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A Survey on Electronic Voting System Based on Fingerprint Authentication

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ABSTRACT: "ELECTRONIC VOTING SYSTEM" is based on the online services like "ONLINE RESERVATION SYSTEM" where a voter can use his/her voting right online without any difficulty. In this system people who have citizenship of India and whose age is above 18 years of age can cast her vote online without going to any polling booth. The election commission of India has maintained a database server in which all the names of the voter with complete information is stored. The voter has to fill a registration form to register himself with the help of a USER ID and PASSWORD. This information is checked by the database server which has already all the information about the voter. If conditions are wrong then that entry will be discarded and he would not be able to vote. This system will be helpful for voters who live far away from their home city and want to cast their vote from anywhere in India. The main advantage of electronic voting is that the percentage of voting will increase. It decreases the cost and time of voting process and hence it will be more secure

KEYWORDS: Online E-voting, Offline E-voting, Distance voting, Finger Scanner Module, Database server, Verification.

I. INTRODUCTION

Electronic Voting Machine is a basic electronic machine that is used to store the votes in place of ballot papers and boxes which were used in traditional voting system. There are two different forms of voting: Distance voting and Presence voting. In distance voting voter cast his or her vote from a place other than a polling booth i.e. via mail or internet voting. In presence voting a voter can cast his vote at a polling station. To increase the efficiency and security of voting procedures, computerized voting systems were developed. Securing the voted data is the main challenge of electronic voting, hence designing a secure e-voting system is very important. Therefore security is the heart of computerized e-voting system where election data is recorded, stored and processed as digital information. There are different levels of e-voting security. Online voting process authentication can be done with fingerprint sensing at the time of voting. To make the system more secure we are making use of the Adhar Card Number which is unique for each person. This entire system can be implemented using login which requires the Name of the candidate, Adhar Card Number and the fingerprint scan. Valid voters will have their name, fingerprint and other details in the government database server for each state district wise. This will therefore ensure with the help of unique Adhar card number and fingerprint scanner only legitimate users can cast their vote. Online voting system contains:

- Voters' information in |database.
- Voters name with Id.
- Voters fingerprint scan.
- Voters vote in the database.

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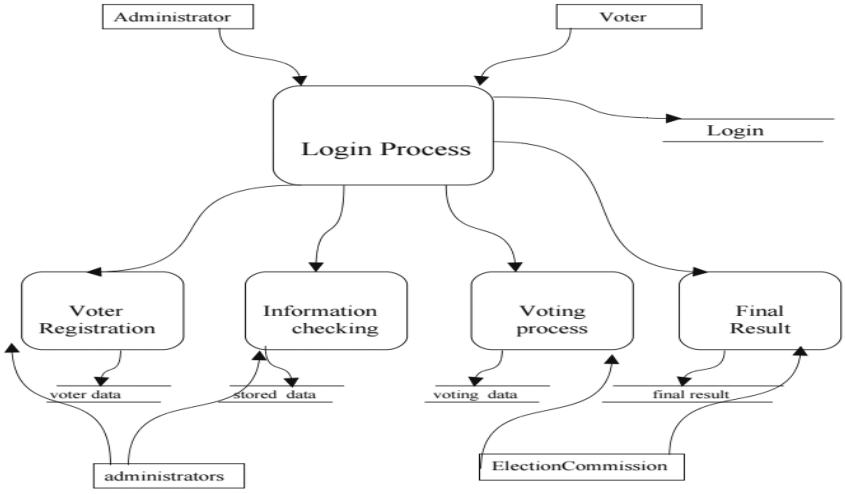

E-VOTING PROCESS

- *How Does a Fingerprint Optical Scanner Work?*

A fingerprint scanner system has two basic jobs -- it needs to get an image of your finger, and it needs to determine whether the pattern of ridges and valleys in this image matches the pattern of ridges and valleys in pre-scanned images. Only specific characteristics, which are unique to every fingerprint, are filtered and saved as an encrypted biometric key or mathematical representation. No image of a fingerprint is ever saved, only a series of numbers (a binary code), which is used for verification. The algorithm cannot be reconverted to an image, so no one can duplicate your fingerprints.

