Online Security and Optimization Powered By Fingerprint in Online Voting System

Naresh kumar
Department of computer science
BTKIT dwarahat
Dist almora,State Uttarakhand
India

Dr Ajit Singh
Associate professor
Department of computer science
BTKIT dwarahat
dist-Almora, Uttarakhand, India

Abstract

Election is a process in which voters choose their representatives and express their preferences for the way that they will be governed. Using the decade old voting system to collect votes is no longer considered efficient due to the various recurring errors. The advancement of information and telecommunications technologies allow for a fully automated online computerized election process. An electronic voting system defines rules for valid voting and gives an efficient method of counting votes, which are aggregated to yield a final result. Correctness, robustness to fraudulent behaviors, coherence, consistency, security, and transparency of voting are all key requirements for the integrity of an election process. Moreover, electronic voting systems can improve voter identification process by utilizing biometric recognition which provides more security. Biometrics is becoming an essential component of personal identification solutions, since biometric identifiers cannot be shared or misplaced, and they represent any individual's identity. Fingerprint matching is a significant part of this process.

The value of democracy is voting. The importance of voting is trust that each vote is recorded and tallied with an accuracy and impartiality. ***Online voting process is*** *live and easier approach and it secure through fingerprints which have been used for identification over the time. However, because of the complex distortions among the different impression of the same finger in real life, fingerprint recognition is still a challenging problem for this. Hence study says, the authors and researcher are interested in designing and analyzing the Online Voting System based on the fingerprint minutiae which is the core in current modern approach for fingerprint analysis. The advancement of information and telecommunications technologies should allow for a fully automated online computerized for the election process the new design is analyzed by conducting short election among the polling for any person for selecting their representative among them. Various analysis predicted that the proposed online voting system resolves many issues of the current system with the help of biometric technology. Taking ovs as consideration*

Keywords— **Biometric, Fingerprint, Minutiae, Online Voting, Single Invariant Fourier transform(SIFT).**

1. INTRODUCTION

In an increasingly digital world, reliable personal authentication has become an important human computer interface activity. National security, e-commerce, and access to computer networks are some examples where establishing a person's identity is vital. Existing security measures rely on knowledge-based approaches like passwords or token-based approaches such as swipe cards and passports to control access to physical and virtual spaces.

Elections allow the people to choose their representatives and express their choices for how they will be governed. Generally, the integrity of the election process is fundamental to the democracy with integrity itself. The election system must be enough bold to withstand a variety of fraudulent behaviors and must be transparent and comprehensible that voters and candidates can accept the results of an election. In context of Western democracies' current crisis, e voting has become a very popular topic of discussion real academic and technical circles.

Online Voting system: a *unique_id is generated* that is mapped on to *finger print database* and provide secure *network* between voting booths and election commission. This network required very high security and thus online voting will be enabling only on and only for the Election Day.

Biometrics system is the automated recognition of individuals identification based on their biological and behavioral characteristics. Biometric recognition means measuring an individual's suitable behavioral and biological characteristics in a particular recognition inquiry and comparing these data with the biometric system reference data which had been stored at the time learning procedure, so that the identity of a specific user is determined. As known fingerprint is the friction ridges impression, from the surface of a fingertip. Fingerprints have been used for identification for many decades of human , more recently becoming fingerprint recognition is one of the most prior and famous biometric technologies mainly because of the inherent ease in acquisition the numerous sources (10 num) available for collection, and the established use and collections by law enforcement agencies

2. ISSUES OF PRESENT ELCTRONIC VOTING SYSTEM

- E Voting machines are expensive and have multiple associated risks on uses. These relate to limited transparency and therefore confidence in the process and outcome of an election. EVMs also create opportunities for manipulation and are accompanied by the risk of malfunction; e.g., as a result of faulty storage or use.

- Two attacks that involve physically tampering with the EVMs' hardware. First, we show how dishonest election insiders or other criminals could alter election results by replacing parts of the machines with malicious look-alike parts second, attackers could use portable hardware devices to change the vote records stored in the machines.

