IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY
IMPROVED FINGER PRINT MATCHING USING MINUTIAE SINGULAR POINTS NETWORK

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ABSTRACT

Fingerprints are considered as a unique identification of a person and due to easy access its the best and one of the fastest method used in biometric identification systems. They are unique, so secure and reliable to use and doesnt change for one in a lifetime. And beside these things fingerprint recognition specially using minutiae matching technique is cheap, reliable and accurate up to a satisfactory limits.

In this thesis work, we propose a method for fingerprint matching based on minutiae matching. However, unlike conventional minutiae matching algorithms our algorithm also takes into account region and line structures that exist between minutiae pairs. This allows for more structural information of the fingerprint to be accounted for thus resulting in stronger certainty of matching minutiae. Also, since most of the region analysis is preprocessed it does not make the algorithm slower.

KEYWORDS: Fingerprint Pattern Matching, Minutiae, FRR, FAR, ROC, EER.

INTRODUCTION

Fingerprint is the most widely used biometric technology due to its feasibility, distinctiveness, permanence, accuracy, reliability, and acceptability. Fingerprints are unique even twins does not have same fingerprints patterns. A fingerprint contains many features such as termination, bifurcation, loops, islands, whorls, core, delta but the most widely used feature of fingerprint is ridges and valleys. Ridges are the dark area and valleys are the white area on the fingerprints.

Minutiae matching consist of two steps as minutiae extracting and minutiae matching. The performance of fingerprint matching depends on the accuracy of minutiae extraction process. Matching algorithm uses both minutiae points and texture information Each person has his own fingerprints with the permanent uniqueness. So fingerprints have been used for identification and forensic investigation for a long time. Fingerprints of an individual can be acquired by an optical sensor device as shown in figure 1.1.

Figure1.1. A fingerprint image using an   Optical Sensor

A fingerprint is composed of many ridges and furrows. These edges and wrinkles show great similitudes in every little nearby window, similar to parallelism and normal width. Notwithstanding, through serious research, it has been watched that fingerprints are not recognized by their edges and wrinkles, but rather by Minutia, which are some strange focuses on the edges (Figure 1.1.2). Among the assortment of minutia sorts reported in literary works, two are for the most part critical and in substantial utilization: end and bifurcation. End is the prompt closure of an edge and the point on the edge from which two branches determine is called bifurcation. Unique finger impression has ended up being exceptionally solid human ID and confirmation record. Unique mark is the most interesting, sturdy and solid components. Particulars based fingerprints coordinating calculation is regularly intended for taking care of issues of correspondence and likeness calculation. A unique finger impression has many edges and wrinkles. We can see great similitudes between these edges and wrinkles for a taken little nearby window, similar to normal width and parallelism. In any case, on the premise of concentrated research on unique mark acknowledgment, we reach the conclusion that unique mark is not perceived utilizing their edges and wrinkles, but rather particulars assumes a crucial part here, which are portrayed by some anomalous focuses on the edges as appeared in beneath figure 1.2 and in figure 1.3 and 1.4. We can see an assortment of details. In spite of the fact that we can have an assortment of particulars sorts according to with writing, however two sorts of details are primarily utilized and most critical and we will likewise broaden these in our venture. In which, one is called "end" which can be portrayed as the prompt completion of an edge and the other one is called "bifurcation " which can be described as the point on the edges where two branches are bifurcated as appeared in figure 1.2
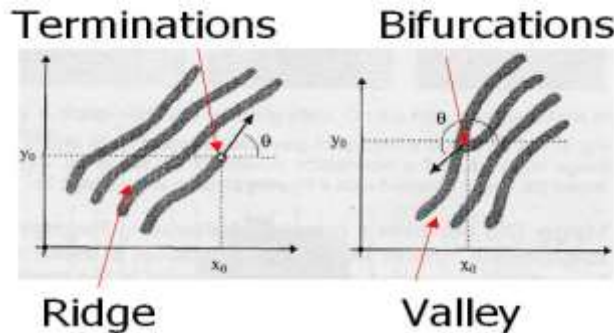

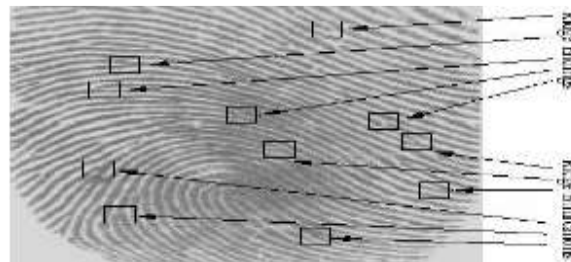*Fig 1.2 : Minutiae (ridge termination and bifurcation)*
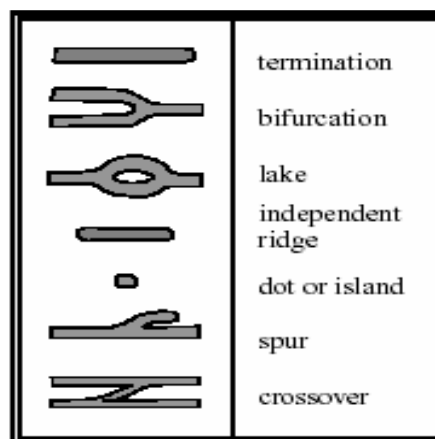

