are:

- AES requires one encryption as well as only one decryption key
- Faster as well as Stronger than Triple-DES
- It can be implemented in C as well as in Java
- Provide design details and full specification

B. MD5 Algorithm

MD5 is a one-way hashing cryptographic algorithm. The MD5 algorithm was designed to authenticate the digital signatures. It takes the input of any length as the message and returns the fixed 128-bit message as the output. In order to authenticate the digital signature, the algorithm compresses the large files before encrypting it with the private key.MD5 is used to protect the errors from the data.

The steps for MD5 are as follows:

1. **Append padded bits –** The message is padded so that its length is congruent to 448, modulo 512. Means extended to just 64 bits shy of being of 512 bits long. A single "1" bit is appended to the message, and then "0" bits are appended so that the length in bits equals 448 modulo 512.
2. **Append length –** A 64 bit representation of b is appended to the result of the previous step. The resulting message has a length that is an exact multiple of 512 bits
3. **Initialize MD Buffer-**A four-word buffer (A,B,C,D) is used to compute the message digest. Here each of A,B,C,D, is a 32 bit register. These registers are initialized to the following values in hexadecimal: word A: 01 23 45 67
   word B: 89 ab cd ef
   word C: fe dc ba 98
   word D: 76 54 32 10

4. **Process message in 16-word blocks** –Four auxiliary functions that take as input three 32-bit words and produce as output one 32-bit word.

$$F(X,Y,Z) = XY \lor not(X) Z$$
$$G(X,Y,Z) = XZ \lor Y\ not(Z)$$
$$H(X,Y,Z) = X\ xor\ Y\ xor\ Z$$
$$I(X,Y,Z) = Y\ xor\ (X \lor not(Z))$$

Process message in 16-word blocks cont. – if the bits of X, Y, and Z are independent and unbiased, the each bit of F(X,Y,Z), G(X,Y,Z), H(X,Y,Z), and I(X,Y,Z) will be independent and unbiased.

5. **Output** – The message digest produced as output is A, B, C, D. That is, output begins with the low-order byte of A, and end with the high-order byte of D.

V.   IMPLEMENTATION

Fig 3: Login Form

Fig 3 shows the Login Form where we select user type either Admin or Doctor and then enter the username and password and then click on login button.
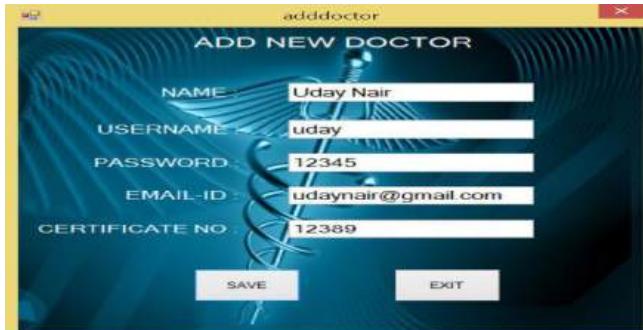
Fig 4: Add New Doctor Form

Fig 4 shows the Add New Doctor Form. By using the admin login we can add new doctor and the click on Save button.

Fig 5: List of Doctor Form

Fig 5 shows the list of doctors in hospital that is added through Add New Doctor Form.

Fig 6: Add Patient Details Form

Fig 6 shows the Add Patient Details Form. By using the admin login we can add the details of the new patient and then click on Add button.

Fig 7: List of Patient Form

Fig 7 shows the list of patient that is added by the Add Patient Details Form.

Fig 8: Doctor Form

Fig 8 shows the doctor form where old patients can scan there fingerprint and there details will be displayed.

VI. FEASIBILITY STUDY

The feasibility study is a major component of the first phase of the system development life cycle. Feasibility study is used to give the measure of how favourable or beneficial will be the progress of the information system for the organization.

The feasibility of the software that is being developed can be studied as follows:

- Operational Feasibility.
- Technical Feasibility.
- Economical Feasibility.

A. Operational Feasibility

The Application will be used to reduce the time that is required for the maintenance of the manual records and thus reduces the efforts in maintaining the records. Thereby the operational feasibility is achieved.

B. Technical Feasibility

The Hardware Requirements for the technical feasibility to be achieved are:

- 1.66 GHz Pentium Processor or Intel compatible processor

- 1 GB RAM.

- Internet Connectivity

- 80 MB hard disk space

C. Economic Feasibility

Economic feasibility of the application will be determined by:

- The Application will be used to reduce the labour work. Thus reducing the efforts to a great extent.

- The Application will help in the reduction of the time which is usually wasted during the manual processes.
- Documents and register handling management will be reduced.

VII. FINGERPRINT MODULE SPECIFICATION

The fingerprint sensor module (Fig 9) having interface of TTL UART is used. The person is identified by using the fingerprint data that is stored and configured as 1:1 or 1: N mode. The module can easily interface by using the 3v3 or 5v5 microcontroller. The level converter (like MAX232) is required for interfacing with PC.
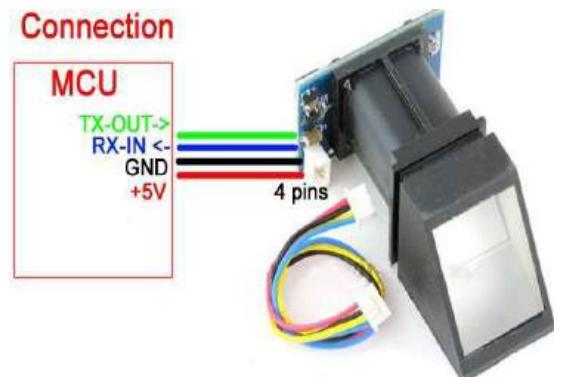
Fig 9: Fingerprint Sensor

VIII. FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENT

A. Functional Requirement:

- Administrator should have access to all details of the system.
- Administrator will train the system and generate rules-set.
- Administrator will doctor into the system.
- User can register into the system.
- User can login into system anytime and give input to system as symptoms
- The system will check the symptoms in the rules-set generated by the administrator during the time of training.
- After that, the system will predict the disease and give the result to the user. Along with disease, the system will also predict the medicines for that particular disease and precautions for that disease which are necessary to be taken by the user.

B. Non-Functional Requirements

- The system should provide the accurately estimated output to the user.
- The system should be able to increase the efficiency and performance of prediction results.
- The system should allow the user to access information anywhere and anytime.

IX. ADVANTAGES AND DISADVANTAGES

Advantages:
•**Unique**-Everyone has the different and unique fingerprint. Fingerprints have loops and arches which vary from person to person

•**Accurate**-The information obtained from the fingerprints is accurate as it different to every person and is easily comparable with the candidate fingerprint images stored in the database.

•**Small storage space**- The memory required to store the fingerprint template is small and requires less memory space.

Disadvantages:
•**False Readings**- Lower cost biometric systems leads to errors thus hampering the authorized person from accessing the personal confidential data.

•**Costly**- Biometric system is costly which is not easily affordable and eliminate many from using it.

CONCLUSION

The Fingerprint Based Patient System was specifically developed for storing, monitoring and analysing the patient medical reports. The system uses the fingerprint scanner for retrieving the patient details from the system. This system will allow users to access hospital's information anytime.

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A Review Paper on Sentiment Analysis

Miss. PrathanaRajendraPatil

Student, Department of Computer Engineering
K.J.Somaiya Institute of Engineering and Information
Technology.
Mumbai, India

prathana.patil@somaiya.edu

Mrs.NishaVanjari

Assistant Professor, Department of Computer Engineering
K.J.Somaiya Institute of Engineering and Information
Technology.
Mumbai, India.

nvanjari@somaiya.edu

Abstract - Sentiment Analysis can be outlined as "automated extraction of subjective content from digital text and predicting the sound judgment such as positive or negative". Sentiment Analysis is conjointly known as Opinion Mining. The different approaches involved in the sentiment analysis are product review, sentiment identification, feature selection, sentiment classification and sentiment polarity. Though after the analysis of sentiment there are certain open problem, such as the data problem, the language problem and the NLP.

Keywords – sentiment analysis, feature selection, sentiment identification, sentiment classification, sentiment polarity.

I. INTRODUCTION

Sentiment Analysis is the method of determinant whether or not a piece of writing is positive, negative, or neutral. It is additionally notable as opinion mining, account the opinion or angle of a speaker. A typical use of this technology is to discover however folks feel a couple of specific topic.

For example: If you wish to recognize that if folks on Twitter suppose that the Chinese food in point of entry is nice or unhealthy. Twitter Sentiment Analysis can answer this question. You will even learn why folks suppose the food is nice or unhealthy, by extracting the precise words that indicate why folks did or didn't like the food. If "too salty" shows as a common theme, for example, you instantly have a much better plan of why customers aren't sad.

II. LITERATURE SURVEY

Sentimentanalysis is one of the quickest growing analysis areas in applied science, making it challenging to keep track of all the activities within the space. We have a tendency to gift a pc - assisted literature review, wherever we have a tendency to utilize each text mining and qualitative writing, and analyse 6,996 papers from Scopus. We discover that the roots of sentiment analysis are in the studies on voxpopuli analysis at the beginning of twentieth century and in the text sound judgment analysis performed by the computational linguistics Community in1990's.In recent years, sentiment analysis has shifted from analyzing online product reviews to social media texts from Twitter and Facebook. Many topics on the far side product reviews like stock markets, elections, disasters,

medicine, software Engineering And cyberbullying extend the Utilization of sentiment analysis.Sentiment Analysis (SA) is associate degree in progress field of analysis in text mining field. Reserves is that the procedure treatment of opinions, sentiments and perspicacity of text. Several recently projected algorithms' enhancements and numerous reserves applications square measure investigated and given shortly during this survey. The connected fields to reserves (transfer learning, feeling detection, and building resources) that attracted researchers recently square measure mentioned.

III. STEPS INVOLVED IN SENTIMENT ANALYSIS

Sentiment Analysis (SA) or Opinion Mining (OM) is that the process study of people's opinions, attitudes associated emotions toward an entity. The entity will represent people, events or topics. These topics square measure possibly to be coated by reviews. The 2 expressions Storm Troops or OM square measure interchangeable.They specific a mutual which means. However, some researchers expressed that Opinion Mining and Storm Troops have slightly totally different notions[1].OM extracts associated analyses people's opinion concerning an entity whereas Sentiment Analysis identifies the sentiment expressed in a very text then analyses it. Therefore, the target of Storm Troops is to search out opinions, determine the feelings they specific, so classify their polarity as shown in figure (1).
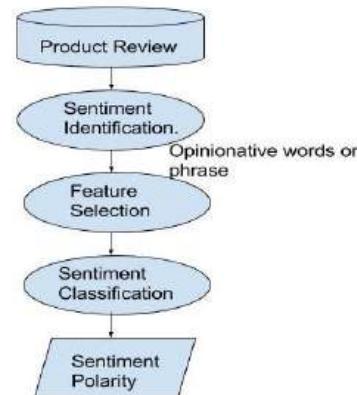

Figure (1): Sentiment analysis process on product reviews.

There are 3 main classification levels in SA: document-level, sentence-level, and aspect level militia.Document-level militia aims to classify Associate in nursing opinion document as expressing a positive or negative opinion or sentiment. It considers the full document a basic data unit (talking regarding one topic). Sentence-level militia aims to classify sentiment expressed in every sentence. The primary step is to spot whether or not the sentence is subjective or objective. If the sentence is subjective, Sentence-level militia can confirm whether or not the sentence expresses positive or negative opinions. Wilson et al.[2] have realized that sentiment expressions don't seem to be essentially subjective in nature. However, there's no elementary distinction between document and sentence level classifications as a result of sentences are simply short documents [3]. Classifying text at the document level or at the sentence level doesn't give the mandatory detail required opinions on all aspects of the entity that is required in several applications, to get these details; we'd like to travel to the side level. Aspect-level militia aims to classify the sentiment with regard to the precise aspects of entities. The primary step is to spot the entities and their aspects. The opinion holders will offer totally different opinions for various aspects of a similar entity like this sentence "The voice quality of this phone isn't sensible, however the battery life is long".

The data sets utilized in militia are a vital issue during this field. The most sources of information are from the merchandise reviews. These reviews are vital to the business holders as they'll take business selections per the analysis results of users' opinions regarding their merchandise. The reviews sources are principally review sites. Militia isn't solely applied on product reviews however can even be applied on stock markets [4, 5], news articles, [6] or political debates [7]. In political debates for instance, we tend to may fathom people's opinions on a particular election candidates or political parties. The election results can even be foreseen from political posts. The social network sites and micro-blogging sites are thought-about a really sensible supply of data as a result of folks share and discuss their opinions a couple of sure topic freely. They're conjointly used as knowledge sources within the militia method.

There are several applications and enhancements on militia algorithms that were projected within the previous few years. This survey aims to provide a more in-depth look on these enhancements and to summarize and reason some articles bestowed during this field per the varied militia techniques. The Sentiment Classification (SC) techniques, as below:

1. *Machine Learning Approach*
    a. Supervised Learning
        i.   Decision Tree classifiers.
        ii. Linear classifiers
             1. Support Vector Machines.
             2. Neural Networks.
        iii. Rule-Based classifiers.
        iv. Probalistics-Based classifiers.

1. Naive Bayes.
2. Bayesian Network.
3. Maximum Entropy.
    b. Unsupervised Learning.
2. *Lexicon-based Approach*
    a. Dictionary-based Approach
    b. Corpus-based Approach
        i. Statistical
        ii. Semantic

IV. FEATURE SELECTION MECHANISM FOR SENTIMENT ANALYSIS

Sentiment Analysis task is taken into account a sentiment classification downside. the primary step within the SC downside is to extract and choose text options. a number of this options are[8]

1. *Terms presence and frequency:*These options area unit individual words or word n-grams and their frequency counts. It either offers the words binary weight (zero if the word seems, or one if otherwise) or uses term frequency weights to point the relative importance of options [9].

2. *Parts of speech (POS):* Finding adjectives, as they're vital indicators of opinions.

3. *Opinion words and phrases:* These area unit words normally wont to specific opinions as well as smart or unhealthy, like or hate. On the opposite hand, some phrases specific opinions while not victimization opinion words. For example: value ME Associate in Nursing arm and a leg.

4. *Negations:* The looks of negative words might amendment the opinion orientation like not smart is akin to unhealthy.

Feature selection method:

Feature choice strategies may be divided into lexicon-based strategies that require human annotation, and applied math strategies that are automatic strategies that ar additional oftentimes used. Lexicon-based approaches sometimes begin with atiny low set of 'seed' words. The feature choice techniques treat the documents either as cluster of words (Bag of Words (BOWs)), or as a string that retains the sequence of words within the document. BOW is employed additional actually because of its simplicity for the classification method. the foremost common feature choice step is that the removal of stop-words and stemming (returning the word to its stem or root i.e. flies → fly).

1. Pointwise Mutual Information (PMI)

The mutual system of measurement provides a proper thanks to model the mutual data between the options and

therefore the categories. This live was derived from the data theory[65]. The pointwise mutual data (PMI) Mi(w) between the word w and therefore the category i is outlined on the idea of the extent of co-occurrence between the category i and word w. The expected co-occurrence of sophistication i and word w, on the idea of mutual independence, is given by Pi · F(w), and therefore the true co-occurrence is given by F(w) · pi(w).The mutual data is outlined in terms of the magnitude relation between these 2 values and is given by the subsequent equation:

$$\square_\square(\square) = \square\square\square\left(\frac{\square(\square).\square_\square(\square)}{\square(\square).\square_\square}\right) = \square\square\square\left(\frac{\square_\square(\square)}{\square_\square}\right)$$

The word w is completely correlate to the category i, once Mi(w) is bigger than zero. The word w is negatively correlate to the category i once Mi(w) is a smaller amount than zero.Yu and Chinese [4] have extended the essential PMI by developing a discourse entropy model to expand a group of seed words generated from a little corpus of securities market news articles.

2. Chi-square (χ2)

Let n be the entire range of documents within the assortment, pi(w) be the contingent probability of sophistication i for documents that contain w, Pi be the worldwide fraction of documents containing the category i, and F(w) be the worldwide fraction of documents that contain the word w. Therefore, the χ2-statistic of the word between word w and sophistication i is outlined as

$$\square_\square{}^2 = \frac{\square.\square(\square)^{~2}.(\square_\square(\square) - \square_\square)^2}{\square(\square).(I - \square(\square)).\square_\square.(I - \square_\square)}$$

3. Latent Semantic Indexing (LSI)

Feature choice ways arrange to scale back the spatial property of the information by choosing from the first set of attributes. Feature transformation ways produce a smaller set of options as a perform of the first set of options. LSI is one among the far-famed feature transformation ways [12]. LSI methodology transforms the text house to a brand newaxis system that could be a linear combination of the first word options. Principal element Analysis techniques (PCA) area unit wont to reach this goal [13]. It determines the axis-system that retains the best level of data regarding the variations within the underlying attribute values. the most disadvantage of LSI is that it's AN unsupervised technique that is blind to the underlying class-distribution. Therefore, the options found by LSI aren't essentially the directions on that the class-distribution of the underlying documents is best separated [8].

V. OPEN PROBLEMS IN SENTIMENT ANALYSIS

Various problems associated with sentiment analysis are as follows:

1. The Data Problem:

It's been noticed that there's lack of benchmark information sets during this field. It had been expressed in [1] that few of the foremost far-famed information sets area unit within the field of SA.

2. The Language problem:

It had been noticed within the articles given during this survey that the Far East languages particularly the Chinese language has been used additional usually recently. Consequently, several sources of knowledge area unit engineered for these languages. The researcher's area unit currently within the section of building resources of different Latin (European) languages.

3. NLP (Natural Language Processing):

The tongue process tools are often accustomed facilitate the SA method. It provides higher tongue understanding and therefore will facilitate manufacture additional correct results of SA. These tools were accustomed facilitate in BR, male erectile dysfunction and additionally SA task within the last 2 years.

VI. CONCLUSION

Thus in this review paper we have studied different approaches for the sentiment analysis. Also we have reviewed the different sentiment classification approaches. After the sentiments have been classified different feature selection techniques are used such pointwisemutual Information, Chi-square, and Latent Semantic Indexing. At last we have also reviewed the different problem areas for the sentiment analysis.

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INSTANT SUPPLY MANAGER BUTTON

HardikPatil, Himanshu Kumar, MohnishKatware,
NachiketPatwardhan
BE Computer Engineering Students, Department of
Computer Engineering
VESIT
Mumbai,India

Prashant Kanade
Mentor, Department of Computer Engineering
VESIT
Mumbai,India
prashant.kanade@ves.ac.in

Abstract—Our homes will be slowly automated by using IOT devices. In this age of digitalization and modern technology, home environment also needs automation. In this paper, we have discussed experiences of users to meet the day to day requirements. We also proposed economic benefit that will be obtained from IOT Based Buttons. This small key-sized buttons, have helped website gain meaningful data and reached the increased transactions and increase their profit margin. So, we plan to develop a programmable button having wifi connectivity. This button takes care to order products with a single press of the button. This button can be placed in our homes and can be automated with a mobile based app or a web portal to complete the desired action. Dash Replenishment Service enables connected devices to order physical goods from a valid or authentic supplier. Amazon has equipped with such type of button that is configured to provide supply to specific range of products, wiz.Coffee maker, Detergent. By using DRS, device users are able to get the desired products without visiting the store or portal of particular store. This tiny device will provide the customers with instantaneous service.

We have considered here Indian environment where there is always a behavior to purchase or procure the things well ahead of time and on specific time line of particular Month.

Keywords—dash button, IoT, Wi-Fi Module, ESP8266, Embedded

I. INTRODUCTION

We use many products to meet our day to day requirements such as tea, soap and other products which we order each time whenever required. The Dash Button will help to order these products. When we want to order desired equipment only a button can be pressed or activated and system will generate the order request instantaneously. The device can be set to put reminder, as many a times we might forget to order the product. This device is compact and can be easily re-configured. It is a small device that can stick to virtually any surface in home. The button can be set with the help of Mobile app or a web portal. Once the button is configured with the website, all you need to do is push the button and order will be placed.

II. MOTIVATION

This idea is adopted from the amzon dash button introduced by amazon. The amazon dash button is is widely used in various parts of USA but it is not yet accepted effectively in India or this part of the world. IoT and Artificial Intelligence will acquire many aspects of our daily life. Various web

applications and E-commerce has already acquired most of our routine life. Sensors and embedded devices in automobiles, phones, watches, supermarkets, homes, roads and bridges, appliances, industrial and farm equipment, and wearable technology are already producing new quality of information and changing the way information is produced, consumed, and experienced. IoT obviously represents a great opportunity for advances in information analysis. The connections between IoT and data storage and processing as well as machine learning are obvious and gaining attention already. Instant Button will be a Wi-Fi device that will make sure we never run out of our daily household or groceries. The process of moving from wanting something to having something is sometimes filled with obstacles. If we'd like a pair of jeans we typically drive to a store, find the style, color, and size that we like, and then we take it home with us – this assumes that we were lucky with the first store we went to. If not, the process repeats itself. Whenever we want to buy a simple product like face wash, we need to choose a specific brand as our priority. Whenever we go to nearby supermarket, searching product in supermarket, we sometimes miss to get the desired items and spend a lot towards billing as well as towards travelling cost.

III. Related work done by different technology providers

A. Smart Doorbells-

A smart doorbell is an integral part of a smart home, which helps protect the security of the home by identifying the visitor and informing the owner of the house. The controller of the smart home can potentially answer the bell and decide whether to admit a visitor outside the door or not through adaptive learning and other technologies. Because of the important role that smart doorbells play on building a smart home, many techniques and methodologies have been invented during past few years. The existing smart doorbells provide an integrated solution, which means that the working mechanisms or the implementation details are

hidden and unknown to the users. If there is a failure, users have to seek help from professionals for repairs or maintenance.

2)Amazon Dash Button-

Amazon Dash Button is a WiFi-enabled device that allows consumers to reorder daily usage products like trash bags, toilet towels or refill blades by pressing a button. A dash button can be purchased online and will costs 4.99 US dollars in 2017 . Recently, it has been found that the dash button can be tweaked to track baby habits. We employ this feature of the dash button and use it as a doorbell (or a trigger) of the Dash bell system. Alternatives to Dash Button include portable door bell kits, and wireless door chime trigger with motion sensors, both of which can be purchased for less than 5 US dollars.

IV. Methodology

Instant buttons can be connected to Wifi. Being small in size, the user can press the button whenever

they've exhausted any household item, so that the replacement may reach them in few hours through our Website. Instant button can be configured through our website. Thus, the button will be connected to Wi-fi and will allow the user/consumer to choose their product or brand they may like to order and add the items to their list. After the initial configuration, the consumer will simply press the instant button and the product will reach their doorstep within a few hours, free of shipping and handling charges.
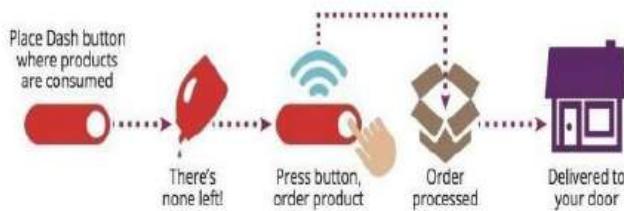
Dash button is simple to set up and use. By using the website to easily connect to your home WIFI network and select the product you want to order with Dash Button. Once connected, a single press automatically places your order. Website sends an order alert to your phone or email, so the order is easy to cancel too. Unless you elect otherwise, Dash Button responds to your first press until your order is delivered.