3. Fingerprint authentication system with Fundaments

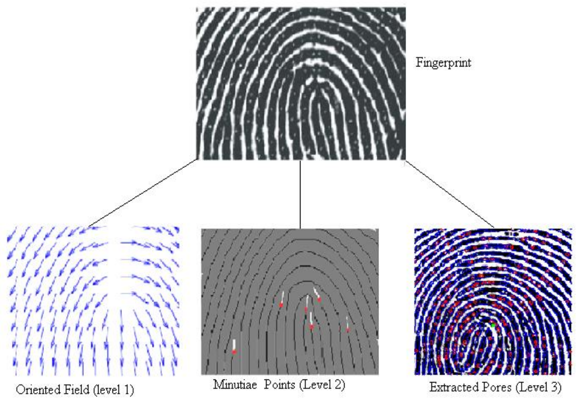

Fig-1 diferent levels of finger print

- Level 1 feature comprises these global patterns and morphological information. They alone do not contain sufficient information to uniquely identify fingerprints but are used for broad classification of fingerprints.
- Level 2 features or minutiae refer to the many ways that the ridges can be discontinuous. These are essentially Galton characteristics, namely ridge endings and ridge bifurcations. A ridge ending is defined as the ridge point where a ridge ends abruptly. A bifurcation is defined as the ridge point where a ridge bifurcates into two ridges. Minutiae are the most prominent features, generally stable and bold to fingerprint impression conditions.
- Level 3 features refer to pores and contour to ridges. These are purely the sweat pores and ridge contours. Pores are the openings of the sweat glands and they are distributed along the ridges. A pore can be either open or closed, based on its perspiration activity.

The pore information (position, number and shape) are considered to be permanent, immutable and highly distinctive but very few automatic matching techniques use pores since their reliable extraction requires high resolution and good quality fingerprint images. Ridge contours contain valuable Level 3 information including ridge width and edge shape

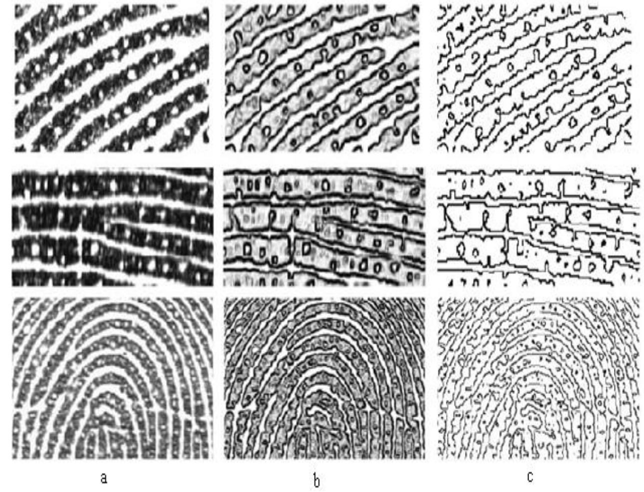

Fig-2 Images illustrating the intermediate steps of the level-3 feature extraction algorithm: (a) input fingerprint image, (b) stopping term f computed using Eq. (3), and (c) extracted fingerprint contour.

The level-3 feature extraction algorithm uses curve evolution with the fast implementation of Mum-ford–Shah functional [13, 14]. Mumford–Shah curve evolution efficiently segments the contours present in the image. In this approach, feature boundaries are detected by evolving a curve and minimizing energy based segmentation model as defined in the following equation []:

$$\text{Energy}(C,c1,c2)=\alpha\iint\emptyset\|C'\|\, dx\, dy+\beta\iint |I(X,Y)-C1|^2\, dx\, dy+\iint|(X,Y)-c2|^2\, dx\, dy$$

…………….... (1)

where , is the evolution curve parameter, φ is the weighting function or stopping term, Ω represent the image domain, *I(x, y)* represent fingerprint image, c_1 and c_2 are the average value of pixels inside and outside $\bar{C}$, respectively, and α, β, and γ are positive constant such that α + β + γ=1 and α<β <γ. Further, Chan and Vese [22] parameterize the energy equation (Eq. 4.1) by the artificial time t≥0 and deduce the associated Euler-Lagrange equation and that leads to the following active contour model,

$$\psi'_t=\alpha\phi(v'+\varepsilon_k)|\nabla\Psi'|+\nabla\Phi\Psi'+\beta\delta(1-c1)+\gamma\delta\Psi'(1-c2)^2$$

