Implementing An Innovative Model For Security In Voting Machine Through Biometrics Recognition System

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Abstract - Fingerprint biometric is widely used around the world for identification purpose. This is due to easy and affordable cost of the system. The main drawback in the current system is authentication for the voters are not provided in a proper manner. The integration of biometric in the electronic voting machine undoubtedly requires less manpower and it also saves much time of the voter and it also eliminates rigging and it also ensures accuracy, transparency for faster result and accurate result during the election. Hence a framework for electronic voting machine based on biometric identification to authenticate and voting can be used. The candidate's identity shall be verified through this process by comparing the fingerprint of the candidate with the pre-stored image in the database. The vote is validated only if both the acquired and the pre-stored fingerprint image matches. Hence only true voters are allowed to vote. The Electronic voting machine is coded and then the hex file is dumped in the microcontroller. When the voter enters his/her vote the fingerprint is verified and then the vote is entered.

Keywords - EVM, Fingerprint , Biometrics, fingerprint module.

I. INTRODUCTION

Voting is a method to conduct the election in which the electorates are selected as their representative. Before election the transport system is maintained properly in order to avoid unwanted situations while transferring the voting machines. The official government works in the major public sectors are stopped during the election month. The election duty authorities are recruited from public sectors and then they are appointed for the election duty. As a result the authorities of the public sector faces a lot of burden. During election schools, colleges are allotted as polling stations they are known as Distribution Centre cum receiving centre. They are used for distributing as well as collection of the votes, their corresponding equipments used for voting and related documents. Even though the election is conducted for one or two days the people related to these institution suffers a lot.

Traditional Voting Process

The traditional voting process is divided into different phases,

Authentication – The voter has to authenticate himself or herself using the voter identity card. This is verified by the presiding officer in public. Later on if the identity is proved the voter will be allowed to cast their vote.

Vote – The vote takes place in a protected booth where voter can cast his/her vote alone in person. The voter can cast their vote by choosing anyone of the candidate and press the button of the corresponding party of the candidate. One voter is allowed to vote only once.

Vote counting – After voting process gets over the voting machine will be sealed and the taken to the vote counting centre. In front of the election commission authority the votes shall be counted.

The conventional voting systems are inefficient due to long period of preparation such as bogus voting, paper material, punch card. The systems efficiency is questioned as these elections are conducted manually and it cannot be accurate. In order to overcome these issues a methodology of voting has to be introduced.

A concept was presented [1], about how the finger prints are recognized and how the information on the fingerprints are recognized and the later how the fingerprint gets compared. This provides way for guiding how to scan the fingerprint.

A New System of E-Voting [4], was introduced in order to overcome some issues. The problem of voting is still critical in terms of safety and security. The method deals with the design and development of a web-based voting system using fingerprint in order to provide a high performance with high security to the voting system also web technology is used to make the voting system more practical. The new design is proposed an election for a university for selecting the president of the university. The proposed EVS allows the voters to scan their fingerprint, which is then matched with an already saved image within a database.

A method was introduced for recognizing the fingerprint [10], of each and every user and also how to differentiate the fingerprint information of one person from another. It also defines how to recognize the fingerprint image from a collection of image in an effective manner. The fingerprint

information are stored in digital format. While searching a particular image through a collection of image in will reduce the time of searching.

Web based voting system based on fingerprint in which the voter's fingerprint [2], is scanned and then later the vote of the candidate is transferred to a web based bulletin board that storing the votes in a different database other than the voting machine through the web. But additional security has to be given to the bulletin board.

A concept was introduced [3], about how to provide security to the vehicle using the fingerprint biometric techniques. In the previous method Radio Frequency Identification method is used to secure the vehicle. In order to secure the vehicle using fingerprint biometrics the fingerprint is acquired. Then the image is preprocessed later on using feature vector the features of the images are extracted and compared with the input image to provide the authentication.

A method for Latent fingerprint matching [7], was orchestrated. Latent fingerprint images are mostly used in crime scenes and forensics applications. The fingerprint images are obtained by rolling the finger from one side to the other nail to nail in order to capture all ridge details of a finger. The latent fingerprints are smudgy and blurred. So it will be difficult to match the fingerprints images. The poor quality latent images are also difficult to read and match. Hence by using preprocessing techniques like histogram, segmentation, Smoothing and extracting minutiae points, ROI the latent fingerprints are compared successfully.

A concept was introduced about how to design an voting machine [5], with complete security that also provides accuracy while counting the votes. The embedded system for designing the voting machine was developed using Arduino Mega 2560. An optical fingerprint sensor for is used for scanning the fingerprints. After verifying the identity of the candidate the vote will be entered and stored in the database then after the completion of election the votes shall be counted.