- *Advantages of Fingerprint Authentication*

There are several ways an electronic time clock system can verify that somebody is who they say they are. Most systems are looking for one or more of the following:

· What you have
· What you know
· Who you are

To get past a "what you have" system, you need some sort of "token," such as an identity card with a magnetic strip.
A "what you know" system requires you to enter a password or PIN number.
A "who you are" system is actually looking for physical evidence that you are who you say you are a specific fingerprint pattern.

- *"Who you are" have a number of advantages over other systems like:*

· Fingerprints are much harder to fake than identity cards.
· You can't guess a fingerprint pattern like you can guess a password.
· You can't misplace your fingerprint, like you can misplace an access card.
· You can't forget your fingerprints like you can forget a password.

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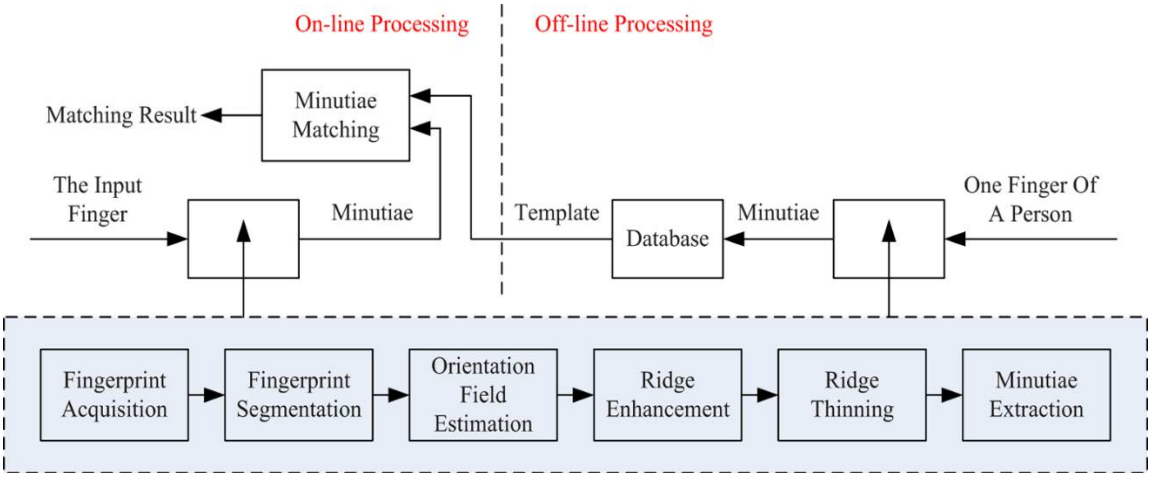
II. RELATED WORK

All computer scientists who have done work in or are interested in electronic voting seem to agree that online voting does not meet the requirements for public elections and that the current widely-deployed voting systems need improvement. In India first election using electronic voting was held from April 20 to May 10, 2004. The Electronic Voting Machine comes in a reusable carry pack and can operate on a battery power source in remote areas. According to Election authorities, each EVM can record five votes' minute or nearly 3,000 votes in a polling day. Throughout history, election fraud has occurred in many electoral processes from which experience shows that the manual voting process is major source of such vices and violence in many democratic countries. A case in point is the Kenyan Electoral Commission (IEBC) that has on several occasions failed to update the Kenyan national voters' register in time before the voting date. The recent EVM have also implemented real time clock and date-time facility which authorize them to record the real time and date whenever a key is pushed. In recent years, a considerable number of countries has adopted E-voting for their official elections. These countries include: America, Belgium, Japan and Brazil.

III. METHODOLOGY

The knowledge based (password) and token based (key or card) security systems are prone to compromise because passwords can be forgotten or guessed and cards can be lost or stolen. Biometrics which refers to automatic identification of a person based on his or her distinguishing characteristics, is inherently more secure than knowledge based or token based identification.
A fingerprint-based biometric system is essentially a pattern recognition system that recognizes a person by determining the authenticity of her fingerprint. The enrolment module is responsible for registering individuals in the biometric system database (system DB). During the enrolment phase, the fingerprint of an individual is acquired by a fingerprint scanner to produce raw digital representation.
The steps involved in fingerprint recognition are explained as follows:



STEP 1: FINGERPRINT ACQUISITION

On the basis of collection procedure, fingerprint images can generally be classified into three categories, namely, rolled, plain and latent.
Rolled fingerprints are obtained from rolling the finger from one side to the other in order to capture all ridge details of the fingerprint.
Plain fingerprints images are acquired by pressing the fingertip onto a flat surface.