……….. (2)

Where $\bar{v}$ the advection is term and ε_k is the curvature based smoothing term. ∇ is the gradient and δ=0.5/(π(x^2+0.25)). The stopping term ϕ is set to

$$\phi=\frac{1}{1-(|\nabla 1|)^2} \quad .... (3)$$

This gradient based stopping term ensures that at the strongest gradient, the speed of the curve evolution becomes zero and therefore it stops at the edge of the image.
Initial contour is initialized as a grid with 750 blocks over the fingerprint image and the boundary of each feature is computed. The size of grid is chosen to balance the time required for curve evolution and correct extraction of all the features. Figure 4.5 shows examples of feature extraction from fingerprint images. This image shows that due to the stopping term (Figure 4.5b), the noise present in the fingerprint image has very little effect on contour extraction. Once the contour extraction algorithm provides final fingerprint contour ψ, it is scanned using the standard contour tracing technique [11] from top to bottom and left to right consecutively. Tracing and classification of level-3 pore and ridge features are performed based on the standards defined by the ANSI/ NIST committee for extended fingerprint feature set (CDEFFS) [42]. During tracing, the algorithm classifies the contour information into pores and ridges:

- A blob of size greater than 2 pixels and less than 40 pixels is classified as a pore. Therefore, noisy contours, which are sometimes wrongly extracted, are not included in the feature set. A pore is approximated with a circle and the center is used as the pore feature [11].
- An edge of a ridge is defined as the ridge contour. Each row of the ridge feature represents x; y coordinates of the pixel and direction of the contour at that pixel [11].

3.1 Fingerprint recognition system

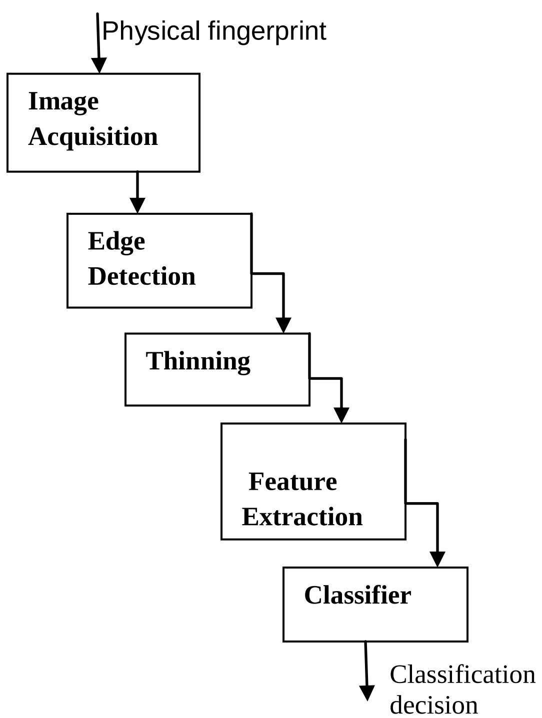

Fig-3 block diagram of finger recognition system

- **Image Acquisition**: A number of methods are used to acquire fingerprints. Fingerprint quality is very important since it affects directly the minutiae extraction algorithm

- **Edge Detection**: An edge is the boundary between parts of 2 regions with relatively distinct gray level properties. In practice, the set of pixels obtained from the edge detection algorithm not often characterizes a boundary completely because of noise, breaks in the boundary and other effects that introduce spurious intensity of discontinuities. Thus, edge detection algorithms typically are come after by linking and other boundary detection procedures designed to assemble edge pixels into meaningful boundaries.

- **Thinning**: An important approach to representing the structural shape of a plane region is to reduce it to a graph. This reduction may be accomplished by obtaining the skeleton of the region via thinning (also called skeleton zing) algorithm.