A method for providing security using cryptography [6], was introduced in order to provide integrity. The votes are stored in a different database other than the voting machine during voting itself. The election authorities shall start counting the votes by generating a distributed key using an android application. The security is maintained in a way that the key will be generated if and only if all the election authorities log in to the android application. An android application was created to generate the distribution key and the key is generated thrice to ensure absolute security.

A concept for recognizing the fingerprint image and also the facial recognition [8], was introduced based on the content. The image is processed in such a manner that it removes sensor noise, blur, inter pixel collapse, missing pixel etc. Hence accuracy shall be maintained in the image. Then by using the machine learning techniques the images are compared. The extreme value theory is adapted to maintain the quality of the image.

A method for scanning the fingerprint image [9], was introduced to find the details in the image and then later finding the core point, ridge ending, ridge bifurcation of the fingerprint image. This will improve the quality of the fingerprint image there by while matching the finger print image using the extreme value theory. The method proposed uses Gaussian to identify the detailed information of the image. Even poor quality image can be processed and the matched.

Thus in this section the various existing methods and their drawbacks are discussed. The proposed method has been developed to overcome the problems like providing complete accuracy while comparing the image which can be implemented using meta recognition. The meta recognition method adopts the Support Vector Machine concepts based on machine learning. Thus it produce a robust result by comparing the fingerprint images.

II. PROPOSED METHODOLOGY

The proposed method has been developed to overcome the problems like providing complete accuracy while comparing the image which can be implemented using meta recognition.

The meta recognition method adopts the Support Vector Machine concepts based on machine learning. Thus it produce a robust result by comparing the fingerprint images.

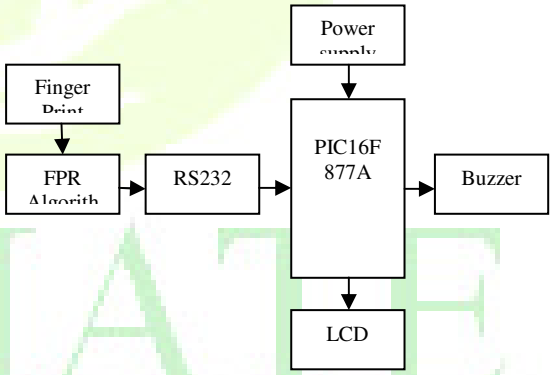

Figure 1.Block Diagram of EVM

The Figure 1 refers that the fingerprint input image is acquired and then it is processed using the FPR (Finger Print Recognition Algorithm) then it will be compared with the data set image and then if the image doesn't match then it will display invalid user if the candidate is trying to vote again it will display that the vote of that particular candidate has been already casted. It also does not allow a particular person to vote for more than one party in the voting machine.

Hence the candidate shall be allowed to vote only if the fingerprint of the candidate has been already enrolled. If the fingerprint doesn't match then it will show indication of invalid voter. Thus it verifies each and every candidate and their authenticity and then allowed them to vote. Using this method only true votes can be casted and also invalid votes cannot be polled and the counting of the votes shall also be accurate. It provides the complete accuracy which is needed during voting and the election. The training data and the test data are compared in order to generate the required output.

III. SUPPORT VECTOR MACHINE

Support vector machine (SVMs) are used for data categorization. It is used for mapping facts into high dimensional gap and for the maximal margin.

Giving training vectors,

$$xy \epsilon R^n, k = 1, \ldots\ldots, m,$$

In two classes, and a vector of labels

$$y \epsilon R^m$$

$$y\, k \epsilon \{1, -1\}, \frac{1}{2}$$

SVM solves a quadratic optimization problem

$$Min_{w,b,} \epsilon^{\frac{1}{2}}\ w^T w + c \sum \text{M K} = 1\, \epsilon$$

Subject to,

$$y_k(w^T \emptyset(x_k) + b) \geq 1 - \epsilon_k$$

A, and C are two functions where the training data is mapping. The decision function(predictor) for the testing enhance is

$$f(x) = sgn(w^T \emptyset(x) + b)$$

Practically,

$$k(x, x') = Ax^T A(x'),$$

to train the SVM, the kernel function is needed.

$$k(x, x) = \text{EXP}(-\gamma)\ //x - x//)$$

A.SVM Training

There are sets of data for the training set i.e.

$$x_{i,i} \epsilon \{1, \ldots., l\}$$

for the labels

$$y_{i,i} \epsilon \{1, \ldots., l\}$$

The SVM Training equation is written as

$$max \sum_{i=1}^{l} \propto_{\text{i}} - \frac{1}{2} \propto^{\text{T}} \text{Q}_{\propto}$$

For,

$$0 \leq \propto_i \leq C, \forall_i \epsilon\, 1$$

Where,

$x_i \epsilon R^n$, is training data point i

$y_{i,i} \epsilon \{1, \ldots., l\}$, is the label attached to point xi, and $\propto_i$ is a set of weights for each training point to find out the SVM classifier. C is a constraint which shows classifier overview for exactness on the training set. Since SVM is used for testing and train the image it highly improves the robustness.