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Latent fingerprints are usually collected from crime scenes, in which the print is lifted from object surfaces that were inadvertently touched or handled.
Based on the mode of acquisition, a fingerprint image is classified as

- Off line image.
- Live-scan image

1. Offline image:
The acquisition of fingerprint images was performed by using the so-called “ink-technique”: the subject’s finger was spread with black ink and pressed against a paper card; the card was then scanned by using a
Common paper-scanner, producing the final digital image.

2. Live scan image:
A digital image is directly obtained by placing the finger on the surface of a fingerprint reader. No ink is required in this method. The most significant characteristics of fingerprint readers are their resolution and capture area.

Step 2: FINGERPRINT SEGMENTATION:

An important step in an automatic fingerprint recognition system is the segmentation of fingerprint images. A captured fingerprint image usually consists of two components, which are called the foreground and the background. The foreground is the component that originated from the contact of a fingertip with the sensor. The noisy area at the borders of the image is called the background. The task of the fingerprint segmentation algorithm is to decide which part of the image belongs to the foreground and which part to the background. The goal of fingerprint segmentation is to discard the background, reduce the number of false features, and thus improve the matching accuracy.

Step 3: ORIENTATION FIELD ESTIMATION

By considering a fingerprint as a texture pattern (oriented line pattern within a certain valid range of frequency), we utilize both fingerprint orientation and frequency information to segment latent. Most of the approaches proposed in the literature for singularity detection operate on the fingerprint orientation image. The orientation image represents an intrinsic property of the fingerprint images and defines invariant coordinates for ridges and furrows in a local neighborhood. By viewing a fingerprint image as an oriented texture, a number of methods have been proposed to estimate the orientation field of fingerprint images.

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Step 4: RIDGE ENHANCEMENT

The uniqueness of a fingerprint is exclusively determined by the local ridge characteristics and their relationships. The two most prominent ridge characteristics called minutiae are

1. Ridge ending

A ridge ending is defined as the point where a ridge ends abruptly.

2. Ridge bifurcation.

A ridge bifurcation is defined as the point where a ridge forks or diverges into branch ridges.

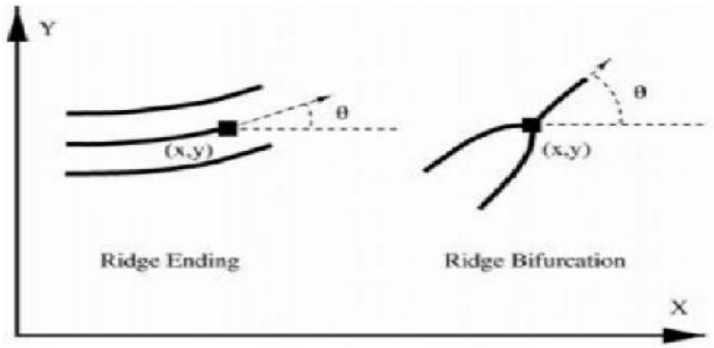

Figure 2 Ridge Ending and Ridge Bifurcation

Step 5: RIDGE THINNING:

The final image enhancement step typically performed prior to minutiae extraction is thinning. Thinning is a morphological operation that successively erodes away the foreground pixels until they are one pixel wide. A standard thinning algorithm is employed, which performs the thinning operation using two sub-iterations. Each sub-iteration begins by examining the neighborhood of each pixel in the binary image, and based on a particular set of pixel-deletion criteria, it checks whether the pixel can be deleted or not. These sub-iterations continue until no more pixels can be deleted. The application of the thinning algorithm to a fingerprint image preserves the connectivity of the ridge structures while forming a skeletonized version of the binary image. This skeleton image is then used in the subsequent extraction of minutiae.