- **Feature Extraction**: Extraction of appropriate features is one of the most important tasks for a recognition system. Figure below is showing the extraction mechanism

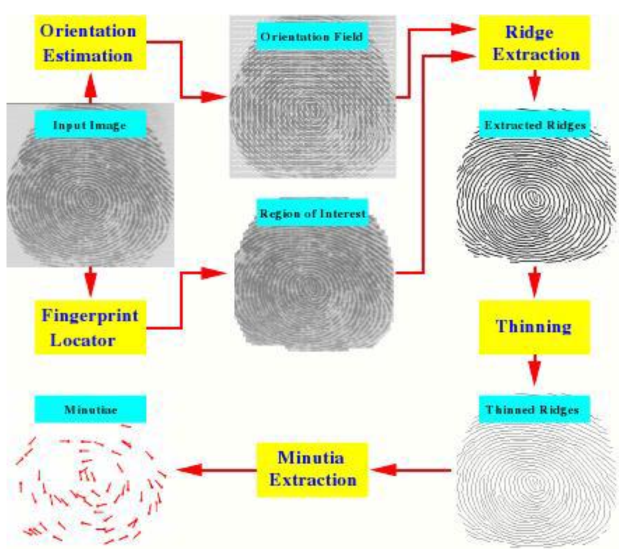

Fig-4 Feature Extraction figure

- **Classifier**: After scanning the entire fingerprint image, the resulting output is a binary image revealing the location of minutiae. In order to prevent any falsely reported output and select "significant" minutiae, two more rules are added to enhance the robustness of the algorithm:

1) At those potential minutiae detected points, it can re-examine them by increasing the window size by 5x5 and scanning the output image.
2) If two or more minutiae are to close together (few pixels away) we ignore all of them

4. Matching Algorithm

There are several matching algorithm such as minute extraction, global search and correlation based etc.

Matching algorithm applied to the original image fingerprint. The enhancement ridge contours are obtained by using a linear subtraction of wavelet response and gabor enhanced image. The resulting image is then binarized using a heuristically determined threshold. Finally, the binarized image is convolved with a filter H

$$f(x,y) = \sum_{n,m} \mathrm{I^b(x,y)H(x-n,y-n)}$$

is applied to the original fingerprint image. The enhancement ridge contours are obtained by using a single subtraction of wavelet response and Gabor enhanced image. The resulting image is then binarized using a heuristically determined threshold. Finally, the binarized image is convolved with a filter H.

4.1 SIFT algorithm

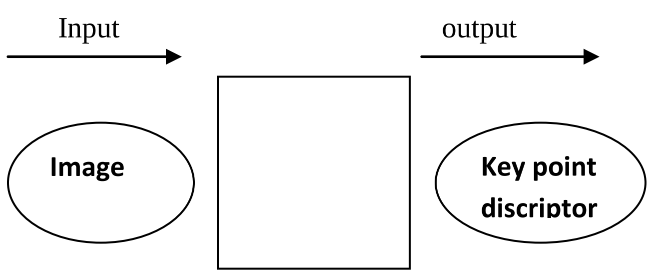

Fig-5 SIFT takes as input an image, and generates a set of keypoint descriptors

Following are the major stages of computation used to generate the set of image features:

- **1 Scale-space extreme detection**: searches over all scales and image locations by making use of difference-of-Gaussian function to identify strongly interest points that are invariant to scale and orientation.
- **2 Keypoint localization**: At each candidate location a detailed model is fit to determine location and scale. Keypoints selected on measures of their stability.
- **3 Orientation assignments**: there is One or more orientations are assigned to each keypoint location based on local image gradient directions.
- **4 Key point descriptor**: The local image gradients are measured at the selected scale in the region around each keypoint. These are transformed into a representation that allows for significant levels of local shape distortion and change in illumination.

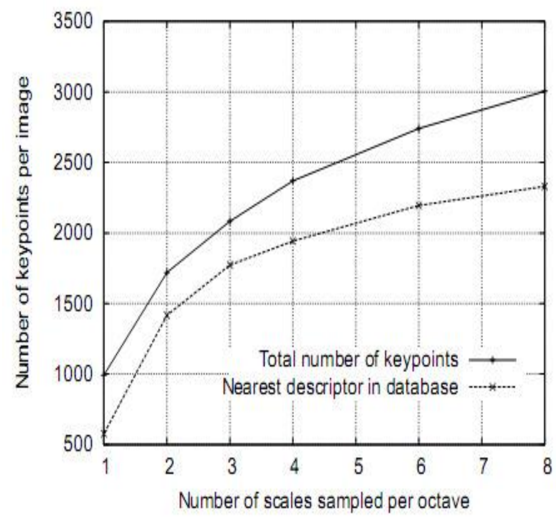

Fig-6 The graph shows the total number of key points detected in a typical image as a function of the number of scale samples.