Further, applying the prediction and classification algorithms in machine learning on the datasets generated by the purchase history of the customers. Amazon has increased its sales exponentially after using precistions algorithms on the datasets obtained.
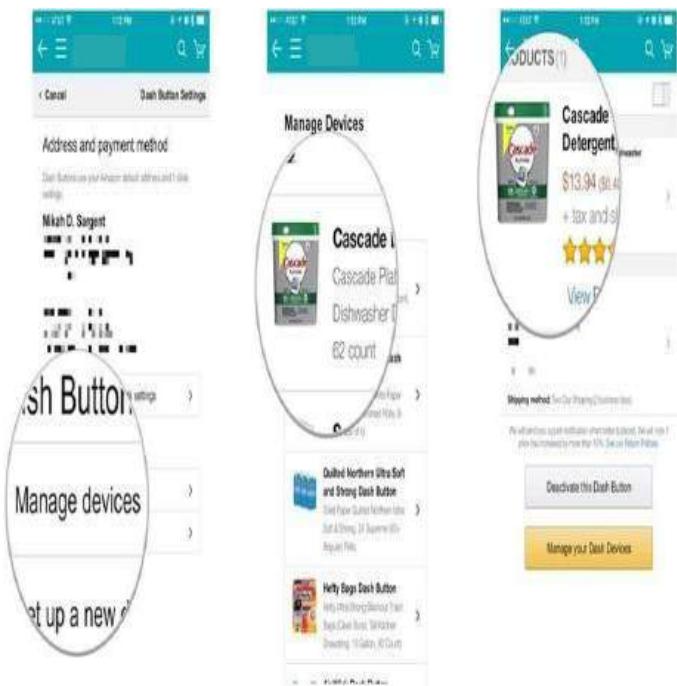
V.   Hardware Implementation

For the hardware, we have used

1) ESP8266 12E Development Board

2) Push button along with the necessary circuit to connect the device with the button.

The ESP8266 wifi module is a self contained SOC(System on chip) with an integrated TCP/IP protocol stack that will connect our Board with WIFI Network. The push button will be connected with the board, to complete the programming circuit. The programming circuit will be modified by connecting the USB Cable to the circuit, and will be connected to PC.

VI.   Software Implementation

For the software implementation, we have used 1) Arduino IDE and a 2) Web site(We have named it Pierceman Electronics). Arduino IDE contains a text editor to write code, a message area, a menu with various functions provided. This IDE makes it easy to write code and upload it to the programming

board. This IDE can be used on any platform such as Windows, MAC OS X and linux. Environment for the IDE is written in java language and is based on Processing and other open source softwares. Website Pierceman, is a dynamic website made using HTML, CSS and PHP. For database to the website, we are using my phpMyAdmin. phpMyAdmin is a free software tool, to handle the administration of MySQL over the web network. phpMyAdmin supports MySQL and MariaDB. We will use MySQL for storing Pierceman data. Pierceman is a user friendly website where a user can login, register, add products to cart, customize their regular order list, make payment, generate Invoice. After registration, user will get an automated welcome email from Pierceman. Also, after placing order an Automated Invoice will be send to user's email. Every user will have a unique link, which will be will activated whenever the push button is pressed.

Using Arduino IDE, we have configured the Development Board according to the user, and will upload the link and wi-fi settings to the development board. Once the uploading completes, the user will be able to place the order by pushing the button. Also, a secure feature will be provided on the website, which will prevent processing of another order, till the previous order completes.

VII.   Future Work

In future work, we plan to use the data generated by the user usage patterns. As the data will keep on generating from our website, we will be apply natural language processing and machine learning techniques (e.g., Support Vector Machines, Neural Networks) to predict the user behaviour and make recommendations for the future users.

As Iot and Artificial Intelligence provides the user with more leisure time, further scope will be in using an automated drone for delivery purpose. The automation of the drone and the whole system will be highly beneficial to the user and the seller.

VIII.   CONCLUSION

For an easy way to place the order, Instant Button are the need. Instant Button has a similar functionality with dash button introduced by amazon. Using the Instant Button typically signals that a customer is running low on a certain item, which tells us what the usual shelf-life in that user's household. This information will be useful in analyzing the button statistics with respect to the users.

This devices is centered on consumer goods, even a small audience for the Button can help drive up order volume for the Pierceman(Ecommerce) website in India as these types of products require frequent purchases. This instant button can be used for multiple brands, and will be suitable for user specific needs in step by step implementation.

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HANDWRITTEN DOCUMENT RECOGNITION

Mr. Vijaykumar Jha
UG Student, KJSIEIT,Sion
Vijaykumar.j@somaiya.edu

Mr. Suraj Kataria
UG Student, KJSIEIT,Sion
Suraj.kataria@somaiya.edu

Mr. Rupesh Barve
UG Student, KJSIEIT,Sion
Rupesh.barve@somaiya.edu

Prof. Dr. Sunita Patil
KJSIEIT, Sion
spatil@somaiya.edu

Abstract—Advancement in technology has resolved many intractable problems in different fields still Handwritten Document Recognition(HDR) is the biggest challenging task in Image Processing field. To recognize documents in handwritten format has been an area of active research. Current research offers many potential solutions on printed documents which involve character recognition of machine printed characters. Due to these effective solutions Optical Character Recognition(OCR) involving computer or typewriter printed characters is considered as a solved problem but in handwritten documents reasonable accuracy and performance has not been achieved.This paper analyses the existing approaches and challenges concerning handwritten document recognition and devices an efficient algorithm to recognize handwritten documents.

Segmentation of characters especially of connected characters in cursive handwriting affects directly the recognition rates hence it is a very important step after image preprocessing. In this paper an efficient technique is proposed for recognising English language characters using Convolutional Neural Network (CNN).The accuracy in recognition of characters by the CNN is more than 90%This paper , presents a system for converting handwritten documents into structural text form.

Keywords—Handwritten document recognition(HDR), Optical Character Recognition (OCR), Convolutional Neural Network (CNN)), Segmentation.

I. Introduction

As mentioned earlier,recognition of machine printed characters is comparatively easy task than handwritten character recognition because characters in it are well structured and can be segmented properly as they are not connected.Due to advancement in machine learning field recognition rate is high in such cases.Handwritten Document recognition(HDR) comes under the field of Image processing, pattern recognition,artificial intelligence and machine vision[1,2].Many challenges are faced in HDR system like rule line detection and removal in handwritten text without losing characters on it,segmentation of connected characters in cursive handwriting,skew characters recognition and different handwriting styles.

As mentioned ,Segmentation of characters in cursive handwriting largely affects recognition rates as it is difficult to identify segmentation points to separate connected characters.False identification of potential segmented points can break the connected characters inaccurately which in turn affects recognition of cursive handwritten text.This paper presents efficient solutions to deal with above mentioned problems.HDR comes under offline character recognition.Contrast to offline system, online character recognition has successive user strokes and two dimensional coordinates available making recognition easier.

This paper presents a innovative 'Handwritten Document Recognition' algorithm to recognize any handwritten characters efficiently from the complete document on computer with input as a scanned document.

The aim is to devise an efficient algorithm which gets input in the form of scanned document,convert it into an image, preprocessing the image for noise removal,binarization of an image and finally after segmentation of characters,,recognizing and giving prediction of the character with better percentage accuracy with the help of CNN.

II. Literature Survey

Neural Networks(NN) are commonly used for Pattern Recognition. The authors[3,4,5] describe the various Models of NN used in OCR. OCR outspread uses of NN.In NN various parameters like no of Hidden Layer, size of Hidden Layer and epochs have been considered. Multilayer Feedforward networks are used along with Back propagation. In pre-processing stage, some key algorithms for segmenting the words and normalizing of characters have been applied[6]. Using various Models of NN

and by applying test sets, they found the accuracy of the specific Neural Networks.

Feature extraction is an essential part of any recognition system.It transforms the input data into well-set features.In papers[7,8] the gradient feature uses a small surrounding pixel in an input to obtain a new intensity value in the output image. Gradients are measured by means of the Sobel filter. The recognition of English Characters have obtained the maximum accuracy of 92%.

III. Proposed System

The most widely used technique for handwritten alphabetical character identification is Convolutional Neural Network(CNN) using artificial neural network.Multilayer neural networks are trained with gradient descent.Hence neural networks are able to learn complex high dimensional nonlinear mappings from large collections of dataset. Because of the sort of data that is being evaluated, we finalized the CNN method as the most appropriate for our task. We propose supervised learning technique CNN.In this feature extraction step is avoided and two dimensional image can be directly inputted. The detailed Security Architecture of the proposed Handwritten Document Recognition(HDR) system is shown in figure 1 .

The architecture for HDR consisting of various modules is as follows:

- Pre-processing of the document
- Words and individual Character Segmentation
- Convolutional Neural Network model
- Training & Testing of the model built
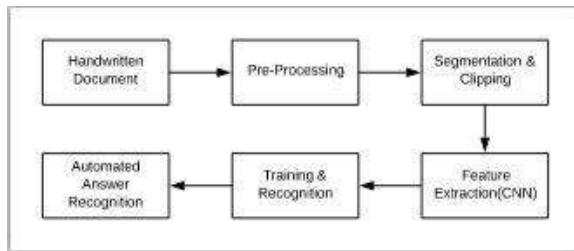
Fig1: Security Architecture for HDR

I. Pre-Processing of the document

Pre-processing of the document is a module that performs a series of operations on scanned input document image. The role of pre-processing is to remove noise in the image as well as to segment the interesting pattern from the background. Generally, noise removing, line removing and binarization of image is done in this step. Coloured image of document is first converted into grayscale image. Binarization is a process that converts a grayscale image into a binary image.All further processing for HDR is carried out on this binary image.Horizontal Line removal from the image is carried out to get words of the image to appear as they are written on white background .This helps in detecting words with high accuracy.

The figure 2 shows the output of the pre-processing module.
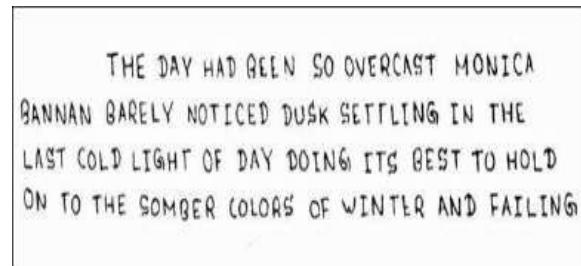
Fig 2: Pre-processed Image

II. Segmentation Process

In segmentation process,every word from the document first gets detected and later on each character from the word are detected by applying further segmentation and then getting recognized by CNN approach. this complete process gives us a word from the document. Contour detection method [10] is used for segmentation of words and isolated characters.Vertical as well as horizontal line projection technique for Segmentation[11] is used for segmenting individual character to separate connected characters in cursive handwriting. This process provides information about number of words and characters in the input image.

The figure 3 shows the output of segmentation process.
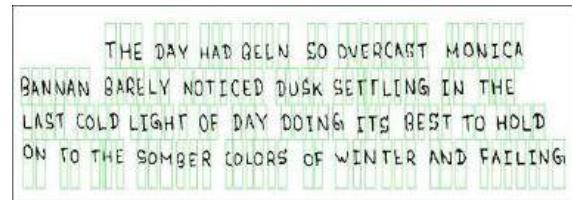
Fig 3: Segmentation Process

III. Convolutional Neural Network

A Convolutional Neural Network(CNN)[12] consists of convolutional layer, spatial pooling layer and fully-connected layer. The convolutional layer is responsible for extracting features from feature maps at lower layer. A new operation-relaxation convolution is proposed to expand the complexity of the convolutional layer, enhancing the learning capability of the neural networks. All layers of a CNN are trained together using back-propagation algorithm. However, a strategy of alternately training a subset of layers of a CNN is proposed to regularize the neural network.

IV. Classification & Recognition

Convolutional Neural Networks(CNN) are examples of specialized neural network architectures which incorporates knowledge about the invariances of 2D shapes by using local connection patterns and by imposing constraint on weights. We used standard, multilayer,fully connected networks as classifiers. Learning is done in the feature extractor itself. Network is fed with the raw inputs and with an fully connected network.

LeNet-5 model[13] is used for character recognition.Each unit in the LeNet-5 model is connected to a local neighborhood in the previous layer, thus it can be seen as a local feature detector. Insensitivity to local transformations is built into the network architecture and the same features on different parts of the input are detected. The outputs of the units in the same position in different feature maps can be thought as a feature vector of the same area. Increasingly complicated features are extracted by neurons in the successive layers. Because of weight sharing, the number of free parameters in the system is greatly reduced. CNN produces an output vector in every layer. Each dimension in the output vector detects features from different parts of feature maps in the previous layer.

Figure 4 shows the architecture of LeNet-5 model.
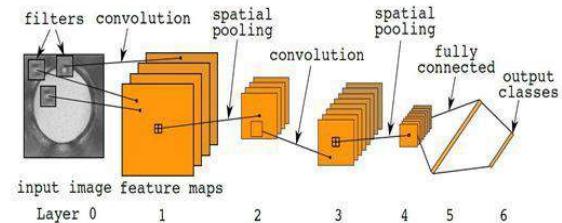
Fig 4: The basic architecture of LeNet-5

Figure 5 shows the flow diagram of HDR system.The system reads input image as handwritten document.After converting document into an image, the image will be preproceed for noise removal, binarization, edge detection. Word segmentation is done on preprocessed image using contour detection[8] approach. Connected Characters Segmentation is done using vertical and horizontal projection. Finally Handwritten documents will be recognised by CNN approach.
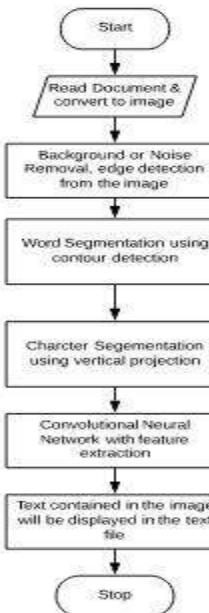
Fig 5: Flow Diagram of HDR System

IV. Result

After getting characters recognized by CNN ,the image file is converted into corresponding text file. Figure 6 shows image input file given to HDR system.
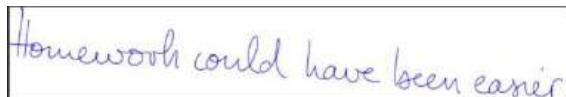
Fig 6: Input Image File

Figure 7 shows final characters recognised by HDR system in terms of output text file.
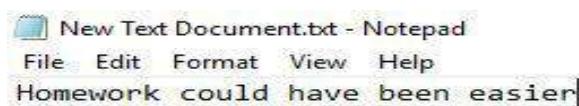
Fig 7: Output Text File

V. Conclusion

The Handwritten Document Recognition system recognises documents and converts it into a text file with the help of algorithm designed using CNN, classification of words and characters and learning of various image segmentation and processing techniques. The results which we received are correct up to more than 90% of the cases.

Thus we conclude that this system is more reliable for Handwritten Document Recognition as compared to existing methods.

VI. Future Scope

The handwritten documents written in english language has been tested, but needs improvement of the segmentation process in order to attain maximum accuracy rate .The efficiency of the HDR can be increased by providing suitable dataset into its training phase .

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Automatic Viva Question Generation

Yash jain, Ronak Kachalia, Rahul Gupta, Prof. Shubhada Labde
Department of Computer Engineering
K.J Somaiya Institute of Engineering and Information Technology,Sion,Mumbai
yash.gj@somaiya.edu, ronak.kachalia@somaiya.edu, gupta.rr@somaiya.edu, shubhada.l@somaiya.edu

Abstract—The Texts is considered as very important source in educational value which are becoming available through the Internet such as Wikipedia, news services. Hence using these new texts in classrooms brings many challenges and so one of which is that there is usually lack of practice exercises and assessments. In this paper we are addressing a part of this challenge by automating the creation of a specific type of assessment. To be specific we are focusing on automatically generating **WH** questions. The main aim is to create an automated system that can take input a text and produce output questions for assessing a reader's knowledge of the information in the text. This question will be given to teacher and they will revise each and every question and will select all he important question. After introducing the problem, we are also describing all the computational and linguistic challenges which are presented by factual question generation. The system uses the ranking of question based on priority used by students for answer of question. Offering such automatic suggestions reduced the time and effort spent by participants (e.g. teachers), though it also affected the types of questions that were created. The research supports the idea that natural language processing can be used to help teachers and other participants efficiently in creating instructional content.

Keywords—Simplify;Extraction;QuestionGeneration; Ranking;

I. INTRODUCTION

If you are highly talented and dedicated reader, and there no need to assess whether you read and retained basic factual information. However, this is not the same with every readers. For example, an engineering college teacher ask numerous question to students for viva. Generating such questions, and framing the reading assessments more generally, can be a time consuming and effortful process. In this research, we work on automating that process and help teachers in reducing some of the efforts. In particular, we focusing on the problem of automatically generating factual questions from the given paragraph.

We aim to create a system for question generation (QG) that can take as input a subject (e.g., a web page or Wikipedia article that a teacher might select to supplement the materials in a textbook), and create all the possible question from the given subject. This system will also help user to select and revise all the possible questions for practice exercises or part of a quiz to assess whether students read the text and retained knowledge about its topic. We focus on QG about informational texts—that is, that convey factual information rather than nonfactual.

To make our factual QG system very much useful, we make the use of domain-specific knowledge (e.g., about historical events or geographical locations) and also focus on modeling fairly general lexical and syntactic phenomena related to questions and the presentation of factual information.

i. Illustrative Example of Factual Question Generation

In this section, we have provided an examples that illustrate that QG about factual information is a very challenging but still achievable task given current advancement of natural language processing (NLP) technologies. We begin with a relatively straightforward example, taken from an Encyclopedia Britannica Elementary Edition article about the city of Monrovia [2].

(1.1) Monrovia was named after James Monroe, who was president of the United States in 1822. In that year a group of freed U.S. slaves, sponsored by a U.S. society, started a new settlement on the continent of their ancestors. As more settlers arrived from the United States and from the Caribbean area, the area they controlled grew larger. In 1847 Monrovia became the capital of the new country of Liberia.

A number of acceptable factual questions can be generated from the above sentence by analyzing its grammatical structure, labeling its important items with high-level semantic types (e.g., person, time, location), and later performing syntactic transformations and WH-framing. From the first sentence, we can extract a perfect structured and specific questions such as the following:
Who was president of the United States in 1822?
When was James Monroe president of the United States?
Who was Monrovia named after?

Related Works:
[1]There are some works that are related to segmentation of sentences and analyze those sentences. There was a repository of all the keywords that they wanted to segment. After analyzing of each sentences they segment the important keyword from it. This keywords resembles a particular meaning such as scheduling an alarm, disabling an alarm, storing a reminder message and active an alarm.

II. WORKING

During viva, teacher will open the application which will be having all the subjects. After that teacher will select the subject that he/she wants to generate the question. The system will find a moderate level question and it will convert that question from text to speech. Initially the question level will

be moderate. The application will frame the question in terms of voice. After that the application will be ready to hear the answer from the student. The system will chec   if there input from for certain period of time, it will consider that question as an unanswered question. Once students completes the answer the audio will be converted to text format and so will be given for evaluation. Based on correctness the system will decide what should be the next question. This process continues until teacher wishes to end.
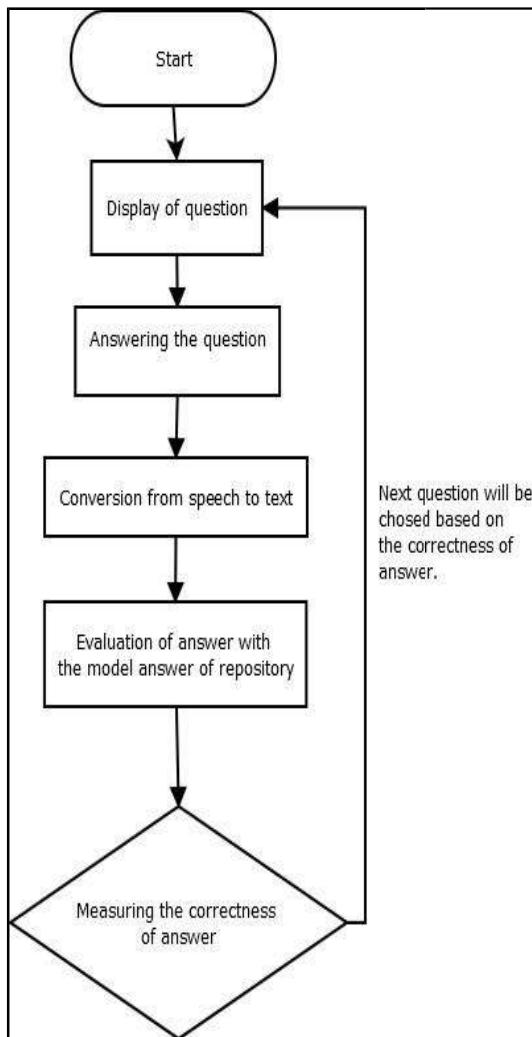
Steps involved in automatic question generation and self evaluation.

a. Converting complex sentence to simple factual.

b. Generation of question from the repository.

c. Based on question the student will answer the question and the system will record the voice of it.

d. This voice will be converted text form and will send for evaluation.

e. The evaluation process will analyze the answer with the model answer and will assign the correctness value to it.

f. Based on correctness value we will decide weather to decrease or increase the toughness of the answer.

g. In order to provide the levels of each question we have classified the question in the following category.

1. Simple
2. Moderate
3. Difficult

III. CONVERTING COMPLEX SENTENCE TO SIMPLE FACTUAL.

Sentences often reflects not just one but many pieces of factual information which makes the use of nested syntactic constructions. Our method for extracting correct meaning-preserving, simplified sentences totally depends on two linguistic phenomena: semantic entailment and presupposition. We provide brief discussion of these phenomena to motivate our approach.

1. ExtractandSimplificationbySemanticEntailment.

A semantically need B if and only if for each and every situation in which A is true, B is also true. It make simple the complex sentences by removing adjunct modifiers and discourse connectives and by splitting conjunctions of clauses and verb phrases. These change in sentences preserve the truth conditions of the original input sentence, while giving more incisive sentences from which questions can be generated.

2. RemoveDiscourseMarkersandAdjunctModifiers.

Many sentences can be made simple by removing some of the adjunct modifiers from clauses, verb phrases, and noun phrases. We can extract by aking off the discourse marker however and the relative clause which restricted trade with Europe.

(2.1) However, Jefferson did not believe the Embargo Act, which restricted trade withEurope,wouldhurttheAmerican economy.

(2.2) JeffersondidnotbelievetheEmbargoActwouldhurtthe
   American economy.