Step 6: MINUTIAE EXTRACTION:

Among all the fingerprint features, minutia point features with corresponding orientation maps are unique enough to discriminate amongst fingerprints robustly; the minutiae feature representation reduces the complex fingerprint recognition problem to a point pattern matching problem. Finally, a simple image scan allows the detection of pixels that correspond to minutiae through the pixel-wise Computation of crossing number. There are a lot of minutiae extraction methods available in the literature. We can classify these methods broadly into two categories .Those that work on binarized fingerprint images. Those that work directly on gray -scale fingerprint images.

Step 7: MINUTIAE MATCHING

Minutiae are extracted from the two fingerprints and stored as sets of points in the two-dimensional plane. Minutiae-based matching essentially consists of finding the alignment between the template and the input minutiae sets that

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results in the maximum number of minutiae pairings. This is the most popular and widely used in commercial applications, because of its good performance and low computation time, especially for good quality images.

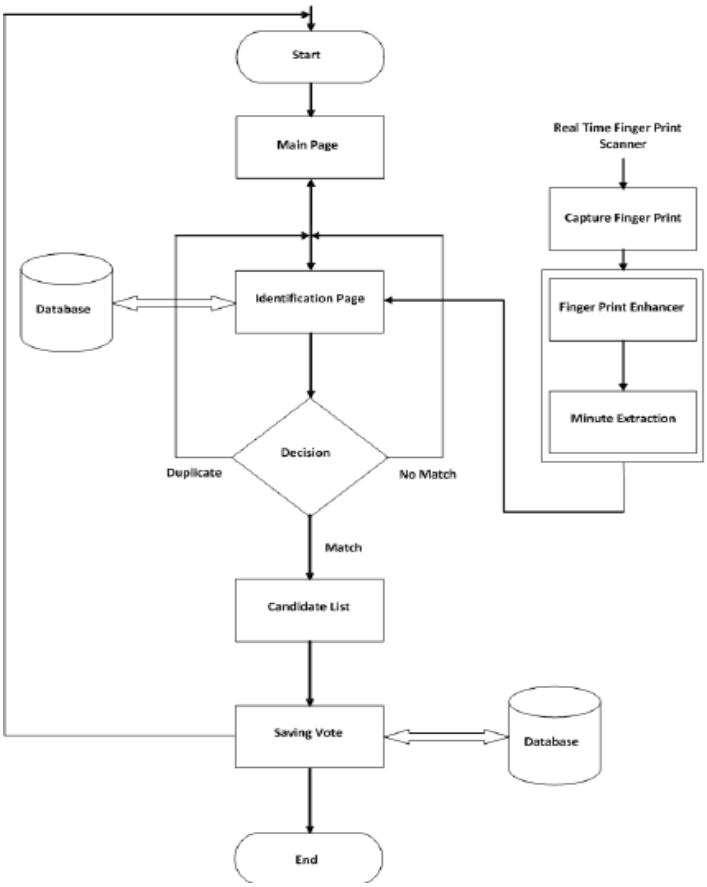
IV. PROPOSED WORK

A.DESIGN CONSIDERATIONS:

The proposed system is focused on improving the existing system by making voting available to all registered voter who cannot be present in home city during election period.

- First voter need to register and give valid reason for his/her absence in city during election time.
- The authorised officials will then have to create a new record in database for that voter.
- Voter must give all required personal details to register for this system.
- Special record to be entered in database will be voters fingerprint.
- Id passwords are not required as voter will only need his/her Unique ID/Voter ID and fingerprint later to login.
- This system will bring increase in overall percentage of voting which will help to choose best leader.

- Following diagram show process of voting:



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V. CONCLUSION AND FUTURE WORK

Elections were never perfect, even in the world of paper ballots stuffed into boxes and lever machines with outputs read off of dials. Today, volunteers are faced with electronic voting machines manufactured and maintained by private firms that have software that hasn't been rigorously tested and source code that is not available to experts of all political persuasions.

This Online Voting System will manage the Voter's information by which voter can login and use his voting rights. The system will incorporate all features of voting system. The system will have lesser cost, faster tabulation of results, improved accessibility, greater accuracy, and lower risk of human and mechanical errors.

Voter's detail will be stored in database after registration. By voting system percentage of voting increases. It decreases the cost and time of voting process.

Future enhancements focused to provide online e-voting with some authentication parameters like facial recognition. In case of offline e-voting some authentication parameters like, Finger Vein and iris matching detection can be done.

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