As above graph shows, the highest repeatability is obtained when sampling 3 scales per octave. It might seem surprising that the repeatability does not continue to improve as more scales are sampled. the reason is that this in results there are many more local extrema being detected, but these extrema are less stable on an average and therefore are less likely to be detected in the transformed image.

5. Enrollment and verification process

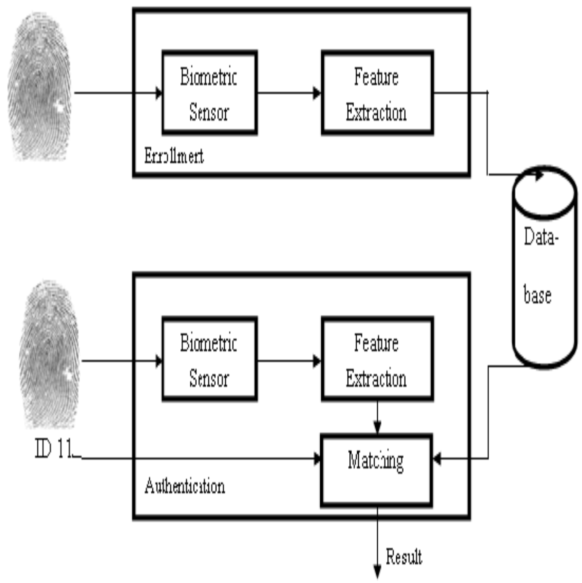

Fig-7 fingerprint verification system

7. Proposed online voting system

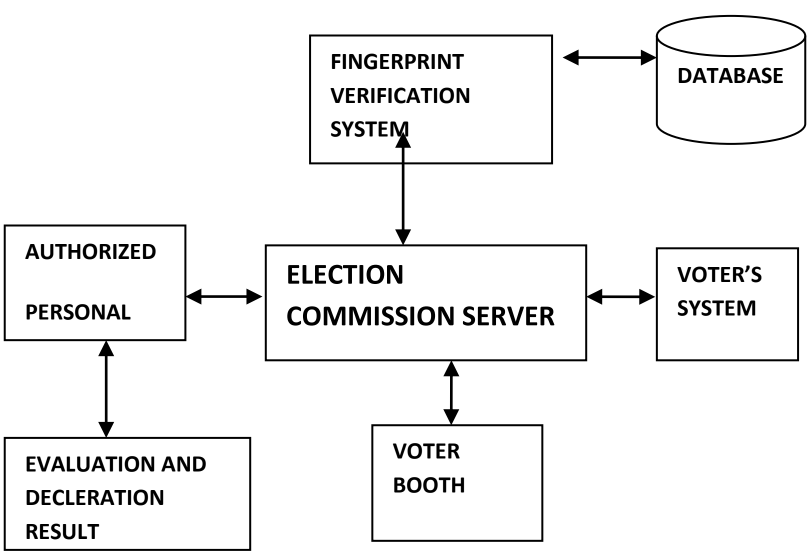

Fig-8 Architecture blog diagram of online voting system

7.1 Proposed Approach

This chapter converse the proposed approach and pores matching using SIFT algorithm. Figure 6.1 shows the block diagram of proposed approach. The basics of SIFT technique is described in the previous chapter. In this section, the proposed algorithm, its features and other various aspects has been described. Two type of database has been created; first one name samedb1 contains the 10 fingerprints of same person with some variations and other factors such as light, noise etc. Thus samedb1 contains 400 fingerprints of 40 different students. Second database namely diffdb2 contains 150 fingerprints of different students.