Example 2.2 is true in every situations where example 2.1 is true, and hence it is semantically entailed. Discourse markers such as 'however' does not affect the truth conditions in and of themselves, but actually it serve to inform a reader about how the current sent nce relative to the prior discourse. Adjunct modifiers do have some meaning in sentence, but also it does not affect semantic entailment. Of course, many adjuncts provide useful information that we should preserve for later QG steps. Such example, prepositional phrases that identifies the locations and times at which events occurred gives clear indication of where and when questions, respectively.

3. Splitting Conjunctions.

We also separate conjunctions of clauses and verb phrases. In most cases, the conjuncts in these conjunctions are needed by the original sentence. For example, it is given John studied on Monday but went to the park on Tuesday, both John studied on Monday and John went to the park on Tuesday are entailed. Exceptions where conjuncts are not entailed include the following conjunctions: with or and nor, which we do not split; and conjunctions

within low monotone contexts, which we have to split. We do not split conjunctions except those conjoining clauses and verb phrases. To be specific, we keep noun phrases as it is. Avoiding conjoined noun phrases is generally advisable for factual QG, because of difficult semantic and pragmatic issues which involves nouns.

4 . Extractionby Presupposition.

In addition with the strict notion of semantic entailment, the pragmatic phenomenon of presupposition has an crucial significance in giving information. The semantically entailed information in highly complex sentences generally covers only some of what readers understand. Extracting semantically entailed statement have a chances of losing some of the useful question of the facts (example 4.1).

The Embargo Act restricted trade with Europe.

The Embargo Act did not restrict trade with Europe.

As the examples conveys, some of the information in some of the syntactic constructions of sentence is not semantically entailed but rather it has been presupposed, or imagined to be true and not stated directly, by the author. The meaning conveyed by these constructions do not get change by the non-factive verbs that affect the meaning of the main clause of the sentence. This phenomenon of presupposition is generally subsumed by the term "conventional implicature". Many presuppositions have perfect syntactic or lexical associations, or "triggers." These triggers helps in the extraction of simple statements which can lead to many useful, concise questions. A list of presupposition triggers-

- non-restrictive appositives
- non-restrictive relative clauses
- participial modifiers
- temporal subordinate clauses

IV. EXTRACTION ALGORITHM.

This section presents our algorithm for seperating simplified factual statements from complex sentences. The primary method, extractSimplifiedSentences, which is shown below is high-level pseudocode in Algorithm 1, takes tree t as an input and returns all the trees in Tresult as output. There is an helper function, which is shown in Algorithm 2, recursively seperates conjunctions and also checks to confirm that outputs have subjects and finite main verbs. After parsing it with the Stanford Parser and identifying key nodes of Tregex, we manipulate trees using the Stanford Parser API, which gives complete independence for inserting and deleting children, changing labels on tree nodes, etc.

We have involve an additional filtering step in the extractor so to restrict processing parse trees which is not grammatically correct sentence, or sentences with improper constructions. If suppose the parse tree generated for an input sentence has any of the non-terminal symbols, the extractor returns a set containing an unmodified tree as its output.

```
Algorithm 1 extractSimplifiedSentences(t)
Tresult ← Ø
T extracted    ←    {t} U extract new sentence parse trees from t for the following: non-restrictive
appositives; non-restrictive relative clauses; subordinate clauses with a subject and finite verb; and
participial phrases that modify noun phrases, verb phrases, or clauses.
for all t' ∈ Textracted do
        Tresult ← Tresult U extractHelper(t')
end for
return Tresult
```

```
Algorithm 2 extractHelper(t)
Tresult ← Ø
move any leading prepositional phrases and quotations in t to be the last children of the main verb
phrase.
remove the following from t: noun modifiers offset by commas (non-restrictive appositives,
nonrestrictive relative clauses, parenthetical phrases, participial phrases), verb modifiers offset by
commas (subordinate clauses, participial phrases, prepositional phrases), leading modifiers of the main
clause (nodes that precede the subject).
if t has S, SBAR, or VP nodes conjoined with a conjunction c /∈ {or, nor} then
        Tconjuncts    ←    extract new sentence trees for each conjunct in the leftmost, topmost
set of conjoined S, SBAR, or VP nodes in t.
        for all tconjunct ∈ Tconjuncts do
                Tresult ← Tresult U extractHelper(tconjunct)
        end for
else if t has a subject and finite main verb then
        Tresult ← Tresult U {t}
end if
return Tresult
```

Figure 2: Convert from complex to simple

V. GENERATION OF QUESTION FROM THE REPOSITORY.

This section gives the very important strategy to generate the question. In order to do this, it is compulsory that we remove complex sentences from the passages. We are taking review of the all the important keywords from the teacher. All the question generated will be completely based on these keywords. We will analyse all the linkage of that particular keyword in the passage. After that we will analyse the meaning of that sentences. This will done by using stanford parser which will be doing tagging process of grammar.

Eg. My dog also likes eating sausage.

We have classified sentences based on the above tagging. For what question there are fourteen types of question. Using parse tree the system will how the words on sentence is grammatically connected. Using this tree we will generate simple factual sentence and then we will concatenate the particular WH keyword. Similar process will carried for where, why, when, who and which. Once we analyse the sentence we will append the particular tag.

Tagging:
My/PRP$ dog/NN also/RB likes/VBZ eating/VBG
sausage/NN
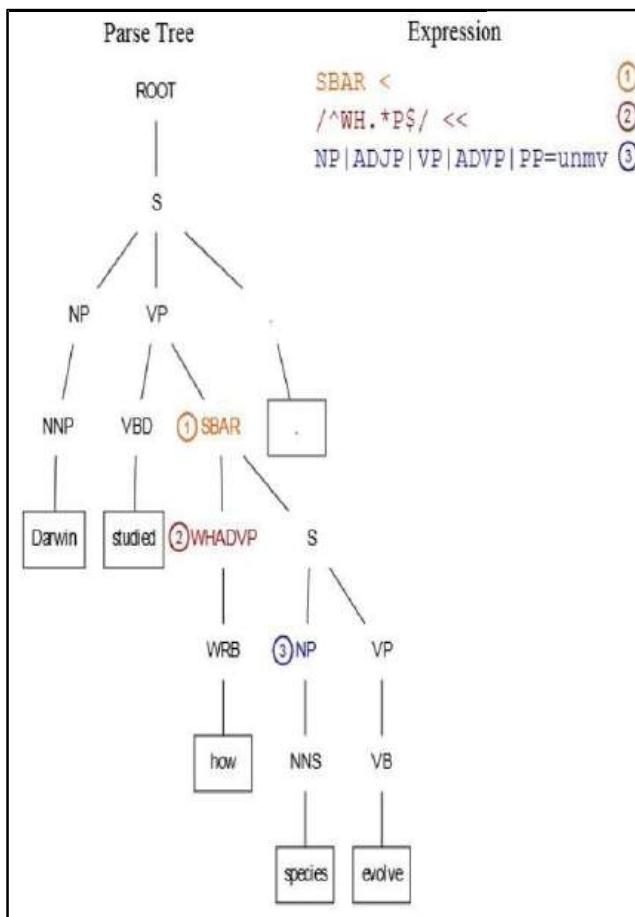
FIGURE 3: PARSE TREE
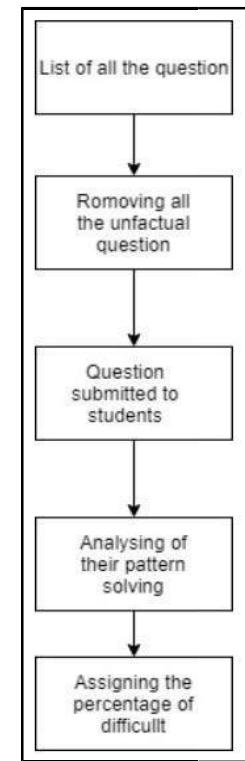
Figure 4: Classification of question.

During viva session the initial difficulty will be 50%. If he/she gives the correct answer then the percentage of difficulty will be increased or else it will be reduced by some amount. So this process of increasing the difficulty or decreasing the difficulty will be continued till the viva session of that particular students ends.

VI. RANKING OF QUESTION.

We are implementing a system which will classify the question into low, moderate and difficult. Most users of QG tools will only consider a relatively short list of approved questions, and so we want to be able to identify the questions that are most likely to be acceptable for viva examination(i.e., at the top of a ranked list)

In order to do these we will generate all the possible from the passages. This will be having all types of question such as

1. True/False

   Eg. Dracula was a real-life figure in history.

2. Brief Answer Question.

   Eg. Explain what is agent?

3. Short Answer Question.

   Eg. Tell me about youself.

This question will be given to students. Based on their answering of question we will we classify them into their respected difficulty level. A pattern will be seen in solving of their question. These question will be given to brilliant as well as to average and below average student.
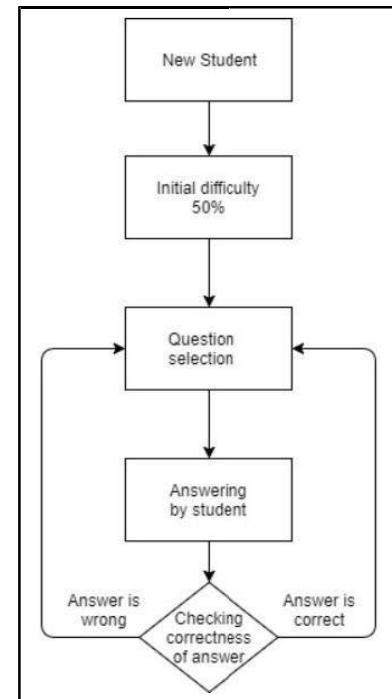
Figure 5: Complete Working

VII. CONCLUSIONS

We have also analyzed many linguistic and computational challenges involved in automatic QG. Our analysis can be beneficial for future QG researchers, also for those who all are working on similar problems, with a proficient roadmap. We have described the complete process for generation and-ranking approach to QG that allows us to use all the existing NLP tools for syntactic analysis. As a first step in this QG technique, we have described a methodology for extracting simplified statements, which can then be use in conversion of questions, from complex input sentences.

The significant feature of our approach is question ranking. We have used live question testing technique to rank candidate questions for viva so that the best questions are selected based on student knowledge.

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Loan Risk Prediction for Bank Customers using Data Mining Techniques

Srividya Iyengar[1] Harshada Deore[2]

Ramrao Adik Institute of Technology, Nerul, Navi Mumbai

Abstract:

In materialistic times like the present, the world is on the brink of development. Just like Globalization, Technology Prowess and Education are predicting the progress of the country, finance similarly is shaping the economy. Through the recent years, new methods and models have been developed to quantify credit risk on a portfolio basis.

Evaluating credit risks in infrastructure projects has generally been based on project financing methodology; this is centred on estimating whether generating a project's cash flows is able to ensure the repayment of the debt so incurred. Transactions in banking sector are shooting up rapidly leading to the huge amount of analysis through the data volumes based on customer behavioural patterns and parameters. Thus, this project would be utilizing 'Data Mining' as a platform for vital area of research with prediction feature.

The model to be developed in this project would be built using data from banking structure to predict the status of all kinds of loans.The prediction model to be built in the project would thus choose the tool of restraining and managing this risk correctly with the aim to minimize credit risk.

financial and banking sector. This project presents briefly some of these techniques which are used in loans risk management and their findings. We mean by loan evaluation process, the sequence of steps that taken to take diced about granting a loan to the customer or not. When the customer apply for a loan granting application, the bank officer must investigate about what called 5 C's which are Character (or Credit History), Cash Flow (or Capacity), Collateral, Capitalization and Conditions. It is helpful for evaluation loan application and it regarded as a helpful framework for estimate the credit risk related to a probable creditor. Risk in the sense that, the customer who is applying for the loan should satisfy all the legal terms and conditions provided by the system parameters, proper name with proof, address, job details, financial details, payment slip, whether he is eligible for loan or not, details that has been provided by the customer are real or not etc. unless and until customer satisfies all the details mentioned above bank will not be able to grant any type of loan.

I. Introduction

Many researches have been conducted based on data mining in the field of

Just like a loan officer at a bank wants to be able to identify characteristics that are indicative of people who are likely to default on loans, and then use those characteristics to discriminate between good and bad credit risk, in a similar manner. As it is developed in Data mining - There are two most important goals for data mining prediction and description. Prediction involves using some variables in data set to predict unknown values of other variables and Description concentrates on finding patterns describing the data that can be interpreted by human. Data mining is the process of extracting hidden pattern from large amount of data that used to take a write decisions. The derived knowledge must be new, not obvious, relevant and can be applied in the field where this knowledge has been obtained. It is also the process of extracting useful information from raw data. Data mining process consist of three phases:

(1)Data preparation (2) The actual mining (3) Interpretation of the results

II.   PROPOSED WORK

In the project Loan status prediction is done using Gradient Boosting method which is an ensemble technique that is rooted in the concept of Gradient descent. It is a first-order optimization algorithm that is usually used to calculate a function's local minimum.

In this method, the classifiers are built in a sequential manner and each member of the ensemble is an expert on the errors of its predecessors.

Based on Gradient Boosting, we present the intuition of Gradient Boosting in the following pseudo-code: 1. Fit the model to the data: 2. Fit a model to the residuals: 3. Create a new model Repeating this model iteratively will keep on improving our classifier. Along with Gradient, Support Vector Machines (SVM) is one of these techniques to be used here which has been proved as an effective and efficient solution in many fields. Its strength lies in the fact that the solution does not get trapped in the local minima. The main idea to be executed in this proposed prototype is to identify special data points (referred as support vectors) that are used to separate the provided cases by transforming input space into linearly separable feature space and then solving the classification problem.

Hence, Stochastic Gradient Boosting along with SVM, should be used for minimizing an objective function expressed in a form of differentiable functions sum but it can be also used as a learner for classification task similar to SVM with hinge loss minimization as loss function.

Both, SGB and SVM support large set data for training algorithm. The algorithms were chosen on the basis of accuracy and error-pruning factors also keeping in mind the varied technicalities that the proposed prototype requires.

I.   PROPOSED METHODOLOGY

INPUT DATA SET

FEATURE SELECTION IN

GRADIENT BOOSTING+SVM

TRAINING

DATA SET

RESULT
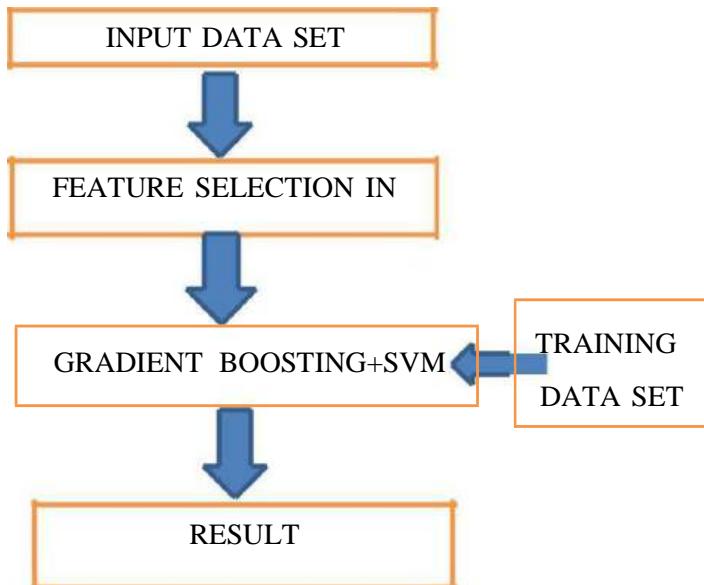
Extensive research on this domain shows that linear SVM classifiers, together with gradient descend based SVM classifiers and Core Vector Machines algorithms, can be a great choice or alternative for implementation of SVM-based credit risk evaluation model. The best coefficients would result in a model that would predict a value very close to 1 (e.g. male) for the default class and a value very close to 0 (e.g. female) for the other class. The intuition for maximum-likelihood for logistic regression based on Gradient Boosting algorithm is that a search procedure seeks values for the coefficients (Beta values) that minimize the error in the probabilities predicted by the model to those in the data (e.g. probability of 1 if the data is the primary class).

The assumptions made by Support Vector

Machines about the distribution and relationships in data are almost equivalent to the assumptions made in Stochastic Gradient Boosting.

GRADIENT BOOSTING: For general loss function $L[Y, Fm (X) + Tm+1 (X)]$, a tree is fitted to the gradient $\partial L/\partial Fm$ rather than residual. The new contribution is shrinked before adding into the model: $Fm (X) + \gamma Tm+1 (X)$.
This slows the forward stagewise algorithm, leadingto improved performance. The Tree depth determines interaction order of the model. • Boosting will eventually overfit; number of terms m is a tuning parameter. • As $\gamma \downarrow 0$, boosting path behaves like 1 regularization path in the space of trees.

SUPPORT VECTOR MACHINE: After maximizing the gap (margin) between the two classes on the training data, for the separable entitites– enlargement of the feature space via basis expansions (e.g. polynomials) should be carried out – using a "soft" margin (allow limited overlap). The resulting solution depends on a small number of points called as "support vectors"

FLOWCHART

Architecture
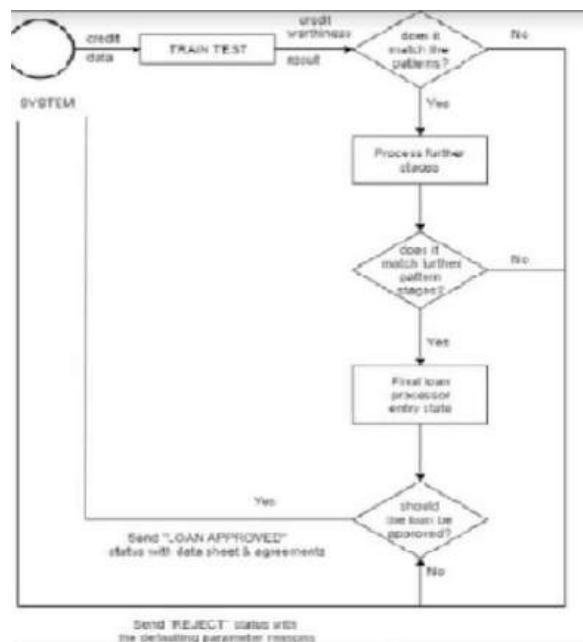
Fig- Flowchart of system

Fig – Architecture of system

The above figure shows the flow of system from initial state to the final state, where initially the customer has to fill his own credit details that then undergoes the train test to match the pattern that checks the criteria of loan.

If the customer satisfies the given pattern then only he/she is entitled to the further process, otherwise it will stop processing further.

Customer who is eligible for loan processing is then allowed to move forward for final loan entry state.

- Above figure shows the architecture for prediction model of loan risks in banks.

- This diagram represents how System is developed for sanctioning the loan process by checking all previous and current credit status of customer.

- When a customer applies for a loan giving an application, it is received by loan officer who checks and authorize loan process.

- Loan officer determines customers credit standing, loan type, available interest rates etc by formatting customer data and develops customer file with details.

Loan committee checks the details of customer and then gives feedback to customer regarding the loan process customer applied for, then they are ready to provide loan.

The above methodology is the manner in which the existing systems function.

CONCLUSION

This application is to be designed for meeting the requirements that originate from the Bank's side as well as that of the customer's side. This component would be developed in a manner keeping in mind that it should work as a plug-in in most of the platforms easily.

Loan Prediction Methodology is very helpful for employees of banks as well as for the applicant too

The Loan Prediction System can automatically calculate the weight of each features taking part in loan processing and the same features are processed on the new test data with respect to their associated weights.

A time limit can be set for the applicant to check whether his/her loan can be sanctioned or not. Loan Prediction System allows jumping to specific application so that it can be checked on priority basis

Result against particular Loan Id can be sent to various department

of banks so that they can take appropriate action on application. This helps all others department to carry out other formalities at a speedy phase

The algorithms implemented to build this predictive model can be used to predict and classify the applications of loans that are introduced to the customers categorized into good or bad loan depending upon the investigation of customer's behaviors and previous pay back credit.

Apart from applying classification's data mining techniques algorithms, we are also to use the algorithms best known for their accuracy as it has best possible feature selections and reduced error pruning.

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STUART

THE STUDENT ASSISTANT IN REAL TIME

Fuzail Shaikh
Student, IT
KJ Somaiya College Of Engineering
Mumbai, India
fuzail.shaikh@somaiya.edu

Ankit Dhame
Student, IT
KJ Somaiya College Of Engineering
Mumbai, India
ankit.dhame@somaiya.edu

Siyara Mascarenhas
Student, IT
KJ Somaiya College Of Engineering
Mumbai, India
siyara.m@somaiya.edu

Viral Parmar
Student, IT
KJ Somaiya College Of Engineering
Mumbai, India
viral.gp@somaiya.edu

Nandana Prabhu
Faculty, IT dept
KJ Somaiya College Of Engineering
Mumbai, India
nandana.prabhu@somaiya.edu

Abstract—**Research in creating artificial intelligence which is able tomimic, imitate and excel at tasks performed by humans has been going on since decades now. While we have accomplished a lot, we still have ways to go. One of the tougherideas is to create an open ended system which can interactusers with n-number of topics. We also wish to be able to authenticate users on the basis of some context available on said person being authenticated. Cognitive computing is still in itsinfancy. However, soon we may imagine how our businessand industry could be positively disrupted by this new technology.**

The proposed project provides a complete student assistantsystem which enables the user for retrieving the data in an interactive way, through chatting with the bot and the system can satisfy the user requirements by extracting user demandedinformation.

The students need not look through various sources of information, instead they can just talk to the student assistant app, and they shall get the information they need, like faculty details, time table information, academic calendar, event information, etc. In the age of AI, students need not go out looking for information everywhere, when the student assistant app can do it for them.

Index Terms— **Artificial intelligence, Chatbot, Dialogflow, Student assistant**

I. INTRODUCTION

Virtual assistants have found their way into human homes as personal assistants with Siri and Alexa. However, these systems find responses to queries with information that is publicly available, eg. a Google search, or return responses based on appointments, reminders that you set through them.

On the other hand, with the boom of the internet, we have a huge array of cloud platforms. Different organizations have tie-ups with different platforms making it difficult to track this ever increasing pile of resources. It can be very intimidating for a user to navigate and search through all these resources for a single piece of information. Bridging this gap was inevitable and our system aims to not only deliver documents scattered across the various platforms but also answer queries based on the information in those documents.

II. RELATED WORK

A lot of work has been done to explore business applications of chat bots such as virtual assistants. An implementation of this NLP based assistant involved asking questions in a specific way to get correct results. It had a prepared knowledge base to answer these queries.[6]

We expand on this by enlarging our scope by including semantics to the NLP domain. Understanding of our agent is significantly increased and it has paved the way for the chatbot to serve many more types of queries.

III. PROPOSED SYSTEM

The proposed project provides a complete student assistant system which enables the user for retrieving the data in an interactive way, through chatting with the bot and the system can satisfy the user requirements by extracting user demanded information.

The system takes search query as an input from the user which is then passed through NLP module and is lexically parsed to extract the necessary keywords. The system then responds to the user by generating results as desired by the users. Our domain is currently limited to user interaction through which the user can extract required documents such as time table, write-ups, faculty information, upcoming events.