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IV. PROBLEM STATEMENT

A model of SVM is to be designed and trained to recognize the fingerprint of the databases that are actually used. An imaging system that converts each fingerprint image using Gabor filters. The result in each fingerprint image is represented as 256 real values.

1. Preprocessing of the image (to remove noise) using the low pass filter.
2. Gabor filter is used for extracting the features from the image after noise removal.

Thus in this section how the image get processed and how the features are extracted are well discussed.

V. DESIGNING THE VOTING MACHINE

The components that are needed to design the voting system are,

1. PIC Microcontroller
2. Fingerprint Identification Module
3. Infrared Sensor
4. LCD
5. Power Supply

The PIC Microcontroller is coded using the MP Lab software and later on it is dumped in the microcontroller using Flash Magic Software. This chip is the centre of heart that act as both the control and ballot unit of the voting machine. Since it also saves time of the voter who is casting their vote.

The fingerprint identification module is used for verifying each and every person before allowing them to vote. This is

the important module which is used for providing authentication to each and every user.

Infrared sensors are used for receiving and transmitting information purposes. It is also used for detecting objects in various fields.

The LCD is used for displaying the status of entering the vote, whether the vote is selected or rejected.

The power supply is used for providing the connection to each and every device.

VI. IMPLEMENTATION AND RESULT

In the proposed methodology the fingerprint images are stored in the database shall be trained using the support vector machine algorithm. The input image is the scanned image from the fingerprint scanner.

The input is processed and verified with the trained image in the database and if it matches with the pre-stored image then the output will be displayed as it indicate the user to cast their vote. The given figure is the test image which is useful in verifying the results by comparing with the database. It also identifies the details in the fingerprint by processing the image while training.

Figure 2. Test Image

Figure 2 refers the test image which is already collected and stored in the database. Later the stored image will be trained in order to match the correct image. The images are classified in order to produce the eigen values which is used for comparing the images.

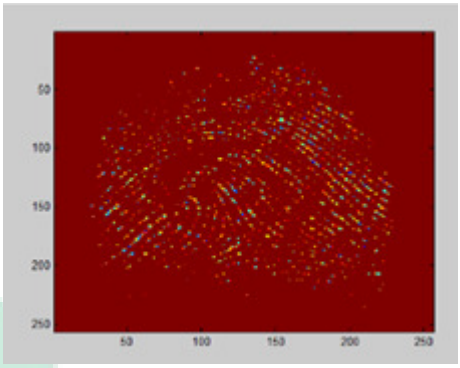

Figure 3. Feature Extracted Image

The Figure 3 refers to the processed image after the images are classified. The image's information regarding the feature extraction are calculated for matching the test image with the trained image.

Figure 4. Output Image

The Figure 4 refers to the equivalent image that will be compared with the test image. This is the resultant image that will be generated if the fingerprint matches with the test image.

This section discusses about how the images are compare using the support vector machine. While an image is being scanned using the techniques of image processing the boundary details and all other information regarding the image is being collected. After storing this image in the database the test data is trained in a manner to produce the required output.

VII . FUTURE SCOPE

1. This system can be implemented in a few years using recent technologies and it also help to provide a safe and secure election procedure

2.The finger print module memory can be expanded in future. One mb flash memory finger print module can be used for increasing the capacity.

Aadhar cards have already been introduced in India recently which contains an individual‘s fingerprints and iris scan. Thus every Indian citizen can have a similar identity card. Rigging in future can be completely avoided. India can conduct the most secured and bogus free election in future using this machine.

VIII . CONCLUSION

Fingerprints has been used for recognizing humans for a prolonged period of time. Automated biometrics recognition system has been in use during the recent years. Fingerprint image enhancement is used to improve the verification process. Since fingerprint have a broad acceptance from public ,law enforcement and the forensic science community, they will be able to use this in the government utilized system. The advent of biometric recognition in voting machine would enable hosting of fair elections in India. This will avoid the illegal practices like rigging. In future face recognition can also be included in the election for voting process.

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