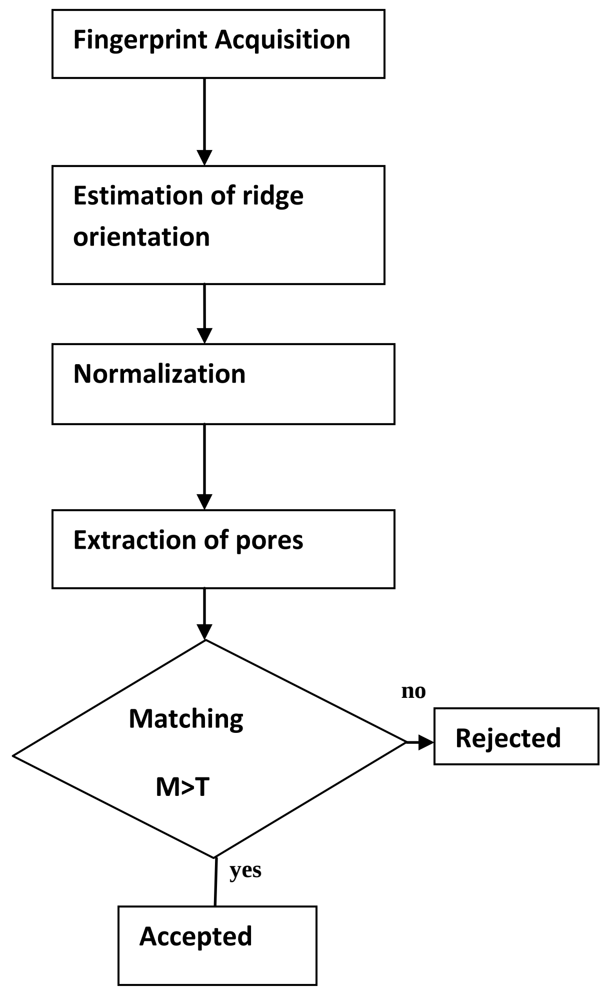

Fig-9 Block diagram of proposed approach

- **Fingerprint Acquisition**

The first step in the proposed approach is to acquire fingerprint image of good quality. Thus, Hamster II is use for acquiring fingerprint image. Hamster II is optical fingerprint scanner and use for scanning the finger. Hamster II is used for creating fingerprint database. This database is use for analyzing the accuracy of proposed algorithm and execute the results on the basis of analyze.

Fig-10 Sample print of Fingerprint Acquisition

- **Estimation of ridge orientation**

The local ridge orientation is determined by the least square estimate method. This data is utilized later in the representation of pores. It can be stated that segmentation is the critical stage of fingerprint pores recognition, since areas that are wrongly identified as pores regions will corrupt biometric templates resulting in very poor recognition.

Fig-11 Ridge orientation

- **Normalization**

To compensate for the variations in lighting, contrast and other inconsistencies, normalization process is used.Gaussian blurring is used to remove any noise introduced by the sensor.The lighting inconsistencies are adjusted by using sliding-window contrast adjustment on the Gaussian blurred image. To further enhance the ridges and valley a final intensity correction is made by using Histogram-based Intensity Level Adjustment.
The image can divide into small processing blocks (32 by 32 pixels) and perform the Fourier transform according to:

$$F(u,v) = \sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y) \times exp\left\{-j2\pi \times \left(\frac{ux}{M} - \frac{vy}{N}\right)\right\} \quad \ldots\ldots(4.1)$$

For u = 0, 1, 2... 31 and v = 0, 1, 2... 31.

Get the enhanced block according to

$$g(x,y) = F^{-1}\{F(u,v) \times |F(u,v)|^{k}\} \quad \ldots\ldots (4.2)$$

Where $F^{-1}(F(u, v))$ is done by:

$$F(x,y) = \frac{1}{MN}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y) \times exp\left\{-j2\pi \times \left(\frac{ux}{M} - \frac{vy}{N}\right)\right\} \quad \ldots\ldots (4.3)$$

For x = 0, 1, 2... 31 and y = 0, 1, 2... 31.

The k in formula (ii) is an experimentally determined constant, which can choose k=0.45 to calculate. While having a higher "k" improves the appearance of the ridges, filling up small holes in ridges, having too high a "k" can result in false joining of ridges. Thus a termination might become a bifurcation.