IV. PROPOSED SYSTEM ARCHITECTURE

The system architecture is a three tier model that defines the structure, behavior, and views of a system. It is overall organization of the system, broken into several components called subsystems. Three tier model is selected to provide a modular approach to development of the product.

The component subsystems are:

1. Android App: This is the communication point for the user. Registration, requesting queries and collecting the response can be done from the app.
2. Cloud Server: This contains the server logic, database and the admin panel
3. Dialogflow: Used to convert natural text to structured input which is easier to process
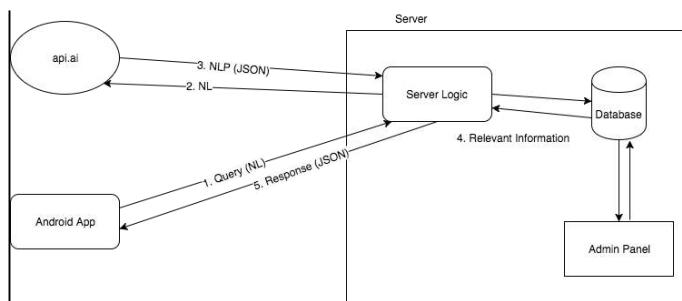
V. IMPLEMENTATION

Stuart uses technologies such as a Node.JS server, with a MongoDB NoSQL database, Dialogflow libraries for NLP, a dynamic web-app for the dashboard, an android app as the client side platform, and a custom algorithm to convert PDF files to JSON objects, and then fit them into our NoSQL database.

The Stuart application has 2 main sections:

1. Front-End (Android App)

The front-end, or the client side platform , which is the android app, is used to communicate with the server. It provides access to the information stored on the database, through various sections of the app, like courses, faculty details, etc.

The main use case of the application is the chat screen, in which the user can communicate with Stuart, by talking to it in normal contextual English, asking queries about various parts of the college, like time table details, faculty details, etc.
The student needs to register using their somaiya.edu email id to use the app.

2. Back-End (Node.JS server, Database, Admin Panel)

The administrators can create new entities like new faculty, new events, staff, and upload documents like time table, academic calendar, etc to the admin panel. The admin panel will be used to upload the data to the database. The database is a NoSQL database, created by using MongoDB. Details about the subjects, faculty, different branches of the college, etc will be stored in the database.

Whenever new queries arrive from the android app, they will be sent to the Node.JS server. The server will then have to perform NLP, and create JSON objects by sending the information to dialogflow, and then store the information correctly to the database, or query data from the server, depending on the query fired from the android application.

The PDF documents uploaded to the admin panel need to be parsed and converted to JSON objects, so that the data can be stored in the database efficiently, and automatically without any human assistance.

To convert the PDF documents into JSON objects, we first divide the table in the PDF document, row wise. In the current scope, we have worked upon the student time table. After we divide the table row wise, we get the time table divided into sections based on lectures/practicals hour-wise. We then have to trace those lectures/practicals to their specific days, i.e Monday, Tuesday, etc and for that we need to further divide the timetable column wise. We perform that using clipping windows by setting the width and height of each column.

After all the processing, we finally get a JSON object with the timetable schematics in a well formatted manner, which now can be parsed and understood by the server, and after it being stored in the database, the users can ask questions about the timetables through the android application, and the app will be able to provide answers by querying the server, and getting the data which was parsed from the PDF tables.

VI. RESULTS

The implementation of the system has yielded the following results.
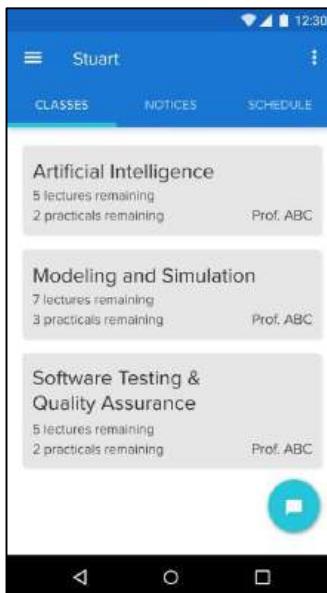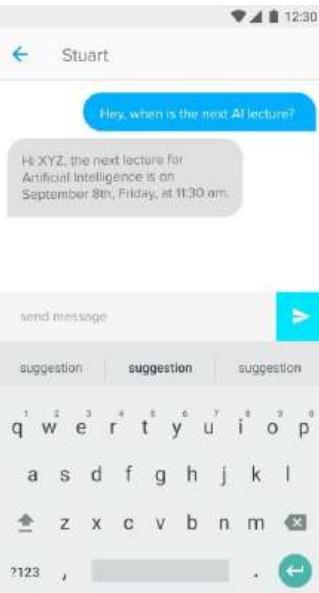

Fig. 2   Fig. 3

User is able to retrieve write-ups as the system correctly identifies and delivers the write up based on its directory location. User is also able to find and query system based on faculty details. Questions like 'Where is 'x' teachers cabin' are successfully answered. Questions asking location of next lecture are also correctly answered as in fig[2].

We have also set up a student corner where the student's classes, notices and schedules are displayed as in fig[3].

We have carried out our implementation of PDF-to-text on Time table to check if information extraction is working as intended.

VII. CONCLUSION

Stuart is a system which accurately processes natural language and converts it into queries. Along with this, it also understands the content in documents and is able to respond to queries based on those documents.

It acts as a student assistant by keeping track of students information and generates responses accordingly. This means that for different students asking the same query, responses will be different based on which year they belong to, which department they belong to and what subjects they have taken. On one search, student can find resources that were otherwise scattered throughout platforms.

VIII.   FUTURE WORK

For our system to understand all types of documents without any human intervention, we are neural networks in

combination with AI. To accommodate large number of users and resources, data compression can be applied before storing materials on the cloud.

Also, STUART could be made available on Google now to eradicate the need of a dedicated chatbot. However, in this scenario, user would not be able to use the app exclusive features.

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Biosensors Based Hand Held Device for Tracking Normal or Caesarean Delivery Process

Ms. Sneha Chogale
PG Students,

University of Mumbai

ersneha2489@gmail.com

Dr. Sunita R. Patil ,
Profesor,K J SomaiyaIEIT,Sion

University of Mumbai

spatil@somaiya.edu

Abstract— **The continuous monitoring of health of expected mother and fetus is the key fact about normal delivery. Sensors can be used to measure the dilation and effacement of cervix and also to measure time required to deliver a child. The focus of this paper is to prepare the sensor based device to measure the dilation and effacement of cervix and time required for normal or c-section.**

Keywords— Cardiotocography, Fetal Heart Rate, MEMS, Sensor

I. INTRODUCTION

This paper provides monitoring and data analysis of the parameters that are important in the normal labor delivery process with sensor based technology. Labor and delivery can be continuously monitored electronically with sensors that will measure and record Fetal Heart Rate (FHR) which is referred as Cardiotocography (CTG) [1]. The delivery of a full-term newborn fetus refers to a gestation age of 37-42 weeks, as determined by the last menstrual period of labor or via ultra-sonographic technique and evaluation. Basically, the normal delivery process is divided into 3 stages as shown in the Figure 1 [1].
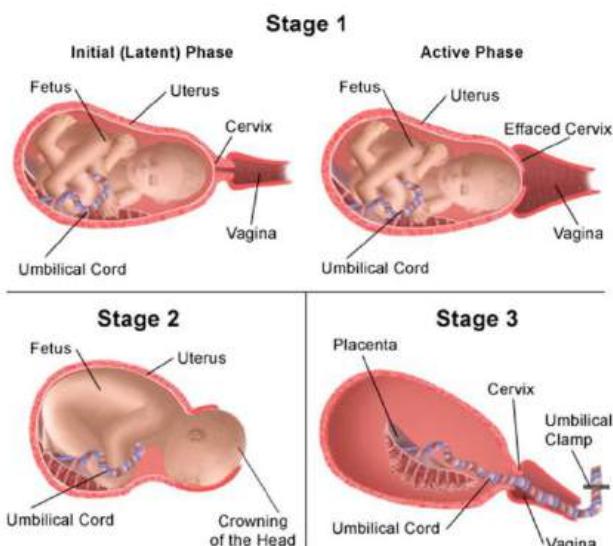

Fig.1 Stages of Normal Delivery Process

Stage 1: Dilation and Effacement of the Cervix
This stage consists of 3 phases as follows,
   a.   Early or Latent phase,
   b.   Active phase,
   c.   Transition phase.
The same is shown in Figure 2.
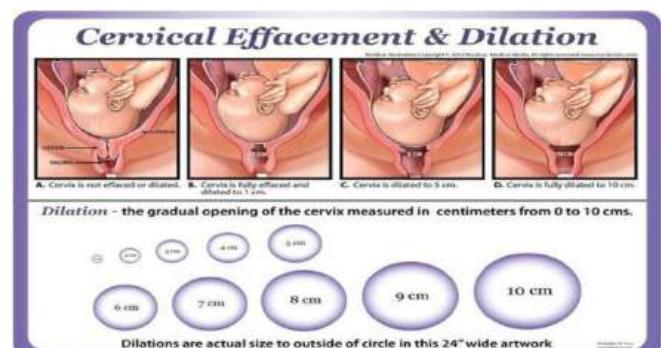
Fig. 2 Dilation and Effacement of the Cervix

a. Early or Latent Phase (cervix dilates from 0 to 4 cm)
In the first phase of normal delivery process, childbirth can take 6 to 10 hours for a first-time mother. The beginning of labor happens differently in every woman. In some women, the cervix can dilate to three centimeters well before any noticeable, real contractions begin. Some women can have strong contractions that don't change their cervical dilation at all. But, in general, the early phase brings some effacement thinning and softening of the cervix and dilation to 3 centimeters over a period of hours or days. Contractions are mild and sometimes irregular, coming from 5 to 30 minutes, lasting 30 to 45 seconds. The water may break in this early phase.

b. Active Phase (cervix dilates from 4 to 7 cm)
In this phase, serious labor for baby delivery begins, and when most women begin to labor more intensely. It can last an average of three to six hours for first baby, and about half that for subsequent births. During the active phase, contractions usually come steadily, gradually increasing in intensity and frequency, from three to five minutes. Pains may be centered in the lower back, abdomen, or thighs, and they may be intense enough to make it hard for mother to talk. The mother might also experience an increased amount of pinkish or brownish discharge, or what's sometimes called a "bloody show".

c. Transition phase(cervix dilates from 8 to 10 cm)
The final phase of the first stage can last 20 minutes to two hours for fetal, and may go quite quickly in subsequent birth. Contractions during this phase are intense, spaced about one to three minutes. Sometimes fatigue, shakiness, and nausea are all common in this phase, as mother body does the hard work of reaching complete dilation and

effacement. It may feel a strong urge to push or bear down, along with pressure in the rectal area and stinging in the vaginal area as the fetal head moves down toward the vaginal opening.

Stage 2: Pushing and Birth
The second stage of labor is the time between full cervical dilation and delivery of the fetus. This phase mainly lasts from minutes to hours. The maximum time for the second stage mainly depends on the patient's parity and whether the labor has an epidural condition.

Stage 3: Delivery of the Placenta
The normal delivery of the placenta is the final and last stage of labor in the process; it normally occurs within 30 minutes of delivery of the newborn fetus. As the uterus contracts, a plane of separation develops at the placenta-endometrial interface. As the uterus further contracts of the labor, the placenta is expelled.

II. LITERATURE SURVEY

For predicting the normal delivery time and monitoring of mother and fetus, few important parameters need to be tested. To test theses parameters some devices and techniques are used in medical field.

2.1 Parameters tested at the time of delivery
Some crucial parameters are to be tested at the time of normal delivery:
a. Heartbeat of fetus
b. Blood Pressure of expecting mother
c. Cervix length of expecting mother
d. Fetus position in womb

a.The Heartbeat of fetus
In most cases, fetal heart rate is monitored during labor to see fetus status and to identify potential problems ahead of time. Electronic Fetal Monitoring (EFM) is currently used to monitor almost all women in hospitals which describe the heart rate variability for contraction and non-contraction intervals in forms of movement frequency in MHz Labor and delivery are monitored electronically with sensors that measure and record maternal uterine pressure (UP) and fetal heart rate (FHR), a procedure referred to as cardiotocography (CTG) [2]. The normal range for a full term baby's heart rate during labor is between 110 and 160 beats per minute (bpm). Higher or lower rates can be a sign fetus is having trouble coping with labor, depending on a number of factors. If the baseline rate is less than 110bpm, it is called bradycardia (abnormally slow heart rate) and if FHR are greater than 160bpm it is called tachycardia (abnormally high slow rate).

b. Blood Pressure of expecting mother
Normal blood pressure of a person is usually somewhere close to 120/80 mmHg. Blood pressure between 140/90 and

149/99 mmHg is called Mildly high, between 150/100 and 159/109 mmHg is called Moderately high and of 160/110 mmHg or higher is called severely high blood pressure. If the BP of mother is not in normal range then there are various risks to mother as well as fetus. Few risks to mother are as follows.
a. An increased chance of having a stroke.
b. Damage to kidneys and liver.
c. An increased risk of blood clotting problems.
d. An increased risk of severe bleeding from placenta. If developed pre-eclampsia, then it can cause serious damage to organs, including brain and kidneys.
The risks to fetus are as follows
a. An increased chance of poor growth.
b. An increased chance of premature birth.

c. Cervix length of expecting mother
Normal cervical length measures 4 to 5 cm when woman is not pregnant. During a normal pregnancy, the cervix remains firm, long, and closed until late in the third trimester. It usually starts to soften, shorten (efface) and open up (dilate) as body prepares itself for labor. Normally, in the late second and early third trimester, the cervical length measures anywhere between 3 cm to 3.5 cm (30-35mm) and decreases progressively as the pregnancy advances, in preparation for labor. When cervical length is less than 2.2 cm (abnormal), women are not in progress to deliver normally. Normal cervix length should be 10 cm at the time of delivery.

d. Fetus position in womb
The most common and abnormal combination of fetus position:
a. Cephalic Presentation
b. Occiput-posterior Presentation
c. Brow Presentation
d. Breech Presentation
e. Shoulder Presentation
a. Cephalic presentation
The normal position of a fetus is facing rearward (toward the woman's back) with the face and body angled to one side and the neck flexed, and presentation is head first. Figure 3 shows the normal position of fetus in mother's womb.

Fig. 3 Normal Fetus Positions

Figure 4 shows the abnormal position and presentation of fetus in mother's womb.

Fig. 4 Abnormal Fetus Presentation

b. Occiput-posterior presentation

In the occiput-posterior presentation (also called sunny-side up), the fetus is head first but is facing up (toward the mother's abdomen). It is the most common abnormal position or presentation. When a fetus faces forward, the neck is often straightened rather than bent, and the head requires more space to pass through the birth canal. Delivery by a vacuum extractor or forceps or caesarean delivery may be necessary.

c. Brow Presentation

If baby is in a brow presentation, this means the largest area of fetus head will be trying to fit through mother's pelvis during birth. Brow presentation usually happens when baby's neck and head are slightly extended (deflexed), as if baby is looking up.

d. Breech presentation

The buttocks or sometimes the feet present first. Breech presentation occurs in 3 to 4% of full-term deliveries. When delivered vaginally, babies that present buttocks first are more likely to be injured than those that present head first. Such injuries may find before, during, or after birth. The baby may even die. Complications are less likely when breech presentation is detected before labor or delivery .Sometimes the doctor can turn the fetus to present head first by pressing on the woman's abdomen before labor begins, usually after 36 weeks of pregnancy. However, if labor begins and the fetus is in breech presentation, problems may occur.

e. Shoulder Presentation

Shoulder presentation is an abnormal position of the fetus at the time of delivery. In this, the fetus lies transversely so that its vertebral column lies perpendicular to the maternal position of spine. So, the part that enters the birth canal will be the trunk or shoulder. In spite of some deviations in the positioning of the fetus, the doctor may try for vaginal birth only if the baby's head, or buttock, or feet are at the bottom. Hence, the vaginal birth will be unthinkable for the mother and she has unquestionably to undergo a C-section.

The decision for usage of forceps or a vacuum assistance is guided by the indication for an instrumented delivery and the clinician's experience.

2.2 Pregnancy period tests & devices

Various devices are used to monitor the wellness of fetus and mother as follows:

a. Ultra scan

As shown in Figure 5, an ultrasound scan sends sound waves through womb (uterus). These waves bounce off the baby as echoes. The echoes are turned into an image on a screen that shows fetal position and movements. Hard tissues such as bone, reflect the sound waves and make the biggest echoes. It includes white in the image and soft tissues as grey. Fluids such as the amniotic fluid surrounding the baby appear as black. This is because the sound waves go through with no echoes. A first-trimester scan will test that baby's heart is beating and also look at the basic examination of baby's head, abdominal wall, and limbs.

Fig.5 Ultrasound Scan

b. Doppler Ultrasound

A Doppler is a form of ultrasound scan that helps to assess baby's health. It measures the blood flow in different parts of fetal body, such as umbilical cord, brain, and heart. This helps to show whether fetal is getting all the oxygen and nutrients needs via the placenta. The transducer sends out sound waves, which bounces off the blood flow to fetal body through the cord as well as his blood circulation system. This creates an image on a display which shows how the blood is flowing. This is shown in Figure 6.

Fig.6 Doppler Ultra Scan

c. CT Scan

A doctor or physician may order a Computerized tomography (CT) scan of the fetus to formulate detailed pictures and analyze the internal structure. Computerized Tomography (CT) scanning is useful to get a very detailed 3D image of certain parts of the body. The same is shown in Figure 6.

Fig. 7 CT Scan

d. Stethoscope

External Electronic Fetal monitoring can be done by listening to baby's heartbeat with a special stethoscope. External monitoring is done using two flat devices known as sensors held in place with elastic belts on belly. One sensor makes use of reflected sound waves i.e. ultrasound to keep track of fetal heart rate. The other sensor measures the strength and duration of uterine contractions. The sensors are connected to a machine to keep the track of information. External monitoring is used for a non-stress test which records baby's heart rate while baby is moving and not moving. A non-stress test may be combined with a fetal ultrasound to evaluate the amount of amniotic fluid. External monitoring is also made for a contraction stress test, which records changes in baby's heart rate when to have uterine contractions. It may be done to check on fetal health during a non-stress test. It may help to predict whether the baby can handle the stress of labor and vaginal delivery.

e. Telemetry

External monitoring can also be done remotely called as telemetry, without need to be connected by wires to a machine. At some places, the sensors send the information about the fetal heart rate and uterine contractions to a remote monitor. Remote monitoring allows to walk around freely. The position of the heart rate monitor changes periodically to adjust to the movement of baby. For a non-stress test, the sensors are placed on belly of the labor. It is asked to push a button on the machine every time baby moves or have a contraction. Fetal heart rate is recorded and compared to the record of movement or contractions.

f. Electrode with a wire & tube

Internal fetal monitoring is done only after cervix has dilated to at least 2 centimeters (cm) and amniotic sac has ruptured. Once started, internal monitoring is done continuously. A thin wire (electrode) is guided through vagina and cervix and attached to baby's scalp. A small tube is also inserted through vagina to attach a device to monitors the contractions inside uterus. The electrode and the tube are attached with wires to a recording device to record of fetal heart rate as well as the strength and duration of uterine contractions.

g. Monitors

Monitors are used to detect the baby's heart rate and length and frequency of the contractions. There are even monitors that allow patients to walk around while it keeps track of the heart rate and contractions. Figure 8 shows the same.
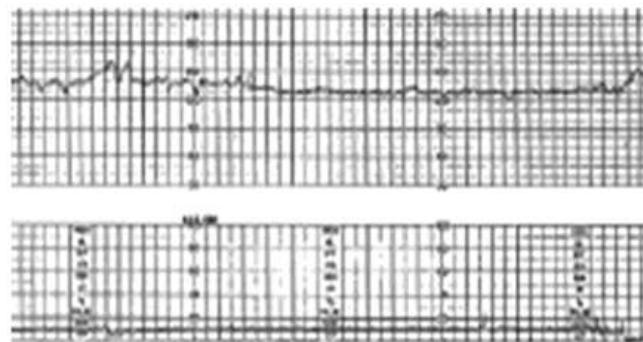

Fig. 8 Monitor

h. Delivery assistance (operative vaginal delivery)

It is hand held metal instrument with blade extensions that are applied to each side of the fetal head part for delivery process. The traction force of the blades helps to aids in neonate delivery as shown in Figure 9

Fig. 9 Operative Vaginal Delivery

Fig.11. Vacuum

i.Forceps

The Use of forceps has decreased over the past several decades. The indications for forceps are included in prolonged second stage of labor or ineffective maternal push power. The presenting part needs to be at +2 station part before forceps should be applied to the labor for the delivery. If the presenting part is at higher station, abdominal delivery should be chosen into consideration of the labor for the process. Forceps use is mainly associated with less fetal hematoma formation and quick delivery times are compared with vacuum assist lacerations. Forceps is associated with lower risk of maternal bleeding condition and better choice that the mother is able to deliver vaginally in subsequent pregnancies. The device is shown in Figure 10.

k.. Axis traction device for delivery forceps

This device is light, simple in construction, having only three parts, and very easy to apply to any forceps handle when axis traction is required. It prevents the lock of the forceps from slipping and at the same time does not hinder the forceps blades from being opened or closed at the wish of the operator. The handle alone is sufficient for most of the axis traction cases, but when a great amount of traction is required a "T" or cross-bar can be attached through the slot in the lower end. The same is shown in Figure.12

Fig. 12 Axis Traction for Delivery Forceps

Fig. 10 Forcep

j. Vacuum

Vacuum consists of a suction cup that is attached to the fetal head part to assist with extraction. Tractional pressure is updated by a negative pressure handle system. Types include metal cup vacuums, plastic cup vacuums, and a mushroom-shaped vacuum cup that uses the advantages of the metal and plastic designs. It is used during emergency delivery because of fetal distress, poor maternal push power, or checks for maternal medical conditions that contraindicate strong pushing. The same is shown in Figure 11.

l.. Cusco's self-retaining bivalve vaginal speculum

Cusco vaginal speculum can be used to carry out an endoscopy. The speculum is placed inside the vaginal opening of the woman which helps the surgeon to perform the required endoscopic process. This process usually involves the female reproductive system and the genitourinary system which is why the vaginal opening must be expanded for the process to be conducted efficiently. The same is shown in Figure 13.

Fig.13 Cusco self-retaining bivalve vaginal speculum

III. PROPOSED SYSTEM DESIGN & IMPLEMENTATION

As electronic components becoming smaller, faster, and cheaper to fabricate with low power and with low maintenance, they can be more easily deployed on a massive and pervasive scale. Ongoing work on Micro Electro Mechanical Systems (MEMS)[3] will enable sensing and actuation down to a scale of a nanometre. The possibilities for miniaturization extend into all aspects of life and the capability for embedding computing and communication technology quite literally everywhere is becoming a reality. It makes eventually an invisible component of almost everything in everyone's surroundings, extending the Internet via embedded networks of MEMS deep into the physical environment, making greater use of the expanded IPv6 address space. According to [4, 5] for hand applied forces during the childbirth and tactile sensing glove, biological sensor fusion would provide more accurate and reliable information. Multi-sensor fusion would be beneficial in numerous ways such as timeliness, redundancy and complementarily. The fusion or integration of simulated sensor would minimize overall uncertainty and thus helping in maximize the accuracy for predicting normal or caesarean delivery. It would provide redundant data and also serve to maximize reliability in terms of sensor failure or error. Currently Glucose sensor and sucrose sensor are used as the biological sensor[6].