Fig 1.3: Minutiae points on a fingerprint

Fig 1.4 Different types of minutiae

LITERATURE SURVEY

Jin Fei Lim[1] In this paper creator depicts a straightforward half breed strategy that enhances the execution of unique mark acknowledgment procedure by melding details based and picture based methods, separating highlights from both systems to repay the impediments of each of them. Comes about demonstrate that the proposed cross breed strategy is fit for accomplishing better acknowledgment rate. Additionally examinations show that the rate of comparability score and the Euclidean separation calculation are both enhanced, by and large.

Feng Liu [2] This paper proposes a conclusion to-end answer for client validation frameworks in light of touch less unique finger impression pictures in which a multitier system is received to gather pictures and the hearty unique mark highlight of touch less picture is removed for coordinating with high acknowledgment precision. All the more particularly, a touch less multitier unique mark catch gadget is intended to create three perspectives of crude pictures took after by preprocessing steps including district of intrigue (ROI) extraction and picture adjustment. The DIP based component is then extricated and coordinated to perceive the human's character in which part determination is acquainted with enhance coordinating effectiveness. Investigations are directed on two sessions of touch less multiview unique mark picture database with 541 fingers obtained around two weeks separated. An EER of 1.7% can be accomplished by utilizing the proposed DIP-based component, which is greatly improved than touch less unique finger impression acknowledgment by utilizing scale invariant element change (SIFT) and particulars highlights. The given combination comes about demonstrate that it is viable to consolidate the DIP-based component, details, and SIFT include for touch less unique mark acknowledgment frameworks. The EER is as low as 0.5%.

Naresh Kumar [3] In this paper creator depicts that Biometric acknowledgment is known as the utilization of unmistakable physiological and behavioral qualities like unique finger impression, palm print, iris, confront walk, signature and so forth. For perceiving people, Fingerprint acknowledgment is one of the most seasoned and most dependable biometric highlights utilized for individual distinguishing proof. By and large unique finger impression pictures are of low quality to concentrate highlights. Fundamental point of this paper is to conquer this issue. We are utilizing CLAHE (differentiate constrained versatile histogram evening out) is connected to upgrade the difference of little tiles and to consolidate the neighboring tiles in a picture by utilizing bilinear insertion, which disposes of the misleadingly instigated limits with the goal that we can without much of a stretch concentrate highlights from unique mark picture. In this paper we are utilizing minutia point extraction and coordinating system for distinguishing singular unique mark.

Preeti Pathak [4] In this paper creator exhibits A noteworthy approach for unique mark acknowledgment today is to extricate details from finger impression pictures and to perform finger impression coordinating in view of the quantity of relating particulars pairings. A standout amongst the most troublesome issues in unique mark acknowledgment has been that the acknowledgment execution is fundamentally impacted by fingertip surface condition, which may change contingent upon natural or individual causes. Tending to this issue this paper proposes some additional components that can be utilized to reinforce the present methodologies followed in creating Fingerprint acknowledgment framework. To expand security and exactness we can utilize Infrared procedure and system to dole out a score esteem to each of extricated particulars.

PROPOSED METHODOLOGY

A fingerprint recognition system constitutes of fingerprint acquiring device, minutia extractor and minutia matcher.

For fingerprint acquisition, optical or semi-lead sensors are broadly utilized. They have high productivity and adequate precision with the exception of a few cases that the client's finger is excessively grimy or dry. Notwithstanding, the testing database for my venture is from the accessible fingerprints gave by FVC2002 (Fingerprint Verification Competition 2002). So no procurement stage is actualized. The minutia extractor and minutia matcher modules are clarified in detail in the following part for calculation outline and other resulting areas.