- **Extracted pores**

Extract level 3 features in ROI. The pores are distributed over ridges and using orientation detail can provide additional information for matching. During tracing, the algorithm classifies the contour information into pores and ridges.

- **RESULT**

Using SHIFT algo and level 3fingerprint the gives more better performances

8. CONCLUSION AND FUTURE WORK

Online voting system through finger print will give secure more powerful structure to polling by applying Fingerprint level 3 features extraction and matching approach which is a novel approach, its characteristics, design issues and applications.

Using SIFT algorithm in online fingerprint matching with level3 fingerprint increases result of this analyzing process, we can conclude that, as the threshold value is increases, false rejection rate is also increases.

These comperision graph will so a much better result for this proposed approach False rejection ratio FRR = Number of genuine fingerprints rejected divided by Total number of genuine tests.

Also increasing threshold energy false acceptance ratios (FAR) will decrease which will show on result while implementing.
Genuine acceptance rate will improve.

It also describes an overview of Level 1 and level 2 features, in the literature and their functionalities Future work will also characterize the performance of level-3 features on a comprehensive large scale database which contains fingerprint images of varying size, quality and other environmental factors. Since the level 3 features are unique so it may give more security with minimal error to defense, corporate & other major organizations,

9. References

1. D. Ashok Kumar#1, T. Ummal Sariba Begum#2 "A novel Approach Design Of Electronic Voting System Using Fingerprint"
2. M. Ray, P. Meenen, and R. Adhami, "A novel approach to fingerprint pore, extraction." Southeastern Symposium on System Theory, page no. 282–286, 2005.
3. McGraw, Gary and Greg Morrisett., "Attacking Malicious Code: A Report to the Infosec Research Council." IEEE Software. September/October 2000.
4. The Implementation of Electronic Voting in the UK research summary. 2002. "http://www.dca.gov.uk/elections/e-voting/pdf/e-summary.pdf." 21.01.2007.
5. D. Maio, D. Maltoni, R. Cappelli, J.L. Wayman, and A.K. Jain. FVC2000: Fingerprint Verification Competition. IEEE Transactions on Pattern Analysis and Machine Intelligence, 24(3):402–412, 2002.
6. Qijun Zhao, Lei Zhang, David Zhang, Nan Luo, "Adaptive Pore Model for Fingerprint Pore Extraction." Proc. IEEE, 978-1-4244-2175-6/08, 2008.
7. Moheb R. Girgis, Tarek M. Mahmoud, and Tarek Abd-El-Hafeez, "An Approach to Image Extraction and Accurate Skin Detection from Web Pages." World academy of Science, Engineering and Technology, page no. 27, 2007.
8. Manvjeet Kaur, Mukhwinder Singh, Akshay Girdhar, and Parvinder S. Sandhu, "Fingerprint Verification System using Minutiae Extraction Technique." World academy of Science, Engineering and Technology, page no. 46, 2010.
9. Hoi Le, The Duy Bui, "Online fingerprint identification with a fast and distortion tolerant hashing." Journal of Information Assurance and Security 4 page no. 117-123, 2009.
10. Anil Jain, Yi Chen, and Meltem Demirkus, "Pores and Ridges: Fingerprint Matching Using Level 3 Features." Pattern recognition letters, page no. 2221-2224, 2007.
11. Mayank Vatsa, Richa Singh, Afzel Noore, Sanjay K. Singh, "Combining pores and ridges with minutiae for improved fingerprint verification." Elsevier, Signal Processing 89, page no. 2676–2685, 2009.
12. Qijun Zhao, Lei Zhang, David Zhang, Nan Luo, "Adaptive Pore Model for Fingerprint Pore Extraction." IEEE, 978-1-4244-2175, 2008.
13. P.J. Besl and N.D. McKay, "A method for registration of 3-D shapes." IEEE Trans. PAMI, Vol. 14, page no. 239-256, 1992.
14. A. Tsai, A. Yezzi Jr., A. Willsky, "Curve evolution implementation of the Mumford–Shahfunctional for image segmentation, de-noising, interpolation, and magnification." IEEE Transactions on Image Processing 10 (8) page no. 1169–1186, 2001.