This research paper proposes a hand held device made up of MEMS and biosensors[7]for tracking exact time for delivery along with the complications involved ,if any.

3.1 MEMS:

Micro Electro Mechanical Systems (MEMS) forms a powerful enabler for the vision of smart ubiquitous computing environments. Although many mechanisms can be made usefully smaller in order to embed them and make them blend into the physical world, some macro mechanisms are still needed, often to support human activities.

3.2 Sensors:

Sensors are a type of transducers that converts some physical phenomenon such as heat, light, sound into electrical signals. Sensors often act as an enabler, as inputs to a system behavior so that it can more favorably adapt, often embedded as part of a control loop in pre-programmed systems that perform specialized rather than general purpose functions. They can be used to do instrument and monitor environments; track assets through time and space with respect to some workflow or process; detect changes in the environment defined to be of great importance that humans are unable or are put at risk to perceive; control a system with respect to the environment within a defined range of changes; adapt services to improve their utility. The biosensor are most widely used in medical applications for tracking problem of human body and suggesting exact solution for medical practitioners.

Types of Sensors:

There are various types of sensors used in medical field as follows:

a. Active Sensor –

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. It aims to converts the physical parameter (e.g. temperature, blood cervix length of mother. The accurate results of both time required for delivery and length of dilated cervix can be obtained. If any abnormalities are found by sensing device then it can be handled by expert with the help of sensing devices which we are developing. This will help mankind and avoids many infant death and other serious problems to mother in labor . The advantage of using this device to doctor , pregnant woman would know labor delivery time, status of fetus in womb and cervix dilation

b. Passive Sensor –

Sensors which do not require any power supply are Passive Sensors. e.g.radiometers, film photography etc,.

c. Accelerometers-

These are mainly based on the MEMS technology. They are used for patient monitoring. e.g. accelerometer, pace makers and vehicle dynamic systems.

d. Biosensors-

These are based on the electrochemical technology. Biosensors are mainly used for food testing, medical care device, water testing, and biological warfare agent detection.

e. Temperature Sensor-

Sensor like LM35is used for measurement of the temperature of the human body. Body temperature changes depending upon on the time to time and day to day. Many diseases such as typhoid, viral fever etc, needs to be monitored as well self-monitoring patients continuously[8,9].

A hand held instrument made up of Biosensors and MEMS which will track fetus heart beats, Contractions during pregnancy with effaced & dilation (opening of vaginal mouth), mother and fetus fitness and wellness status etc. will be designed and developed . The continuous monitoring of various parameters and their analysis for tracking normal delivery process will give immediate decision making power in case of emergencies whether to go ahead with caesarean delivery or wait for normal delivery process.

IV.   CONCLUSION

Sensor-based hand held device can be designed to predict whether mode of delivery is normal or c-section by monitoring the pregnant women during labor conditions such as infant heartbeat and position in womb, BP and cervix length of mother time required for delivery and length of dilated cervix. It signals various problems or complications ,if any to be occurred at the time of labor. The accurate results of both time required for delivery and cervix length of dilated cervix can be obtained. This device can be made full proof to work on many more parameters giving accurate result and early prediction for delivery mode.

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Effect of Sampling Rate on Irradiance measured by First and Second Class Pyranometers

Heman Shamachurn

Department of Electrical and Electronic Engineering
University of Mauritius, Reduit, Mauritius
h.shamachurn@uom.ac.mu

Abstract—**Accurate solar resource assessment is critical for the proper design and evaluation of the performance of solar photovoltaic and solar thermal systems. A solar irradiance sensor typically provides a voltage output with a given response time. This time should be taken into account when selecting the sampling rate to be used by the data logging system. Photoelectric-based sensors respond very quickly, whereas thermoelectric-based sensors have a relatively higher response time, due to the thermal mass. As per the author's knowledge, no work has investigated the effect of the sampling rate on the irradiance measured by thermoelectric-based sensors. This work makes a new contribution in the field of solar energy measurement, by experimentally investigating the effect of varying sampling rates on the global horizontal irradiance measured by CMP6 first class and DPA053 second class thermopile pyranometers. It was found that the measured irradiances depend on the sampling rates and this dependance is larger for the DPA053 as compared to the CMP6. Moreover, the DPA053 tends to have a lower measurement error at low irradiances than at high irradiances. Additionally, even if the CMP6 was sampled at higher than recommended rates, it tends to have superior response than the DPA053.**

Keywords— Solar irradiance; Sampling rate; First class pyranometer; Second class pyranometer; CMP6; DPA053

I. INTRODUCTION

The electromagnetic radiation from the Sun has a huge potential to provide us with clean and renewable energy. Solar photovoltaic (PV) systems are increasingly being used to produce electricity around the world. Moreover, solar thermal systems are used to produce heat for space and water heating, as well as electricity production through concentrating solar power (CSP) schemes. New technologies are emerging to avoid excessive solar heat energy from entering buildings in hot and tropical climates, in order to avoid discomfort. In all these applications of solar energy, prior assessment of the available solar resource is crucial in order to be able to the design effective systems. In addition, once the systems in place, the continuous and accurate performance monitoring requires solar updated solar resource data.

The complex interactions of the extraterrestrial solar radiation with the earth's atmosphere results into the three essential components namely Direct Normal Irradiance (DNI), Global Horizontal Irradiance (GHI) and Diffuse Horizontal Irradiance (DHI). The DNI, sometimes referred to as the beam component of solar radiation, is the straight line irradiance from the Sun received perpendicularly to the surface. The DNI is of particular interest to CSP and concentrating PV schemes as well as systems which track the position of the Sun. The DHI results from the scattered solar radiation by molecules and particles in the atmosphere and comes equally from all directions from the sky dome. It is particularly useful in assessing the performance of solar systems in the absence of DNI, such as under cloudy conditions. GHI is the total amount of solar radiation per unit area received by a surface horizontal to the ground and is in fact the geometric sum of the DNI and DHI. It is sometimes referred to as the total hemispheric irradiance and the most common irradiance measured for solar systems applications.

DNI is measured using pyrheliometers. DHI and GHI are measured using pyranometers. Both of these equipment make use of the thermoelectric or photoelectric effect so convert the irradiance (W/m^2) into a proportional low level electrical voltage (μV). The thermopile pyranometers make use of an optically black coating so that their spectral response is wide and uniform over all wavelengths between about 300 nm and 3000 nm [1]. The thermoelectric detector has a relatively large thermal mass so that its response time is of the order of seconds. Thus the output voltage lags behind the actual solar irradiance by a relatively large amount as compared to photoelectric detectors which have response times of the order of milliseconds. Photoelectric detectors generally respond only to a smaller portion of the electromagnetic spectrum, typically in the range of about 400 nm and 1100 nm.

The World Meteorological Organisation (WMO) and the International Standards Organisation (ISO) classify pyranometers and pyrheliometers. Instruments which comply with the classifications measure the solar irradiance accurately under all weather conditions. The WMO specifies that a good quality pyranometer has a response time of less than 30 s for 95 % response while a moderate quality one has a response time of less than 60 s [1]. The ISO 9060 standard specifies the same response times, but the good quality pyranometer is referred to as a first class pyranometer and the moderate quality is referred to as a second class pyranometer. The response time of the

instrument is a critical parameter to be considered when deciding about the sampling frequency of its data acquisition system. Moreover, a high sampling frequency will lead to a high temporal resolution but the data storage memory limitations can be a limiting factor. A sampling interval of 1s is commonly used although manufacturers specify that other rates can be used. For instance, the manufacturer of the CMP6 first class pyranometer specifies that sampling periods below 5s are not necessary and states that 10s can be used [2]. As per [3], the recommended practice is that the sampling time period should not exceed the time-constant of the sensor. Moreover, for averaging purposes, somewhat faster sampling rates such as twice per time-constant are often practiced. Furthermore, for the estimation of extremes of fluctuations, such as sudden change in irradiance due to cloud passing, the sampling rate should be at least four times per time-constant.

Many research papers in literature have only specified the irradiance logging time period, without providing the details of the exact pyranometer sampling time period. For instance, the authors of [4] mentioned that the outputs of the pyrheliometer and pyranometer used were recorded in a database every minute, without providing the exact sampling frequency. The authors of [5] stated that the output of the CMP3 thermopile pyranometer was recorded every minute and that the 10-minutes averages were stored in a data logger, without specifying the sampling frequency. A study employing a thermopile pyranometer [6] specified a sampling time period of 60s and recording time period of 1 hour. On the other hand, a few papers have specified the employed sampling frequency. The authors of [7] have used a sampling period of 1s when measuring the solar irradiance with the CMP11 secondary standard pyranometer having a 95% response time of less than 5s. The CNR-1 thermopile pyranometer which has a 95% response time of less than 18s was used in [8] at a sampling time period of 5s and an averaging period of 30 minutes.

As per the author's knowledge no experimental analysis has been carried out so far to investigate the effect of varying sampling rates on the irradiance measured by commercially available thermopile pyranometers. The aim of this work was therefore to contribute in addressing this knowledge gap, by using the CMP6 first class and DPA053 second class pyranometers alongside the accurate FluxDAQ+ Arduino-based data acquisition system. The rest of this paper is organized as follows: Section II describes the methodology adopted in this work, section III provides the results and their discussions, and section IV eventually concludes the paper.

II.   METHODOLOGY

A. Equipment

In this work, 2 CMP6 thermopile pyranometers by KIPP & ZONEN and 2 DPA053 thermopile pyranometers by LSI LASTEM were employed for the experimental investigation. All pyranometers were factory calibrated and their technical specifications are provided in TABLE I. Given that no artificial solar light source capable of providing varying and high enough irradiance was available, it was decided to perform the experiments under real outdoor conditions. Few data loggers which are capable of recording the very low microvolt level voltage signal without amplification are available. Moreover, a

data logger which can enable its channels to be sampled at different rates was not found. It was therefore decided to use 2 affordable and similar data loggers capable of recording microvolt level signals. The FluxDAQ+ is a low cost and accurate Arduino based data logger designed to record small analog DC voltages from heat flux sensors and thermocouple-based temperature sensors, and is mainly used for in-situ measurements of building material thermal insulation [9]. Moreover, each FluxDAQ+ has 8 differential channels, employs 24-bit Delta-Sigma analog-to-digital converters and has a voltage resolution of less than 1 µV. The maximum sampling rate depends on the number of active channels. For 2 active channels, a maximum sampling rate of 2.5 Hz can be achieved.

TABLE I. PYRANOMETER SPECIFICATIONS

Specifications	CMP6	DPA053
ISO 9060 Classification	First Class	Second Class
Spectral Range (nm)	285 to 2800	305 to 2800
Sensitivity (µV/Wm^{-2})	12.47, 12.57	12.38, 13.59
Maximum Irradiance (Wm^{-2})	2000	2000
Response Time (95%)	<18s	30s
Response Time (63%)	<6s	unknown

B. Experimental set-up

The 4 pyranometers were installed on a platform as shown in Fig. 1. The two top pyranometers with the yellow wires are the CMP6 and the bottom ones with read wires are the DPA053. Care was taken to ensure that the CMP6 are properly levelled by using the in-built bubble levelling device. A spirit level was used to ensure that the DPA053 are properly levelled.
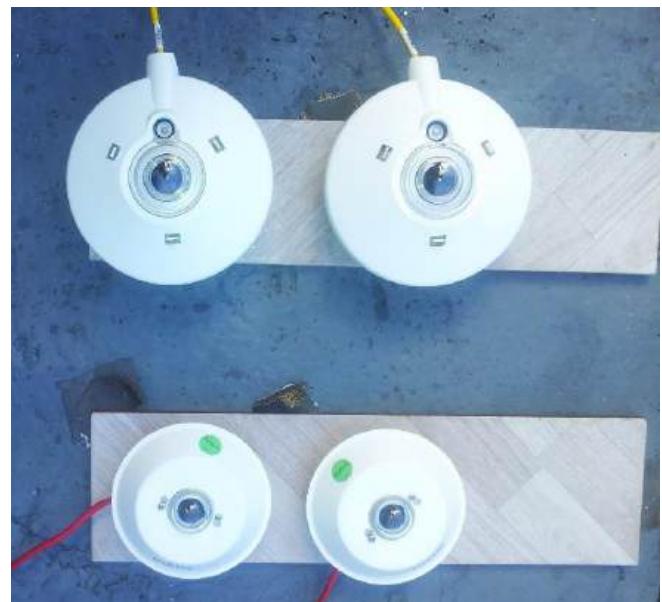

Fig. 1. Pyranometer set-up

The 2 FluxDAQ+ loggers are shown in Fig. 2. Only the channels 1, 3, 5 and 7 were used on each logger as the software for the logger has been configured by the supplier to record pairs of heat flux-temperature data.

Fig. 2. FluxDAQ+ data loggers

C. Measurements

The Arduino code for the data loggers were accessed in order to change the sampling rates. The sampling time periods used in this work were 2s, 6s, 10s, 14s, 18s, 22s, 26s and 30s. In setting up the logger via the software interface, only the number of active channels and corresponding sensitivities had to be inputted. Initially, each logger was tested with all 4 pyranometers simultaneously at sampling periods of 2s, 10s, 18s and 26s in order to identify the average measurement errors between the 2 CMP6 and the 2 DPA053. Subsequently, each logger was used to log the measurements from 1 CMP6 and 1 DPA053 such that the measurements from all 4 pyranometers were logged simultaneously at a sampling period of 2s. This procedure was followed in order to determine the average error between each logger in taking measurements from similar pyranometers under the same light conditions. Eventually, 1 logger was used along with 1 CMP6 and 1 DPA053 at a fixed sampling period of 2s, while the other logger was simultaneously used with the remaining pyranometers to take measurements under the same light conditions, but with varying sampling rates. This last procedure was followed to be able to determine the average error, if any, when different sampling rates are used for similar pyranometers. Each experiment was run twice and the duration of each was at least 5 minutes.

III. RESULTS AND DISCUSSION

A. Comparing all 4 pyranometers with the same logger

Fig. 4 shows the mean errors between the 2 CMP6 and between the 2 DPA053 based on measurements by logger A. Fig. 3 shows the same information for logger B. All measured irradiances were less than 75 W/m^2. Logger A took measurements at slightly higher irradiances than logger B as the sun was rising. It can be observed that the errors of the CMP6 are less than for the DPA053. Moreover, the errors are higher for logger B, possibly because of higher measured irradiances. There is a general tendency for the error to increase slightly with increasing sampling period.

B. Comparing the 2 loggers with identical pyranometers

Fig. 5 and Fig. 6 show the 2 sets of measurement at a sampling period of 2s, when 1 CMP6 and 1 DPA053 was connected to each logger. The data have been labelled using the pyranometer name and the corresponding sensitivity. It can be deduced that each CMP6 provided nearly the same irradiance although they were connected to separate loggers. The mean irradiances recorded by the 2 CMP6 were 715.8 W/m^2 and

831.5 W/m^2 for the 2 subsequent sets of measurements and the mean error was -0.25 W/m^2
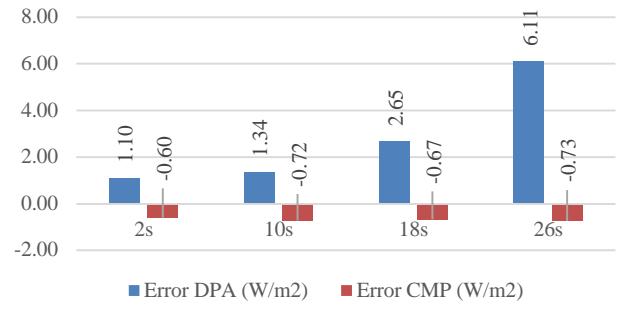

Fig. 3. Mean measurement errors (logger A)

Fig. 4. Mean measurement errors (logger B)
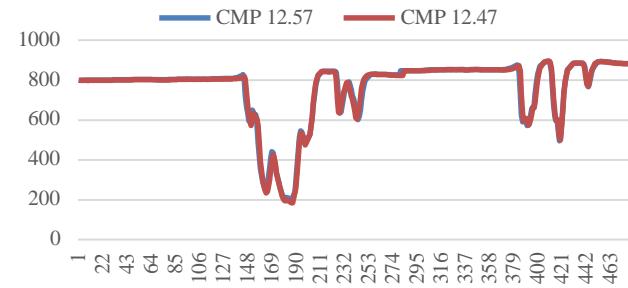
Fig. 5. CMP6 measurements by loggers A and B
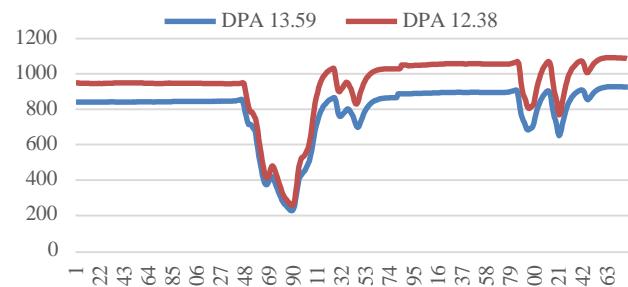
Fig. 6. DPA053 measurements by loggers A and B

On the other hand, it can be observed that the DPA053 tend to have an offset between their measured irradiances. Fig. 6 shows that the offset tends to decrease when there are sudden changes in the irradiance. The mean irradiances for the 2 sets of measurements by the 2 DPA053 were 803.9 W/m^2 and 949.2 W/m^2. The mean error between the 2 DPA053 was 134.52

W/m^2. It can deduced that the CMP6 produce low error even when under very high irradiance conditions and when used with different loggers. The DPA053 however tend to produce high errors at high irradiances and when used with different loggers. Fig. 7 shows that the CMP6 and DPA053 do not track sudden changes in the irradiance in a similar way even when the sampling period is 2s. In fact, the CMP6 is more accurate in tracking the small and sudden changes in irradiance.
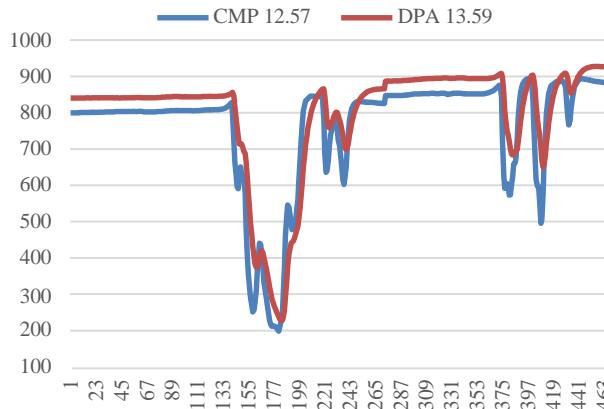

Fig. 7. Logger A measurement with 1 DPA053 and 1 CMP6

C. Varying sampling rates

Fig. 8 and Fig. 9, Fig. 10 and Fig. 11, and Fig. 12 and Fig. 13 are corresponding pairs of measured irradiances. Fig. 8, Fig. 10 and Fig. 12 are measurements at a sampling period of 2s. Fig. 9, Fig. 11 and Fig. 13 are the corresponding measurements at sampling periods of 14s, 22s and 30s respectively. Comparing Fig. 8 and Fig. 9, it can be deduced that the sudden changes in irradiance are not properly tracked at a low sampling rate. Moreover, from both figures, it appears that the DPA053 lags behind the CMP6 in following the changing irradiance, irrespective of the sampling rate. Similar conclusions can be drawn from Fig. 10 and Fig. 11, and Fig. 12 and Fig. 13. The lag is more obvious in the graphs corresponding to higher sampling periods than 2s.
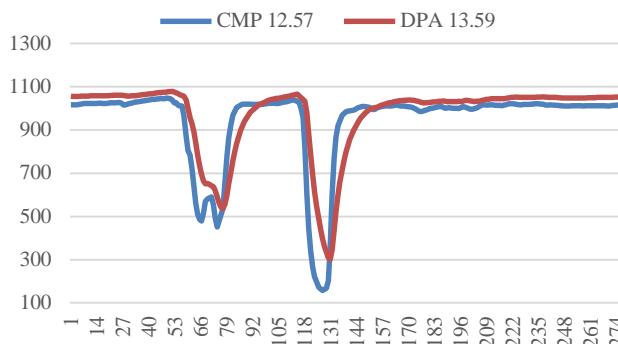

Fig. 8. Logger A with sampling period of 2s (1)

One particular observation from Fig. 10 and Fig. 11 is that a sampling period of 22s leads to a relatively large error in following a rapid and sudden change in the irradiance by the CMP6. The irradiance as measured by the CMP6 at 2s sampling period drops to about 767 W/m^2, but at 22s sampling period, the

irradiance appears to have dropped to only 977 W/m^2. However from other figures, the rapid and sudden changes are better tracked.
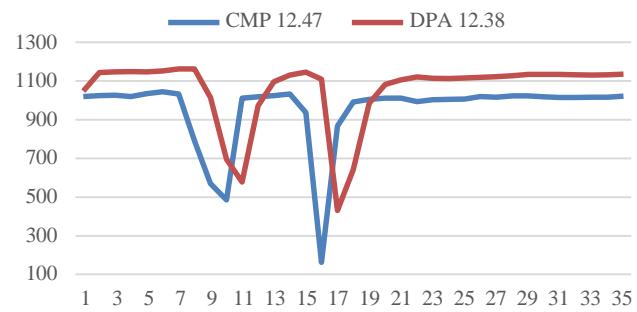