To actualize a minutia extractor, a three-arrange approach is broadly utilized by analysts. They are preprocessing, minutia extraction and post processing stage Figure 4.1
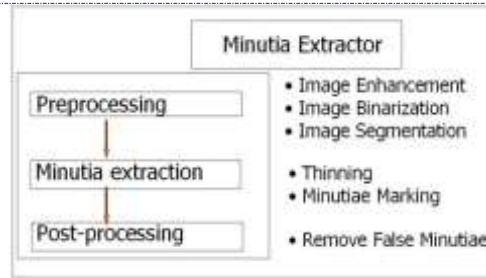
Figure 4.1 Minutiae Extractor

For the fingerprint image preprocessing stage, I utilize Histogram Equalization and Fourier Transform to do picture improvement and after that the unique mark picture is binarized utilizing the locally versatile limit strategy. The picture division assignment is satisfied by a three-stage approach: piece bearing estimation, division by course power and Region of Interest extraction by Morphological operations. Most strategies utilized as a part of the preprocessing stage are created by different scientists yet they shape a fresh out of the box new blend in my venture through experimentation. Likewise the morphological operations for extraction ROI are acquainted with unique finger impression picture division by me.

For minutia extraction stage, three diminishing calculations are tried and the Morphological diminishing operation is at last offered out with high productivity and quite great diminishing quality. The minutia stamping is a basic errand as most literary works reported however one exceptional case is found amid my execution and an extra check instrument is implemented to maintain a strategic distance from such sort of oversight.
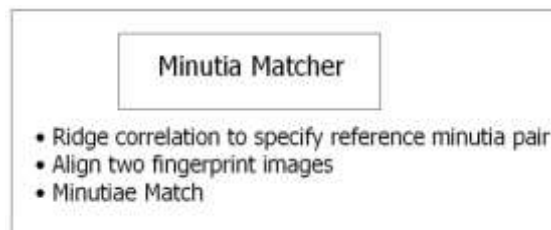
Figure 4.2 Minutiae Matcher

The minutia matcher chooses any two minutiae as a reference minutia pair and then match their associated ridges first. If the ridges match well two fingerprint images are aligned and matching is conducted for all remaining minutia Figure 4.2

Flowchart of the proposed system is as flow:
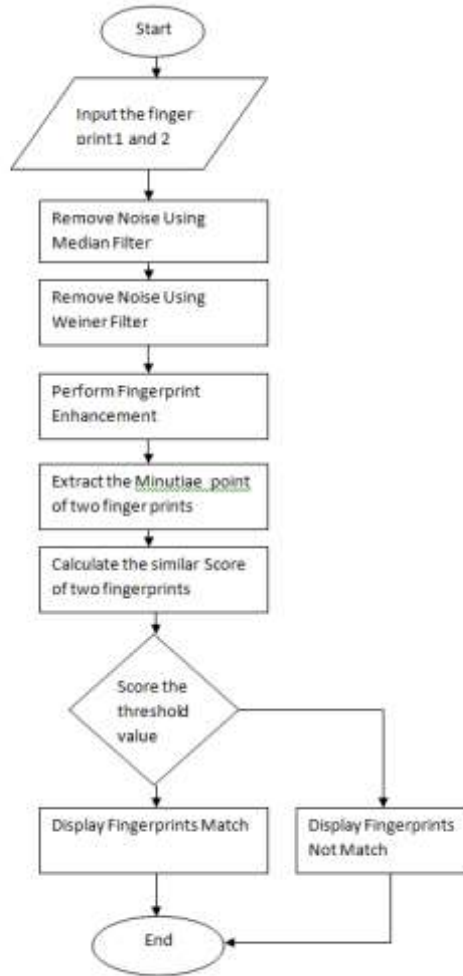
RESULTS AND DISCUSSION

The proposed system is tested on various input fingerprints collected from various standard data sets. We use two standard data sets in fingerprint matching using minutiae singular point networks. Each fingerprint has its eight variations in which various types of modifications has been made on these fingerprints which are rotation, cropping and addition of some noise. We have tested the fingerprints matching system on various threshold values. %age accuracy of matching of fingerprints at varying threshold values

Person	Threshold =.20	Threshold=.30	Threshold=.40
Person1	89%	98%	91%
Person2	90%	99%	93%
Person3	88%	100%	90%
Person4	87%	99%	94%
Person5	85%	97%	91%
Person6	90%	99%	92%
Person7	86%	98%	90%
Person8	88%	98%	89%

Graph showing the accuracy representation of above graph:
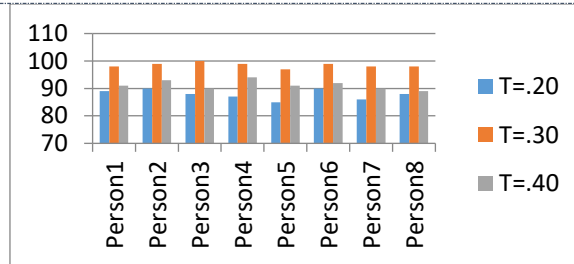
FRR and FAR on Different Datasets with various threshold value

	Data set 1			Dataset 2		
	T=.20	T= .30	T=.40	T=.20	T=.30	T=.40
FRR	5%	0.006%	14%	7%	0.002%	15%
FAR	4%	0.0012%	11%	5%	0.001%	10%

CONCLUSION

In the proposed system we have developed for fingerprint recognition algorithm. We have removed noise with two types of noise filters: median filter (1D and 2D) and Weiner filter. Proposed system used fingerprint matching using enhanced minutiae singular point network to recognize the fingerprint. We have tested the proposed system on various inputs results obtained by the proposed system are very accurate. Proposed system is used to evaluate different threshold values 0.20, 0.30, 0.40. This is evaluating that on threshold value 0.30 has better results.