Fig. 9. Logger B with sampling period of 14s
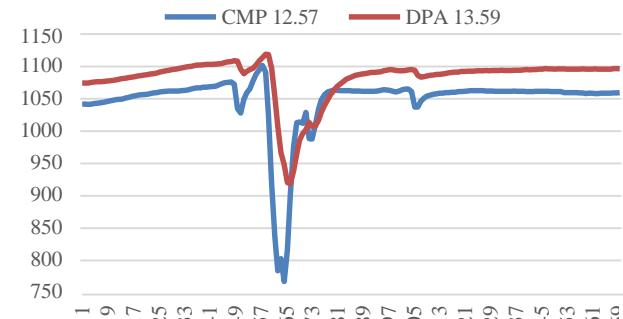
Fig. 10. Logger A with sampling period of 2s (2)
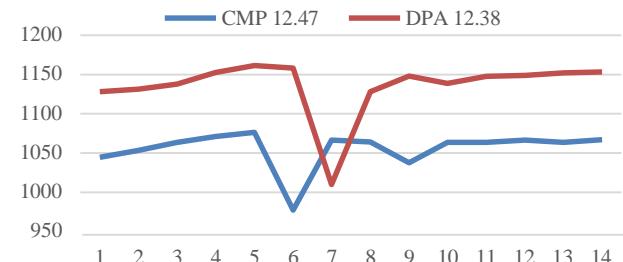
Fig. 11. Logger B with sampling period of 22s
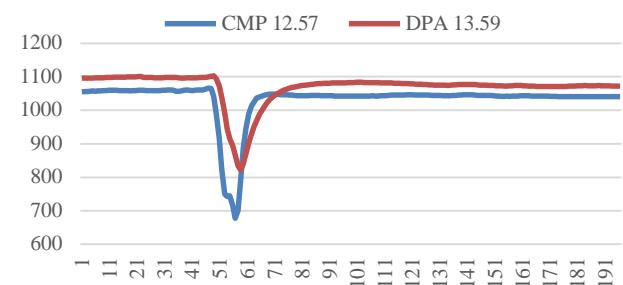
Fig. 12. Logger A with sampling period of 2s (3)
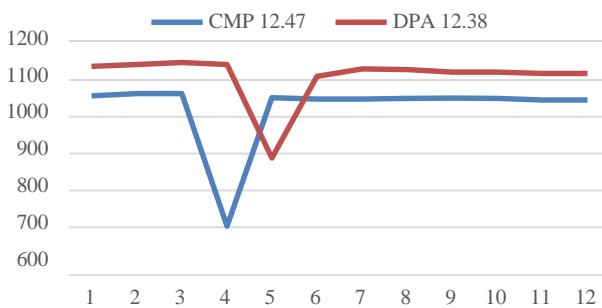
Fig. 13. Logger B with sampling period of 30s

Fig. 14 shows the mean irradiance differences for both sets of experiments carried out at each sampling rate, relative to a sampling rate of 2s. During all the tests, the minimum and maximum measured irradiances by the CMP6 were 717.6 W/m² and 1055.7 W/m² respectively. It can be observed that the differences between the DPA053 irradiances have consistently been much higher than those between the CMP6. The maximum and minimum absolute irradiance differences were 15.5 W/m² and 0.03 W/m² respectively for the CMP6, and 19.8 W/m² and 156.8 W/m² respectively for the DPA053. The overall mean irradiance difference for all the sampling rate experiments was 78 W/m² for DPA053 and 3 W/m² for CMP6. The CMP6 tend to have lowest irradiance difference at a sampling period of 2s. The DPA053 tend to have relatively lower irradiance differences at sampling periods of 18s and above. There were no large sudden changes in irradiance when the tests were carried out for the sampling periods of 6s, 10s and 26s. For the other sampling periods, sudden changes in irradiance occurred in one or both of the measurement sets.
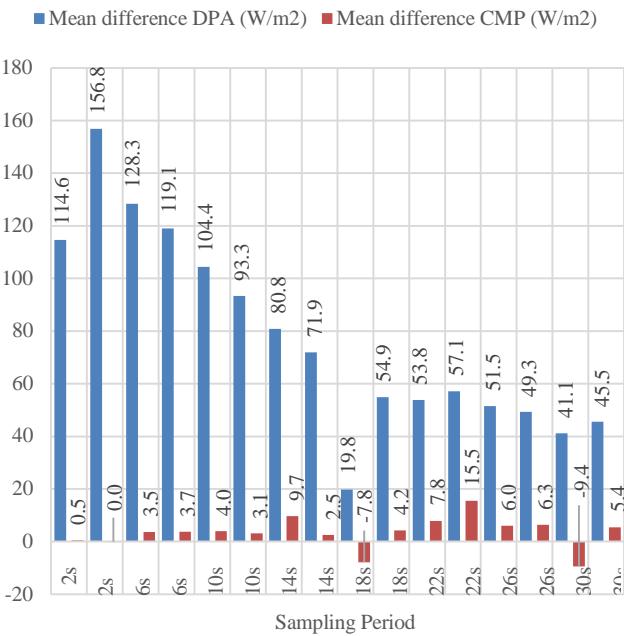

Fig. 14. Mean errors for different sampling rates

No definite conclusion can be drawn about the dependence of the CMP6 irradiance difference on the sampling period, as no continuous pattern is visible from Fig. 14. It should be noted

that the tests were not carried out under a constant irradiance, which could be a cause of randomness in the differences. However, considering the fact that the irradiance varied gradually and by small amounts when the sampling periods were 6s, 10s and 26s, the relationship between the sampling rate and the irradiance difference can be guessed. The mean irradiance difference for the 2 sets of experiments for sampling periods of 6s, 10s and 26s were 3.6 W/m², 3.5 W/m² and 6.2 W/m² respectively for the CMP6. Therefore, it can be observed that the CMP6 tend to have increasing irradiance differences with increasing sampling periods. Even though there were sudden changes in irradiances at 2s sampling period as depicted from Fig. 7, the CMP6 mean irradiance difference is less than for other sampling rates. If the CMP6 is sampled every 6s (63% time constant) or every 10s (manufacturer recommendation), slightly higher irradiance differences are obtained as compared to 2s sampling period. One additional important observation is that the CMP6 do not lead to significantly higher irradiance differences when sampled at periods greater than their 63 % or 95 % time constants. When considering the DPA053, a general tendency for the irradiance differences to decrease with increasing sampling period is observed, with the exception of only a few outliers. The mean irradiance differences for the 2 sets of experiments for sampling periods of 6s, 10s and 26s were 123.7 W/m², 98.9 W/m² and 50.4 W/m² respectively for the DPA053. However, it should be noted that the DPA053 having a sensitivity of 12.38 μV/Wm⁻² consistently provided a higher irradiance than the DPA053 with sensitivity 13.59 μV/Wm⁻², with this difference being low at low irradiances and relatively high at higher irradiances. From Fig. 3 and Fig. 4, for a maximum measured irradiance of less than 75 W/m², the highest error for the DPA053 was only 6.15 W/m² at a sampling period of 2s, whereas for a maximum measured irradiance of 1091 W/m² at the same sampling period the mean error from Fig. 14 was 135.7 W/m².

IV. CONCLUSION

This paper presented an experimental investigation to understand the effect of varying sampling rates on the irradiances measured by the first class CMP6 and second class DPA053 thermopile pyranometers in real outdoor prevailing conditions. It was found that relative to a sampling period of 2s, the CMP6 tends to produce slightly higher irradiance differences when the sampling periods increase up to 30s. Moreover, no huge irradiance differences occur when the CMP6 is sampled at higher than the 63 % and 95 % time constants. Furthermore, the CMP6 tend to maintain a low irradiance difference between themselves, both at low and high irradiances when sampled at a time period of 2s. Compared to a sampling period of 2s, the DPA053 tends to produce a low irradiance difference when sampled at periods close to its 95 % time constant, i.e. 18s and above. However, the difference tends to double at sampling periods less than half the 95 % time constant. In addition, the DPA053 tend to have low differences between their measurements when the irradiances are low, but these differences appear to increase when the measured irradiance becomes high. Therefore, taking into account the findings in this work and depending on the accuracy required, it is crucial that manufacturers perform detailed tests in order to provide the best or optimum sampling rates to be used for their

pyranometers. Evenually, it was found that relatively cheap Arduino-based data loggers have the capability to be used for irradiance recording systems with thermopile pyranometers. In the near future, subject to availability of funding, the author plans to perform a more detailed study by using a suitable solar light source with a controllable irradiance. Moreover, it will be certainly interesting to compare the measured irradiances at the different sampling rates with a photoelectric-based pyranometer sampled at a very high frequency.

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Structural and Transport properties of Ba-doped Nanostructured LSMO Provskite

Sakina Kachwala, Shivani Sivahshankar, U. L. Shinde

K. J. Somaiya Institute of Engineering & IT, Sion(E), Mumbai-400022, India

sakina.kachwala@somaiya.edu,ushinde@somaiya.edu

ABSTRACT

Structural and Transport behavior in sol-gel prepared $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ $(0\leq x \leq 0.3)$ nanomanganite system have been investigated in the temperature range $10 - 330$ K. The composition and structural properties were studied at various concentrations by X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). X-ray diffraction (XRD) pattern confirms the single phase nature of the samples with orthorhombic crystal symmetry. The average A-site ionic radii which is directly related to tolerance factor and size variance, plays a vital role in magnetotransport properties. The metal-insulator transition temperature, T_{MI}, shifts toward low temperature with increasing Ba substitution from 205 to 95 K and shows semiconducting like behavior at low temperature. It is shown that the correlated polaron model accounts for the temperature dependence resistivity and magnetoresistance in the entire temperature range. The number of charge carriers, n decreases as Ba^{2+} ion concentration increases. The small polaron binding energy, $\sum_P$, is found to decrease as Ba^{2+} ion concentration increases. The increase in the thermally assisted activation energy, U_0, is observed as the system varies from Sr- to Ba- substitution. The number of charge carriers, n, is decreases as Sr^{2+} ion concentration decreases which is responsible for the increase in resistivity values.

Keywords: CMR; Nanomanganites; Polaron

1. INTRODUCTION

A great deal of interest is created for the mixed valent perovskite manganites of the general formula $Ln_{1-x}A_xMnO_3$ (Ln = rare earth and A = divalent alkaline earth cation) due to their colossal magnetoresistance (CMR), charge-ordering, electronic phase separation, etc. These systems have technological significance as they are used in sensor applications, and especially for increasing data storing by increasing the sensitivity of hard disk drive read heads [1-5].

The CMR properties are related to mobile e_g electrons travelling between the Mn^{3+} and Mn^{4+} cations, triggering ferromagnetic (FM) interactions through the double-exchange mechanism [6–8]. The physical properties in manganese perovskites are thought to arise from the strong competition between a ferromagnetic double-exchange interaction, an antiferromagnetic super-exchange interaction and the spin–phonon coupling. These interactions are determined by intrinsic parameters such as doping level, average cationic size, cationic disorder and oxygen stoichiometry. The striking phenomena are related to a strong interplay of charge, spin, orbital and lattice degrees of freedom. The magnetic and transportproperties of these samples are determined by several factors such as the percentage of divalent ions,

the ionic radii of the metal ions, the preparation method of samples, etc. Earlier studies have shown that the magnetic and transport properties of hole doped manganites can be varied at constant doping by varying the A-site cation composition [9–12]. It is also obvious that disorder due to the random displacement of oxygen ions creates domains in which the Mn–O bonds have different length values, thus inducing typical strains in the lattice [16]. Therefore, one may expect that the properties of manganites with A-site disorder would be as interesting as those of manganites based on doping at the Mn-site[17].

In this paper, we report the structural, magnetic and electrical properties of the $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ $(0\leq x \leq 0.3)$ series by changing the mean cationic radius of the A-site $<r_A>$. We have varied $<r_A>$ systematically by partially replacing the Sr^{2+} ions by the larger Ba^{2+} ions, while keeping the carrier concentration Mn^{3+}/Mn^{4+} fixed at a ratio of 4/3. The basic correlation between structure and physical properties as a function of the Ba-doping will be unambiguously presented.

2. EXPERIMENTAL

$La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2, 0.3) manganites have been prepared by sol-gel process using metal nitrates (Aidrich made) as starting materials. In this process, the stoichiometric amount of metal nitrates, in the form of solution, were converted into citrates and pH was adjusted between 2 to 3. After getting sol on slow evaporation, a gelating reagent ethylene glycol was added and heated around 100 ^{0}C to get a gel. The gel on further heating in oven at 200 ^{0}C for around 12 hours yields a dry fluffy porous mass, which was calcined at 800^{0}C for 2 hours. Then the powder was pressed into circular pellets and was sintered at 1000^{0}C in air for 2 hours. The materials are characterized by X-ray diffraction (XRD) using Bruker Difractometer with Cu anode (Cu Kα radiation source λ = 1.5410 Å) at room temperature, by colleting the data in 2θ range of 20^0 - 80^0. Scanning Electron Microscope (SEM) studies (on Hitachi s-4800 2nd type) were performed to examine the surface morphology of the samples along with the energy dispersive X-ray analysis (EDXS) study for elemental examination. To obtain the metal insulator transition temperature T_{MI} and to investigate the influence of magnetic field on the transport behavior of these samples electrical resistance was measured using Quantum design PPMS over temperature range 10 - 330 K.

## 3. RESULTS AND DISCUSSION

3.1 X-RAY AND SEM ANALYSIS

The X-ray diffraction patterns of the samples are shown in Fig. 1. The X-ray diffraction pattern clearly reveals that all the samples have a perovskite orthorhombic structure. The average crystallite size value has been

calculated based on full width of the half maxima of the XRD peaks by using Scherror formula [18]

$$< D > = K\lambda/\beta\cos\theta$$

(1)

Where K is constant (K = 0.9), λ is the wavelength of Cu Kα radiation (λ = 1.541 Å) and β is full width of half maxima of XRD peak.

The calculated values of $<D>$ for all the samples are found to be in 30 to 40 nm range as given in table 1. The Fig. 2 shows SEM and EDS images of all the samples. The fluffy nature and voids in sol-gel derived powder can be attributed to large amount of gases evolved during reaction.
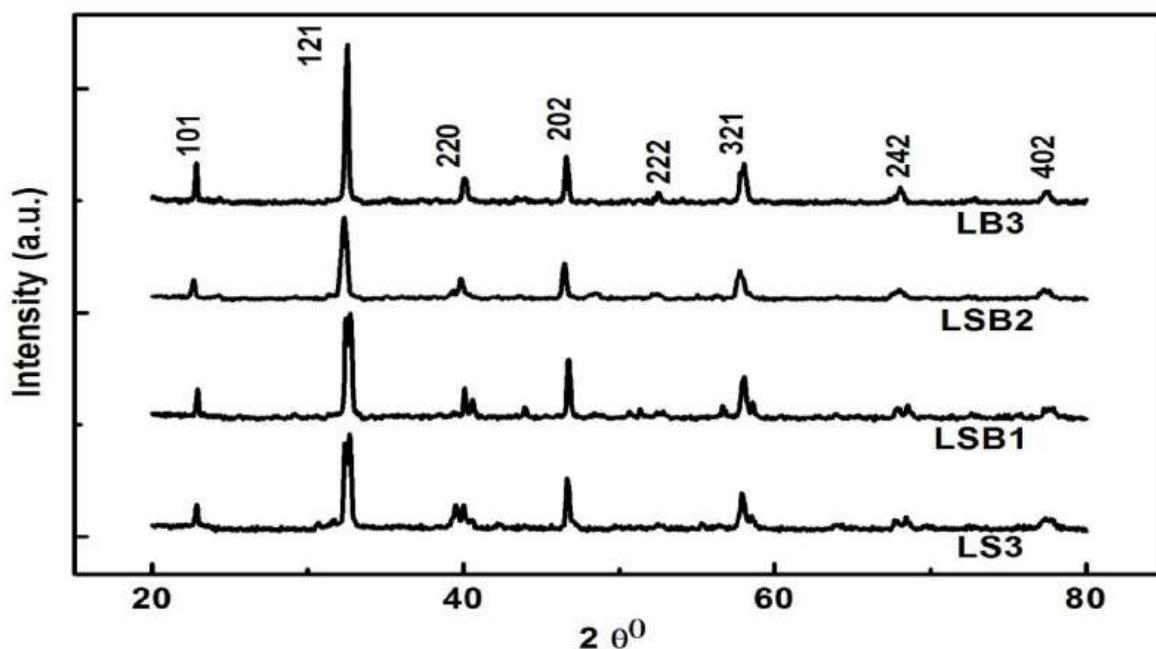
Fig. 1: X-ray diffraction patterns of the series $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2, 0.3)
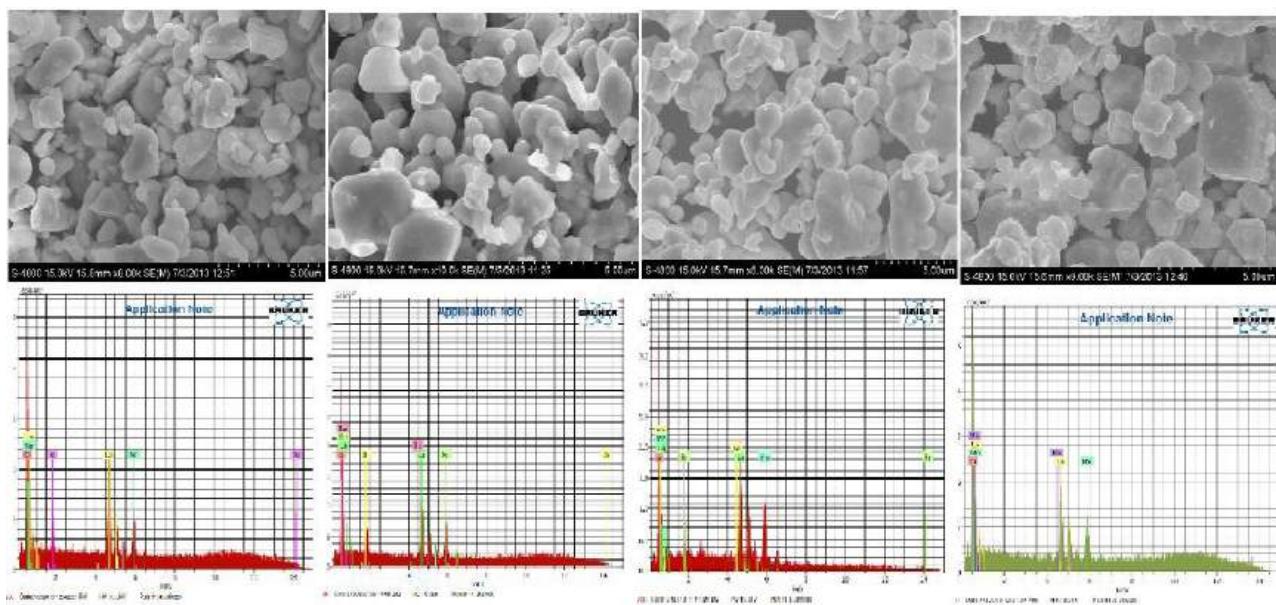
Fig. 2: SEM and EDS images of $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2, 0.3)

3.2 Transport Properties

The tolerance factor is the highest in Ba-substituted samples. This indicates that the structure tends towards pseudo-cubic symmetry as one goes from Sr to Ba substituent. The cell volume increases with increasing A-site ionic radius. To understand the effect of variation of A site ionicradii $\langle r_A \rangle$ and size variance, $\sigma^2 \langle r_A \rangle$ on transport properties of Nd based manganites, the average A-site ionic radii and size variance have been calculated using the coordination number twelve [19]. The average A-site ionic radius, $<r_A>$ varies from 1.384 Å for x = 0 to 1.435 Å for x = 0.3 samples. The tolerance factor, $|$, varies from 0.9860 (for x = 0) to 0.9991 (for x = 0.3). This indicates that the structure tends towards pseudo-

cubic symmetry as Sr content decreases. The average A-site ionic radius, tolerance factor, size variance ($\sigma^2(r_A) = \langle r^2_A \rangle - \langle r_A \rangle^2$), metal-insulator transition temperature (T_{MI}), peak resistivity are summarized in Table 1. The variation of resistivity (ρ) with temperature (T) for the series $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2,) is shown in figure 3. The metal-insulator transition temperature, T_{MI}, shift towards low temperature with increasing Ba substitution from 330 to 94 K. The resistivity value is very high for composition x = 0.1, 0.2 over entire temperature range 330 k to 10 K. and these compounds shows semiconducting like behavior. The semiconductor behavior due to charge localization effect at low temperature is observed in x = 0 and x = 0.1 compositions. The electronegativity of Ba (0.89) is smaller than that of Sr (0.95). The ionic characteristic of the A-O bonds increases with decreasing Sr content due to increasing electronegativity difference between A-site ion and oxygen which may lead to the charge localization behavior. The replacement by the bigger ion (e.g Sr by Ba) at A-site will lead to the distortion in the lattice. The transfer integral (t) of the e_g electrons hopping from Mn^{3+} to Mn^{4+}, defined as $t = t_0 \cos(\backslash/2)$ [20] (where t_0 is the normal transfer integral and $\backslash$ is the angle between two neighboring spin directions) reduces more drastically in the case of Ba-substituted compounds as compared to that in Sr- substituted compound. Therefore in series $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2, 0.3) resistivity increases as x increases. It also suggests the possibility of spin canting in Ba-rich samples due to deviation of Mn-O-Mn angle from 180^0. The canting will be more prominent in lower temperature due to the minimum thermal effects. The effect of canting is observed in the $\rangle$(T) plots for the samples with x = 0 and 0.1 in the form of charge localization. The T_{MI} decreases with increasing size variance which is strongly indicative of the presence of disorder present in the Ba containing samples. It is observed that for the low size mismatch values (x = 0.1), the samples exhibit the conventional metal-insulator transition while those having higher $\sigma^2(r_A)$ show different transport behavior. The increase of resistivity at low temperature in composition x = 0.2 gives a strong support to the effect of local atomic disorder on the carriers scattering [21].

System	Crystallite Size $\langle D \rangle$ nm		Average Radius $\langle r_A \rangle$ (Å)	Size Variance $\sigma^2 (r_A)$ ($\times 10^{-2}$ Å^2)	Tolarance factor ($\mid$)	T_{MI} (K)	Resistivity ρ (Ω-cm)
	XRD	SEM					
$La_{0.7} Sr_{0.3}MnO_3$	30	59	1.384	0.411	0.9860	310	0.2207
$La_{0.7}Sr_{0.2}Ba_{0.1}MnO_3$	31.0	78	1.401	0.39	0.9922	105	5166
$La_{0.7}Sr_{0.1}Ba_{0.2}MnO_3$	38	69	1.418	0.78	0.9983	94	9698
$La_{0.7} Ba_{0.3}MnO_3$	35.2	88	1.435	1.31	0.9991	--	--

Table 1: The values of $\langle D \rangle$, ρ_{IM} , T_{MI} and MR% for the series $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ (x = 0, 0.1, 0.2, 0.3)
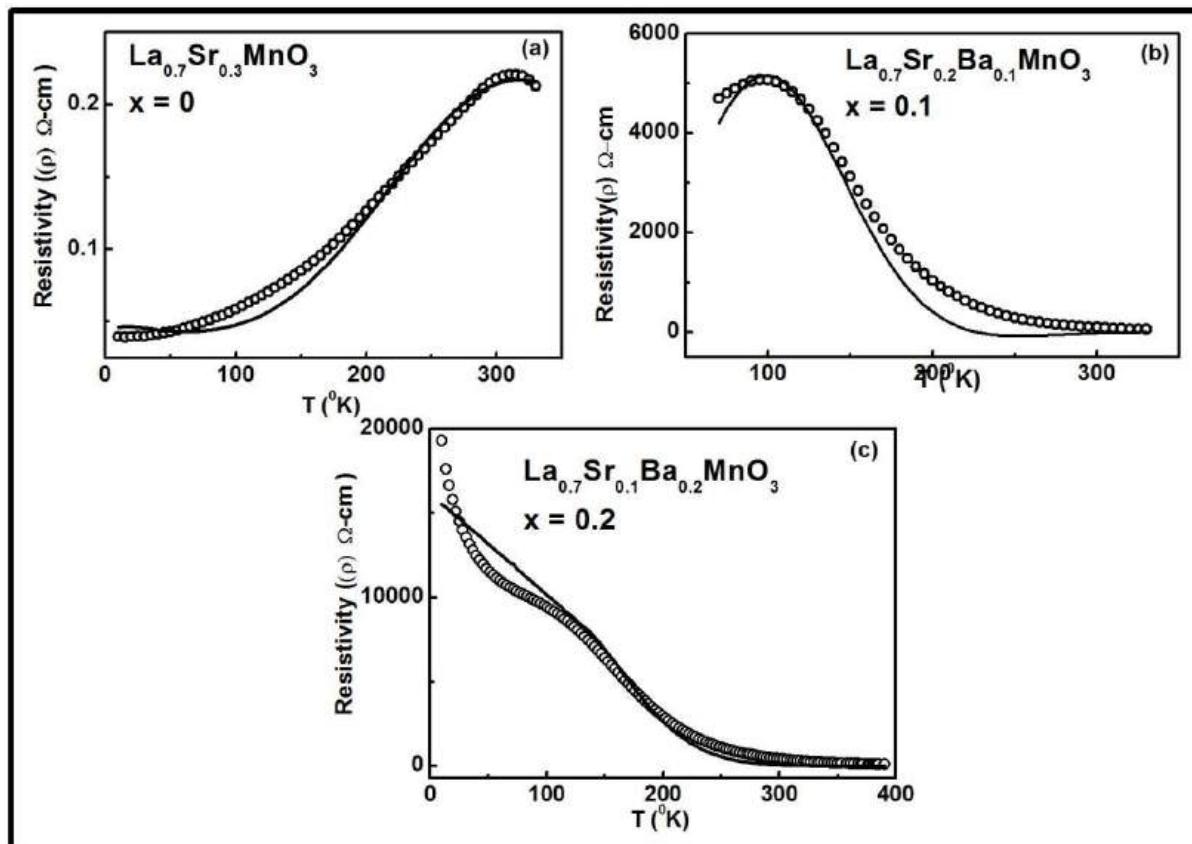
**Fig. 3: Observed variation of resistivity with temperature for La$_{0.7}$Sr$_{0.3-x}$Ba$_x$MnO$_3$ (x = 0, 0.1, 0.2) are shown in hollow circles. The fitted plots are shown by solid lines (Eq. (1))**

3.3 Conduction Mechanism

The nature of the charge carriers and the mechanism of transport in (Ln$_{1-x}$A$_x$)MnO$_3$ manganites (Ln = Nd, Pr, Sm, La and A = Ba, Sr, Ca) have been extensively investigated [22, 23, 24] but there is still no theory that can satisfactorily account for the complex correlation between the magnetic and transport properties of the system. Since most attempts to understand the physics of the problem relate to the competition between the double exchange and superexchange [25, 26, 27, 28].

The correlated polaron (CP) model proposed by Srivastava [29] gives satisfactory account of the observed variation of resistivity with temperature reported here. The CP model is based on the Holstein Hamiltonian [30] for a molecular crystal in which a charge carrier is shared between two atoms. In this model, the electron itinerancy is promoted by valance exchange (VE) in mixed valance ionic compounds when the electrons are coupled to phonons. In systems with an anion or a cation in mixed valence state on crystallographic equivalent sites, there are two possible ways to arrange the ions, that can be represented by degenerate states in static lattices but on coupling to the longitudinal optics phonons, the degeneracy is removed. The conductivity is given by [31]

$$\sigma_{hop} = (\sqrt{\pi}/2) n (t/h)^2 e^2 a^2 (\tau/k_B T) sech^2(\varepsilon_P/2k_B T) exp(-U/k_B T) \quad (2)$$

Here n is the number of charge carriers, a is the separation between the sites to which the electron hopes, t = $\langle t_{ij} \rangle$ is the average of hopping amplitude, τ is the relaxation time, U is the activation energy, ε_P is the small polaron stabilization energy and e, h, k$_B$ are the electron charge, Plank constant and Boltzmann constant respectively. The sech term arises from the same average number of electrons at the initial site i and holes at site j in the jump process. The mobility is governed by the Einstein relation μ = eD/k$_B$T with the diffusion constant D = a$^2\nu_{ph}$, where ν_{ph} is the longitudinal phonon frequency. In the CP model that applies to mixed valance compound like Ln$_{1-x}$A$_x$Mn$_{1-x}^{3+}$Mn$_x^{4+}$O$_3$ the valance exchange (Mn^{4+}Mn^{3+}↔Mn^{3+}Mn^{4+}) takes place and the following relations hold [29, 32]

$$1/\tau = \nu_{ph}[1 + c (1-m^2) \sigma_a^2] \quad (2a)$$

$$U = U_0 (1-m^k) \sigma_a^2 \quad (2b)$$

$$m = m(t_c) = M(T)/M(T_c), \qquad t_c = T/T_C \quad (2c)$$

$$\sigma_a = (1 - 0.75 t_{ca}^3)^{1/2}, \quad t_{ca} = T/T_{ca} \quad (2d)$$

Here, m is reduced magnetization at temperature T and is given by Brillouin function for spin j=1/2, T$_C$ is the Curie temperature and σ_a is atomic order parameter. T$_{ca}$ denotes order-disorder crossover temperature of a binary alloy Mn$_{1-x}^{3+}$M$_x^{4+}$, c is a constant arising from low temperature spin wave excitations and k a constant arises from the critical point magnetic excitations near T$_C$. The phonon frequency ν_{ph} = 5.5 ×10^{12} Hz [29] and is observed by Dai

et al [30]. For T < θ_D/4, where θ_D is Debye temperature, the zero-point lattice vibration dominate and take the place of thermal phonon. The resistivity is then given by [29]

$$\rho(T) = \frac{A}{n}[(1-f)\frac{\theta_D}{4}\cosh^2(2\varepsilon_p / k_B\theta_D) +$$

$$+ fT\cosh^2(\varepsilon_p / 2k_B T)][1 + c(1-m^2)\sigma_a^2]\exp[U / k_B T]$$

where, A= $1.13 k_B$/ $a^2 e^2$ ν_{ph} and f is the polaron distribution function $\exp(\varepsilon_p/k_B T+ 1)^{-1}$ between the localized and band polaron states.

The resistivity curve for $La_{0.7}Sr_{0.3-x}Ba_xMnO_3$ ($0\leq x\leq 0.3$) are compared to equation 3 with the parameters given in Table 2 and from the quality of these fittings one may conclude that this equation might be an appropriate one to explain the conduction mechanism of the samples of present investigation. The best fit parameters T_{ca}, ε_p and

U_o for all the samples are presented in Table 2 and plots are shown in Figure 3. The Debye temperature is 425 K in all the cases. Further, all the three parameters T_{ca}, ε_p and U_o in the presence of magnetic field, have also been computed for all the materials and are given in Table 2. All the three parameters obtained from resistivity data has an interesting dependence on doping concentration x which indicates that T_{ca}, ε_p and U_0 depends upon cation mismatch. The small polaron binding energy, $\sum_p$, is found to decrease as Ba^{2+} ion concentration increases. The increase in the thermally assisted activation energy, U_0, is observed as the system varies from Sr- to Ba-substitution. The number of charge carriers, n, is decreases as Sr^{2+} ion concentration decreases which is responsible for the decrease in resistivity values. We conclude that the correlated polaron model with zero-point vibrations plays a dominant role at low temperature where complications from thermal phonons are minimal.

Table 2: The best fit parameters T_{ca}, ε_p and U_o for all the samples. The Debye temperature θ_D is 425 K in all cases. n/x is the ratio of the carrier concentration data from Eq. (3) and the nominal hole concentration from composition. The value of n has been obtained from the values using ν_{ph} = 5.5 $\times 10^{12}$ Hz with a = 5.4599 Å.

Sample	T_{ca} (K)	ε_P (K)	U_0 (K)	A/n x 10^{-4} (Ωcm/K)	c (K)	k (K)	n/x (x 10^{18})	n/Mn
$La_{0.7}Sr_{0.3}MnO_3$	400	83	580	3.6	3	1.7	9.3	15.9
$La_{0.7}Sr_{0.2}Ba_{0.1}MnO_3$	169	200	700	31.8	0.75	0.5	0.012	0.02×10^{-2}
$La_{0.7}Sr_{0.1}Ba_{0.2}MnO_3$	147	250	751	49.4	0.75	2	0.008	0.0325×10^{-6}

4. Conclusion

We have investigated structural, transport and magnetotransport properties of sol-gel prepared $La_{0.7}Ca_{0.3-x}Sr_xMnO_3$ (x = 0, 0.1, 0.2, 0.3) nanomanganite. An attempt has been made to correlate the transport properties with the cation mismatch parameter using the correlated polaron model. The interesting findings were noticed by partially substituting Sr by Ba ion at A-site. The T_{MI} shifts to lower temperature and the semiconducting behavior increases with increasing Ba-content due to the charge localization behavior because of increase in size variance. The overall magnetic and transport properties could be attributed to the competing AFM and FM interactions present in these frustrated systems. We conclude that the correlated polaron model with zero-point vibrations plays a dominant role at low temperature where complications from thermal phonons are minimal.

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AUTONOMOUS WEEDING BOT

Prathamesh Siddhesh [1], Jatin Shah [2], Vatsal Tanna [3], Anant Nisar [4], and Dr. Vaishali Wadhe [5]

[1,2,3,4,5] Department of Electronics and Telecommunication Engineering

[1,2,3,4,5] K. J. Somaiya Institute of Engineering and Information Technology

vwadhe@somaiya.edu

Abstract: **This paper presents an electronic machine that serves the purpose of cutting down weeds in small to medium gardens and farms. The project uses image and video processing to distinguish between the wanted and unwanted plants and a high speed motor with nylon wires to cut the unwanted plants. It works on an algorithm that finds out the colours uniquely present in a plant and then uses it to detect plants of same kind in the captured frame. Current methods used for weeding being costly, and even hazardous to plant & human health in some case, this model proves to be an effective alternative. The project has two main blocks, one which will perform the image processing and the other which is the bot on which the first block will be mounted. The two blocks will be controlled by two different microprocessors.**

Keywords – Image processing, weeds, Microprocessors.

I. INTRODUCTION

Weeds are the unwanted plants which grow along with the crops. If they are not prevented from growing they compete with the planted crop for water and nutrients. Weeds not only increase the irrigation requirement but also reduce the soil quality by consuming the nutrients. They not only pose a threat to crops but also to animals and humans. Some weeds are poisonous when consumed. Some when eaten by animals then it will produce an undesirable odour in their milk. Example of such a plant is Datura stramarium. They also harbour pests, insects, pathogens and parasites. They might also hinder the process of cross pollination [1] [2].

Due to above mentioned reasons and more, the weeds must be prevented from growing and if they exist already, they must be cut and removed as soon as possible. The process of removing weeds is called weeding. But this process takes up lot of time and resources. If they are to be cut down or uprooted manually, then it required a large man power for large farms, which is a big problem in India, cost cutting being one of the important aspect of farming. Other way is to use herbicides, to destroy the unwanted vegetation.[3] These apart from being expensive, pose other problems. Herbicides have widely variable toxicity. Some of them also affect health of humans, animals and at times, the crop too. They cause a range of health effects ranging from skin rashes to death. The risk of Parkinson's disease has been shown to increase with occupational exposure to herbicides and pesticides[2] [3].

All these problems generate a need for an autonomous weeding bot which will mechanically remove the weeds. It should be economically cheap. It must be an autonomous in nature which finds its way through the crop and differentiate and cut the unwanted plants on its own. The aim of this proposed model is to build the same.

This model uses computer vision or image and video processing as a tool to differentiate the weeds from crops. It uses the colour attribute of the weeds to distinguish them. To avoid false detection, the colour difference between the crops and weeds is used as indicator of weeds.

II. OBJECTIVES

Following are objectives of this proposed model:
- To make an efficient machine that distinguishes crop from weeds.
- To make a bot that will move swiftly, even on the uneven terrains of the farm and cut the weeds when detected.
- To have a LDR based light system to compensate for the lack of light which will aid in the image processing at different times of the day.
- Creating an economic and cost-effective option for getting rid of weeds.

III. PROPOSED MODEL

Aim of the proposed model is to present a cheap and safe alternative to the currents weeding solutions. The algorithm followed by the bot for cutting the weeds is as follows: the bot moves around the garden or the farm randomly. A image

processing unit which also controls the cutter is mounted on top of the bot which independently differentiates crops and cuts the weeds as the bot makes its way through the crops. The image processing unit detects crops and turns of the 'always ON' cutter. This is to avoid the cutting of crops due to detection of weeds very close to them. To reduce the probability of the above problem and still be able to cut the weeds very close to the crops, the frame of the camera and the cutter are kept small. Figure 1 is a flowchart that represents the algorithm.


Figure 2: Flowchart of the detection algorithm.

Figure 3: Test image. Grass considered as weeds and the plant as the crop for test purpose.
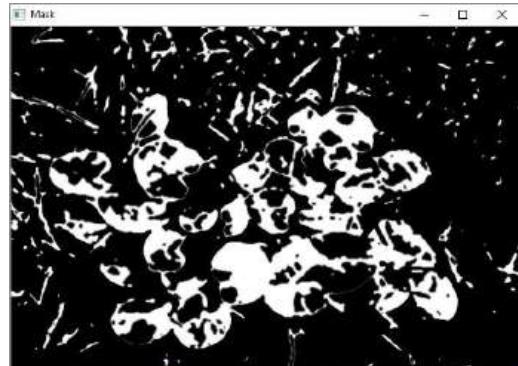
Figure 4: Mask which covers the common colours and shows colours which are uniquely present in the crop.

Figure 1: Flowchart of the algorithm.

The design has two major parts as follows:

    A.   *Plant classification system*

This system uses image processing to recognise the crop. It uses Red, Green, and Blue values (colour range) of all the colours in the crop and the weed as the input. The colour range of the weeds is subtracted from the colour range of crop. This gives the range of colours uniquely present in the crop. Thus whenever the camera spots these unique colours, the system assumes it to be a crop. This information is used to turn on and off the cutter.

The cutter is turned off whenever the system detects a crop and turned on otherwise.

Figure 5: Output of the algorithm.

The colour ranges of crop and weeds is determined from the pre-existing photos of both as in figure 3. Then the colour range of the weeds is subtracted from the colour range of crop to get the values of colours which are uniquely present in the crops as shown in figure 4. Thus the algorithm detects crops using the colour difference between weeds and crops. The algorithm detects crops instead of weeds to avoid cutting of crops due to false detection. We have used OpenCV Python 2.7 to simulate the above results. The libraries used for the image and video processing are Numpy[4] and cv2.

B. Bot

This bot is an Obstacle avoider bot. The main task of this bot is to detect the obstacles on the path and avoid them by changing the course of direction. This bot has a microcontroller ATMEGA 328 chip as its brain for functionality.
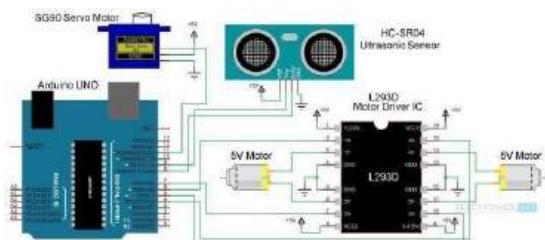

Figure 6: Circuit Diagram of proposed Autonomous Bot

Figure 6 is a circuit diagram of the obstacle avoider bot [5]. There is an ultrasonic sensor which is interfaced with arduino. This sensor helps in detecting obstacles / hurdles / barriers in its course by sending out a high frequency sound through trigger and receiving it back or absorbing the same sound waves through echo slot and calculate the distance using the formula Distance = Speed * Time. Where speed of the sound wave is constant and the time required by the wave to reflect back is calculated and corresponding distance is obtained. There are threshold set for the bot where it would move by few degree on detecting the obstacle and navigate the path on it's on. This algorithm enables the bot to have a freedom of movement.

IV. FUTURE SCOPE

Following are future scopes of this proposed model:

1. The proposed model covers random path while detecting and cutting weeds. But in future, using a well-developed algorithm and memory the path traversed can be memorized by the bot.
2. Along with detection of weeds, the same system can be used to detect the diseased crops.
3. Using IOT, the plants and weeds data can be stored in a remote server and can be downloaded by the bot whenever necessary.

V. CONCLUSION

The current models being used are either less efficient or the cost to efficiency ratio is too high. Our proposed model will be cheap and as it does not use any herbicides, it does not harm the environment. The model will efficiently differentiate between crops and weeds and cut/uproot the weeds mechanically.

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Parkinson Disease Severity Score Prediction using Speech Signal

Savitha S. Upadhya
Electrical Engineering Department Veermata Jijabai Technological Institute Mumbai, India.
savitavjti@gmail.com

A. N. Cheeran
Electrical Engineering Department Veermata Jijabai Technological Institute Mumbai, India.

H. Nirmal
Electronics Engineering Department K J Somaiya College of Engineering Vidyavihar, Mumbai, India.

Abstract—**This paper deals with the prediction of severity scores of people suffering from Parkinson disease (PD) using the voice signals of the diseased. As a first step the features of speech signal are extracted from the collected voice samples and then regression techniques are applied on these features to predict the severity score. Three regression techniques namely the k nearest neighbor, Support vector regression and Regression trees are then applied to the fourteen speech features extracted. A performance comparison of the regression techniques in terms of Root mean square error (RMSE) is discussed. The regression model performance is validated using three, five and seven-fold validation methods. The results obtained shows that the *k* nearest neighbor model predicted the PD severity score with least RMSE followed by the regression tree models**

Keywords—*Severity score; speech signal; Parkinson disease; k nearest neighbor; regression trees; support vector regression; root mean square value.*

I.   INTRODUCTION

People suffering from PD not only exhibit symptoms like tremor, slowness in the body movement, body stiffness, EEG variations but also exhibit speech impairments [1 - 3]. The intelligibility and quality of speech of the Parkinson diseased patients depreciates as the disease progresses [3]. This provides the necessary cue in predicting the severity of the disease using the speech signal of the diseased.

The standard method used to estimate the severity of PD is by using a measure or metric called Unified Parkinson disease rating scale (UPDRS) [4]. The UPDRS score is obtained by interviewing and observing the patients by a clinician. The clinician grades the different attributes specified in the UPDRS chart on a scale from 0 to 4 and the total score evaluated is the UPDRS score which signifies the severity of the disease. Efforts have been made by researchers to predict this severity without the intervention of the clinician. H. Jeon et al used a wearable device which predicted the severity of the PD based on tremor [5]. Analysis of gait signals has also been studied by researchers to predict the severity [6 - 8]. Researchers have also analyzed the speech signals to predict the severity score. The various features of speech used by researchers includes

the dysphonia features, pitch, energy features and cepstral features [9 - 11]. In this work, the objective is to estimate the PD severity by using speech signal features and regression techniques and then predict the severity score assessed by the doctor. This severity score which was assessed by the doctor did not take into account all the attributes of the UPDRS chart. It included only seventeen of the attributes like tremor at rest, gait, posture, dressing, salivation, speech etc. Each attribute was graded on a scale of 0 to 4. Hence the severity score had a range 0 to 68.

In this work, 14 features of speech are used which include five pitch perturbation parameters (Jitter), six amplitude perturbation parameters (Shimmer), one Mean autocorrelation (ACR) parameter and two noise parameters (Harmonic to noise ratio HNR and Noise to harmonic ratio NHR). The three regression techniques implemented are *k* nearest neighbor, two regression trees namely the Classification and regression tree (CART) and Bagged tree and Support vector regression. The performance of the regression techniques in predicting the severity score is then compared in terms of RMSE

The rest of the paper is organized as follows. Section 2 explains in brief the different speech features extracted and the three regression techniques used to predict the severity score. This is followed by results and discussion in section 3. Finally, the paper is concluded in section 4.

II.   SPEECH FEATURES AND REGRESSION TECHNIQUES

The time domain speech features used in predicting the PD severity score includes amplitude and pitch period variations, shimmer and jitter. In addition, another feature called the mean ACR which is computed by obtaining the mean of the autocorrelation of the fundamental frequency at different instants of time and also the two noise features NHR and HNR which exhibit harmonicity is also extracted from the speech samples of both healthy and Parkinson diseased people [12 - 13]. In all fourteen features of the speech signal are extracted. Fig.1 shows the mean value of

some of the features extracted from the 196 voice samples used in this work.
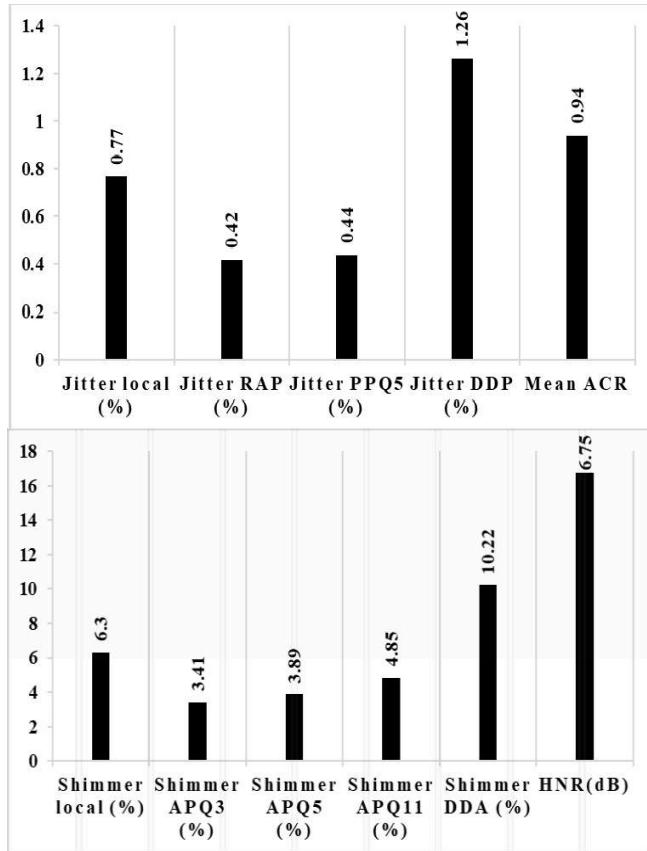

Fig. 1.   Mean value of the features extracted

These features of speech are then passed to three different regression techniques to predict the severity score. The first regression technique is the *k* nearest neighbor regression. This non-parametric regression technique works on an algorithm which stores in all the existing outcomes and predicts the target based on a distance functions or similarity distance measure. The distance functions used are Euclidean, Manhataan and Minkowski. In this work the Euclidian distance function is used. The algorithm uses a weighted mean of the *k* nearest neighbors with the weights inversely proportional to the distance [14]. Initially the Euclidean distance is computed from the test input with the labeled inputs. The labeled inputs are then arranged in order of increasing distance. Based on the RMSE obtained an optimal value for *k* is then found. Then weighted average proportional to the inverse distance with the *k*-nearest neighbors is calculated. The second regression technique is using Regression trees. These trees are methods which follows a set of splitting rules to separate, or segment, the predictor variable used. One such regression tree model is the CART tree model which involves the construction of a suitable tree based on selecting input variables and split points on those variables. This selection of which input variable to use and which particular split to choose is achieved by using a greedy algorithm based on minimizing

a cost function. The construction of the tree terminates using a stopping criterion that has been predefined, like a minimum number of instances of training allotted to each leaf node of the tree [14 - 15]. In another approach, several model trees are constructed and an ensemble of these model trees are then used for final prediction. This ensemble of models delivers a variance reduction effectually. There are various ensemble methods used and once such ensemble method is the Bagging (bootstrap aggregating) ensemble method. This technique uses random sampling with replacement to generate the different training sets. The regression tree algorithm is then applied to each of the generated data set. Then the average amongst the models to calculate the predictions for the new data is taken. The third regression technique used is the Support vector machine regression. Support vector regression is simply an extension of the support vector classifier. It contains all the important and necessary features which illustrates the maximum margin algorithm. Here the learning machine which is basically nonlinear is mapped into a high dimensional kernel induced feature space using a nonlinear function. As long as the boundary between two classes is linear, the support vector classifier is simple and straightforward. But when the class boundaries are non-linear the support vector classifier makes the feature space larger by using kernel functions. The support vector classifier forms a hyperplane to build a decision boundary [15]. The performance of all the constructed regression models is then evaluated in terms of RMSE using 3-fold, 5-fold and 7-fold cross validation method.