FUTURE SCOPE

In future, proposed system can be tested on large dataset. Future research direction aims at the optimization of the proposed algorithm for further reduction in the FRR values and the computation times. FRR ratio can further be improved by hybriding   another pattern recognition techniques.

REFERENCES

[1] Koichi Ito, Ayumi Morita1, Takafumi Aoki, Hiroshi Nakajima, Koji Kobayashi, and Tatsuo Higuchi," A Fingerprint Recognition Algorithm Combining Phase-Based Image Matching and Feature-Based Matching", Springer-Verlag Berlin Heidelberg March 2004, Vol,E87-A,pp.684-691

[2] Minwei He, Huimin Zhao, A Identity Authentication Based on" Fingerprint Identification", Proceedings of the 2009 International Symposium on Web Information Systems and Applications (WISA'09),May 22-24,2009,pp.261-263

[3] Le Hoang Thai and Ha Nhat Tam, "Fingerprint recognition using standardized fingerprint model", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 3, No 7,pp. 11-17, May 2010

[4] Lavanya B N and K B Raja, Performance Evaluation of "Fingerprint Identification Based on DCT and DWT using Multiple Matching Techniques",IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 6, No 1, ,November 2011,pp.275-283

[5] Smita S. Mudholkar , Pradnya M. Shende , Milind V. Sarode, Biometrics Authentication Technique for Intrusion Detection Systems Using Fingerprint Recognition, International Journal of Computer Science, Engineering and Information Technology (IJCSEIT), Vol.2, No.1,pp.57-64, February 2012

[6] Madhuri and Richa Mishra, "Fingerprint Recognition" using Robust Local Features, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 6, June 2012,pp.5849-5851, ISSN: 2277 128X

[7] Sangram Bana and Dr. Davinder Kaur, "Fingerprint Recognition using Image –Segmentation", (IJAEST) INTERNATIONAL JOURNAL OF ADVANCED ENGINEERING SCIENCES AND TECHNOLOGIES , Vol. No. 5, Issue No. 1, pp.012 – 023,June 2012

[8] Ravi Subban and Dattatreya P. Mankame, A Study of "Biometric Approach Using Fingerprint Recognition", Vol. 1, No. 2,pp.209-213, May 2013

[9] Manisha Redhu, Dr.Balkishan, "Fingerprint Recognition" "Using Minutiae Extractor" International Journal of Engineering Research and Applications (IJERA), Vol. 3, Issue 4, Jul-Aug 2013, pp .2488-2497, ISSN: 2248-9622

[10] Iwasokun and Gabriel Babatunde, "Fingerprint Matching Using Minutiae-Singular Points Network," International Journal of Signal Processing, Image Processing and Pattern Recognition, Vol. 8, No. 2 (2015), pp. 375-388

[11] Le Hoang Thai and Ha Nhat Tam," Fingerprint recognition using standardized fingerprint model", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 3, No 7, May 2010.

[12] S M Mohsen, S M Zamshed Farhan and M M A Hashem,"AUTOMATED FINGERPRINT RECOGNITION: USING MINUTIAE MATCHING TECHNIQUE FOR THE LARGE FINGERPRINT DATABASE", ICECE 2004, 28-30 December 2004, Dhaka, Bangladesh

[13] Smita S. Mudholkar, Pradnya M. Shende, Milind V. Sarode,"BIOMETRICS AUTHENTICATION TECHNIQUE FOR INTRUSION DETECTION SYSTEMS USING FINGERPRINT RECOGNITION", International Journal of Computer Science, Engineering and Information Technology (IJCSEIT), Vol.2, No.1, February 2012

[14] Parul Mishra, Ajit kumar Shrivastava, Amit Saxena,"Enhanced Thinning Based Finger Print Recognition", International Journal on Cybernetics & Informatics (IJCI) Vol.2, No.2, April2013

[15] Muzhir Shaban Al-Ani, "A Novel Thinning Algorithm for Fingerprint Recognition", International Journal of Engineering Sciences, 2(2) February 2013, Pages: 43-48

[16] Shahram Mohammadi, Ali Frajzadeh, "A Matching Algorithm of Minutiae for Real Time Fingerprint Identification System", International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering Vol:3, No:12, 2009.