III.   RESULTS AND DISCUSSION

The speech corpus consists of a total of 90 Indian speakers from different parts of the country. It includes voice samples of both the genders. Out of the 90 speakers, 45 speakers are healthy subjects and remaining 45 are PD subjects. The voice samples of the PD speakers were collected using a transcend voice recorder from various Parkinson Disease Movement Disorder Society's (PDMDS) centers situated in Mumbai, India. The PD speakers were suffering from the disease since less than 4 years and are under medication since then. The average age of the 45 PD speakers is 64.4 years. The voice samples of the healthy speakers were collected from different parts of India like Karnataka, Mumbai, Kerala and Navi Mumbai. The mean age of the 45 healthy speakers is 64.8 years. All the speakers are asked to speak the vowel /a/ for at least 4 to 5 seconds and two to three times. So, in all 196 voice samples were collected and analyzed. The severity score had a range from 0 to 68, as 17 attributes of the UPDRS scale is evaluated with each attribute evaluated in a scale of 0 to 4. As our speech corpus has PD speakers suffering from PD since less than 4 years, the maximum value of the severity score is 42 and minimum is 8. A severity score of zero is assigned to the healthy speakers. The 14 features of speech are then extracted from these voice samples using the Praat voice analysis software [16].
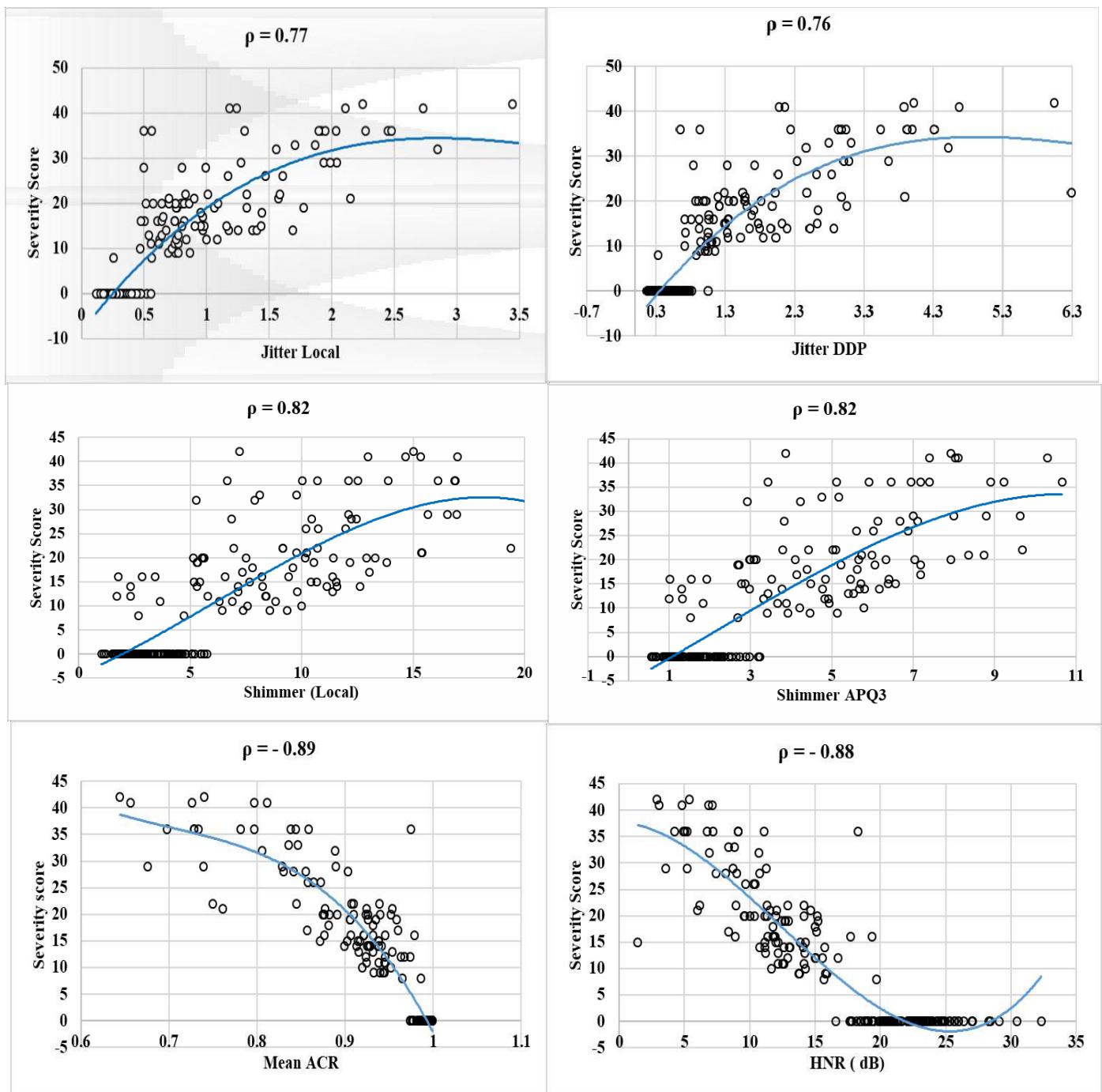
Fig. 2. Correlation graphs of highly corelated speech features

A. Mapping features of speech to severity scores

To obtain an insight into the statistical properties of the extracted 14 speech features, Pearson correlation coefficient between the extracted speech features and associated severity score is computed. Fig. 2 shows correlation graphs of some of the highest correlated features. This gives the distribution of these feature values and its relationship to thePD severity. Similar graphs are plotted for other features too. The blue line represents a trend of PD severity for the associated speech feature (3rd order polynomial fit curve).

All the features significantly correlate with the severity score ($p < 0.001$).

B. Regression Analysis

The features extracted are then fed to the three regression models and their performance is compared in terms of RMSE. The three regression models implemented are the k nearest neighbor, two regression trees – CART and Bagged and Support vector regression. The models are evaluated using 3-fold, 5-fold and 7-fold validation methods and the results are measured using RMSE.
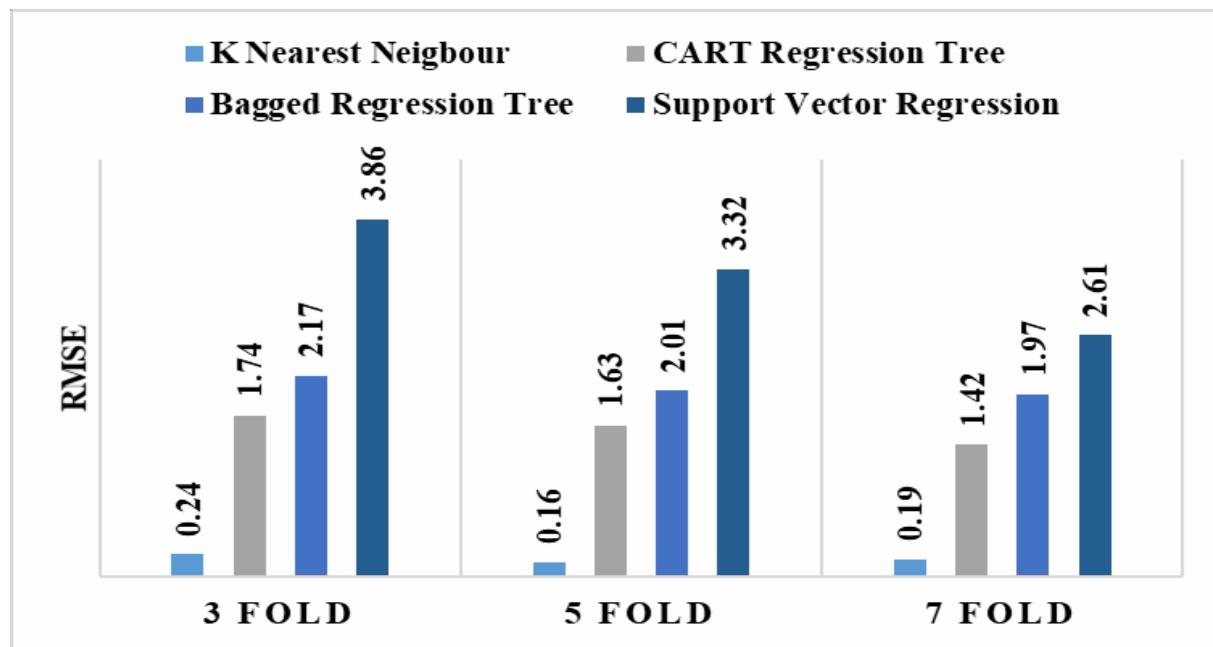
Fig. 3.   Comparison of the RMSE values obtained by the 3-fold, 5-fold and 7-fold validated regression models
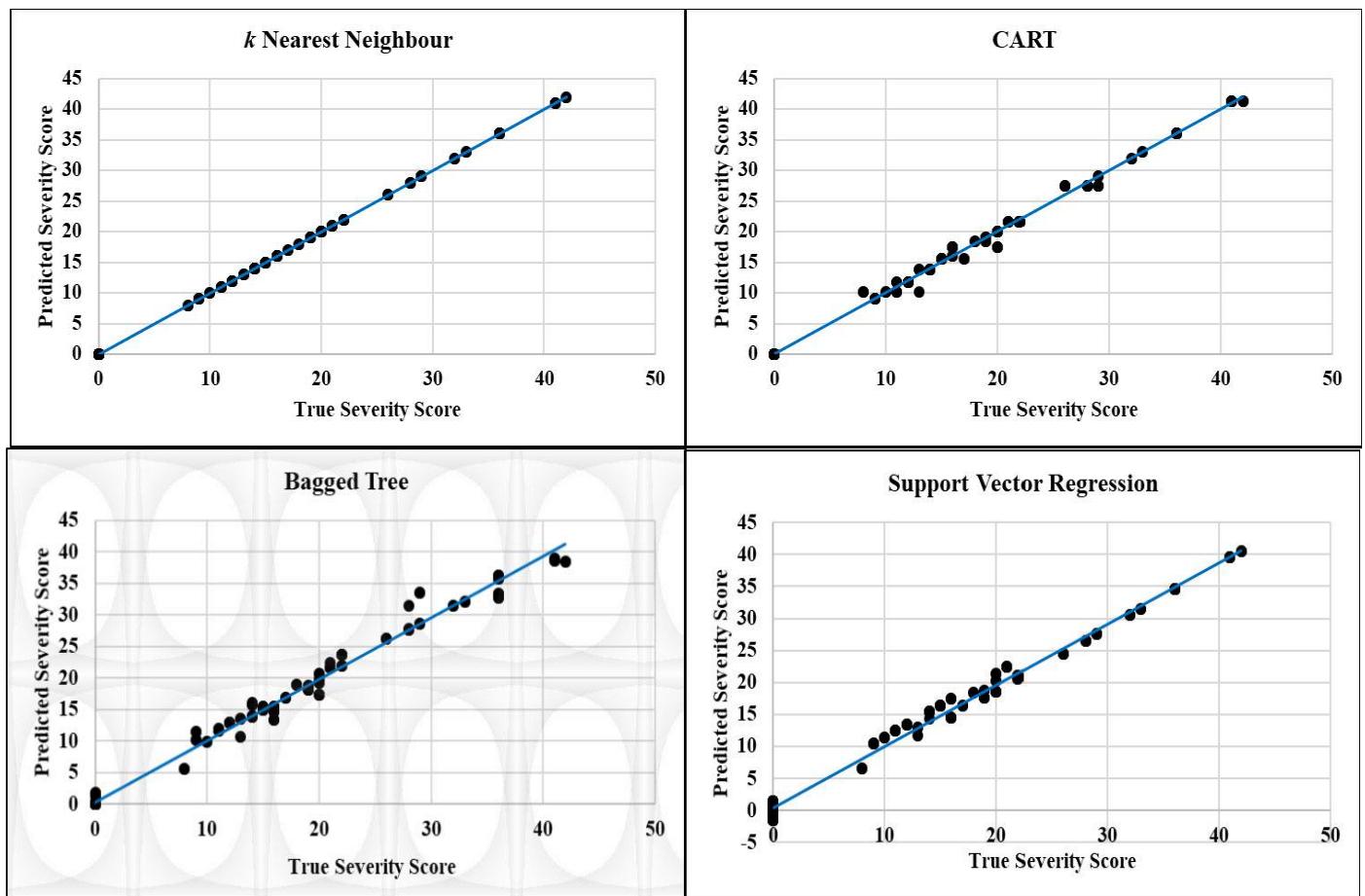

Fig. 4.   Plot of true severity score and predicted severity score using regression techniques

Fig. 3 shows a comparison chart of the RMSE values obtained by the cross validated regression models. From Fig. 3 it is observed that in all the cross-validation models, the RMSE of the k nearest neighbor is the least followed by the regression trees. Among the two regression trees the RMSE of CART regression was lesser than that of Bagged regression. The RMSE of the k nearest neighbor technique is less than 1 which implies that the predicted score differs from the true severity score by at most ±1 point. The technique which gave the maximum RMSE of 3.86, 3.32 and 2.61 for the 3, 5 and 7-fold validation respectively is the Support vector regression. Fig. 4 shows the graph of the true severity scores versus the predicted severity scores of the three regression models. The blue line in Fig.4 represents a trend of predicted severity score versus true severity score when linearly interpolated.

From Fig. 4 it is observed that the predicted severity scores were linearly interpolated to the true severity scores using the k nearest regression technique. In other techniques a variation between the two severity scores is observed.

IV. CONCLUSION

This paper investigates the prediction of severity scores of patients suffering from Parkinson disease using speech signal. Initially fourteen features of speech were extracted from the speech signals of both the healthy and PD speakers which includes the pitch and frequency perturbation features as well as the noise features. To visualize the association of these extracted features with the true severity score, correlation graphs are plotted as shown in Fig. 2 for some of the highly correlated features. The severity scores are then predicted by using three different regression techniques namely the k nearest neighbor, tree regression and support vector regression. The performance of the three regression techniques is then compared by evaluating their RMSE using the 3-fold, 5-fold and 7-fold cross validation methods. The results obtained showed that the RMSE of k nearest neighbor technique was the least in all the validation methods followed by the regression trees.

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Enhancing usage of Library Resources using Advanced Technologies in K J Somaiya Institute of Engineering and Information Technology, Sion, Mumbai, Library

Librarian
Gauri Gothivrekar, KJSIEIT Mumbai,India
g.gothivrekar@somaiya.edu

Abstract
This article discusses the importance of advanced technology and its crucial role in academic community. It further elaborates the methods for increasing usage of libraries. The practical implications of technology by K J Somaiya Institute of Engineering and Information Technology, Sion, Library is illuminated in detail.

Library is the 'Heart' of the institute. Heart pumps out blood whereas library pumps out information which facilitates the teaching and learning process. Library can also be termed as the engine of information drive of any institute. A well equipped and well managed library is the foundation of modern educational organization. The importance of library in education can be appreciated properly and precisely if we try to understand the changing concepts of education of today.

Keywords: *Information literacy, Book reservation, Self renewal, Overdue Reminder, GCC module, E-journal consortia etc.*

Introduction
The information thirst in every individual is developed by Information literacy drive. It is focused on content, communication, analysis, information searching and evaluation whereas information technology fluency focuses on a deep understanding of technology and increasingly skilled use of it. A clear understanding of the need for processing the information and a capability for processing the information and applying the information to reach a goal is crucial to the information literacy equation.

The modern libraries quipped with modern forms of technology make the resources of information globally available and consequently making the role of library personnel more dynamic and ever changing. The electronic environment has created significant role changes for librarians of all categories of library and information centers.

Role of information literacy in academic community

Most of the students in any institute have incomplete knowledge of the accessible library resources and are unaware about usage of all library tools. The key for this could be the college instruction should be library-centered rather than class-centered and that teaching functions of the Library must be ordered by Teachers and the Librarian of the college, so that the Library truly becomes the heart of the college with arteries running into each department. The actual portrait is very pitiful where the cooperation between the library and the teachers for making effective use of college library is lagging. This atrophy on the part of the teaching staff makes students depend entirely on lecture notes, digest and guide books flooded in the market to help them pass examination. Many students believe that only text books comprise their courses and that the theory does not to go beyond these books or their notes for passing their university examinations. The result is that there are mass failures in competitive examinations. This clearly indicates significance of advanced tools to bridge gap between users and information resources.

The Library at K J Somaiya Institute of Engineering and Information Technology, Sion, (KJSIEIT Library) has identified this need of the hour and has introduced Information literacy drive to rule out above discussed issues. The administration has been very supportive in every new idea explored. Energetic and competent Library staff has taken great effort to implement these facilities and run them without any hindrance. KJSIEIT has its in-house Library software 'Bookworm', owned by Brainstorming pvt.ltd. which is a sister concern of KJSIEIT. Somaiya Vidyavihar Trust is actively involved in Education field since 1957 with the sole

motto of "Dnyanadev tu Kaivalyam" (Knowledge only Liberates). Library software is designed as a user friendly module and is implementing new services for over 25,000 Library users of all the 34 institutions under Somaiya Vidyavihar Trust.

Each new term begins with excitement. Students and faculty is recharged after vacation. They want to borrow books immediately after commencement of terms. Many a times with change of new syllabus, new titles are included. Hence here in KJSIEIT Library, care is taken to procure and process the new titles prior to reopening of college with prior approval from subject teachers. The recommendations from staff and students are also invited and treated important. A major part of collection includes engineering subject books. General observation says that Students are good in technical knowledge but lag behind in interview due to poor vocabulary. For this reason special attention is given to nurture the students in English speaking and their personal development. Consequently, importance is given to books pertaining to Competitive examination, interviews techniques, personal development, fictions, biographies etc. This facility is triggered is with the usage of technology by accepting online recommendations from students. The list of books is also circulated to the staff and students online by providing web links to them through mail. Links of online catalogues of distinguished Libraries are circulated for their ready reference.

Book exhibitions are arranged twice a year. One exhibition is for new titles in subjects of engineering, fictions, and competitive exams published by quality publishers. The third law of Library Science laid down by Dr.S.R.Ranganathan says "Every book its reader". Here at KJSIEIT Library we fulfill it by arranging exhibition of less read books from Library. Library has good collection of reference books which are in search of relevant readers. Appropriate initiative is taken to bridge gap between the readers and books. Modern technology like mail, whasapp messenger, Facebook, library blog helps us to spread news about the exhibition with every Somaiyte thus getting good fabulous response for the event.
The list of latest arrivals is generated with the help of Bookworm software and sent to every library user on mail. In addition, Current Awareness Service is effectively given by providing pinpointed list of books to concerned students and faculty members. If asked for a list of books on a particular subject, the requirement is fulfilled by Library staff members. All the Libraries are connected on Web OPAC. Users can

view their personal Library accounts through this system.

At KJSIEIT, various print journals are subscribed and are in great demand by students for projects. Content pages of latest journals are scanned and sent to each patron on mail which is highly appreciated by faculty members. All the old journals are bound and classified for further usage. Bound journal contents are of great help in projects especially in field of electronics. Online foreign journals are important part of library collection. Crawford and Gorman in their *Future libraries: Dreams, Madness and reality* have modified the third law of Library Science as "Use technology to enhance services". Thanks to the 'Data Centre team' in Somaiya group which is very keen in upgrading IT services in Somaiya Campus. Various institutions under the Somaiya group are subscribing various e-journal packages as per their syllabus requirements. Technological aids aimed for resource sharing are implemented and thus the access of e-journals is reached to every Somaiyaite. E-books also share some part of this collection. The KJSIEIT library is also provided with Wi-Fi connection to ensure maximum usage of e-journals and e-books.

In one striking example, few years back, IIT Chennai Library has taken initiative in the video lectures series by eminent IIT professors which was uploaded freely in public domain. The same was also available in hard disks with a minimal cost. This Video Hard disks were added in KJSEIEIT Library and these gained recognitions amongst Faculty and students.
Global common communication service (GCC Service) was the latest service given to all Somaiyaites. Any Somaiyaite can visit any library in Somaiya campus and is also eligible to borrow book from any Somaiya Institute. This is an advanced Inter Library Loan service provided without any formalities. We can proudly say "Knowledge is freely available in Somaiya Campus. Just bring your own container".

KJSIEIT Library further pays attention to recovery of books. Many readers tend to delay while returning books on time. Thus they deny right of other needy readers. To sort out this issue, e- reminder system was made active years four years back. Manual SMS are regularly sent to every defaulter reader. This is now replaced by auto generated emails and SMS as well. One more provision is now added and that is sending mails and SMS prior to due date which will minimize the overdue records of the readers and will also ensure satisfaction of every reader of the Library.

Many titles are in great demand and to queue the demands, book reservation system has been implemented. Using the GCC service, every reader of library can view his/ her library account. Book reservation can be done using this service. If any title is not reserved, provision is also made for self renewal of the same book for one more time by the existing borrower. This enhances usage of the book and minimizes the tenure of the book on the rack.

Earlier question papers are required by students as well as faculty members. All earlier year's subject wise question papers are readily available. As a value added service, these papers are available in soft format on college website.

Alumni Library Membership is given on demand with minimal deposit money. This service was highly praised by alumni.

Future plans

KJSIEIT Library provides open access to students. To ensure the security of library resources implementation of RFID system will be on priority list. Extended Current Awareness Service with the aid of technology is also one more interesting work on the list. Institutional repository using cloud environment for sharing syllabi, question papers, projects, photo archive of various events in institute is also in pipeline.

Conclusion

Information is a right of every human being. Academicians should take special care to make their students information literate. Library which is termed as heart of the institute plays a significant role in Information mastery of its patrons viz. Faculty and students. KJSIEIT Library has taken significant steps for accomplishment of institute's information literacy drive. The utilization of information resources can be habituated and sensitized with aid of advanced technologies.

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