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REVIEW OF THREE CATEGORIES OF FINGERPRINT RECOGNITION

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ABSTRACT

Fingerprint recognition is the broadly used in biometric authentication and security as it is unchangeable throughout our lifetime. They are formed by minutiae (these are major features of a fingerprint, using which comparison of one print with another can be made.) ridges and furrows on the fingers. This paper presents the review of different methods of fingerprint recognition. The minutiae based matching is used in most automated systems but it is time consuming. Pattern based matching make use of a virtual core point and pattern based point. The correlation is parts of one image with parts of the next (in order to find image flow) has been used more often as part of flow estimating algorithms than as a single method in its own right. The method does not perform the data reduction of the feature-based techniques, and is computationally expensive.

Keywords: biometric, core-point, minutiae.

I. INTRODUCTION

Fingerprints are the oldest and most widely recognized biometric trait. All human being posses fingerprint and these fingerprints are result of unique ridge and valley structure formed by skin over the fingers [1]. Ridges and valleys are often run in analogous. These structures have bifurcation and ridge endings called as termination. The ridge structure as a whole takes different shapes, characterized by high twist, terminations, bifurcations, crossover etc. These regions are called singularities. According to the methodology of Henry Classification System [2], [3], there exist three main fingerprint textures: loop, whorl and arch. Generally, Automatic Fingerprint Identification Systems (AFIS) performs three basic steps to recognize fingerprint: pre-processing, region of interest (ROI) extraction and finally classification.

II. Types of fingerprint:

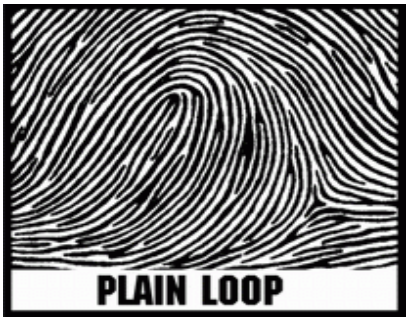

FIGURE: 1

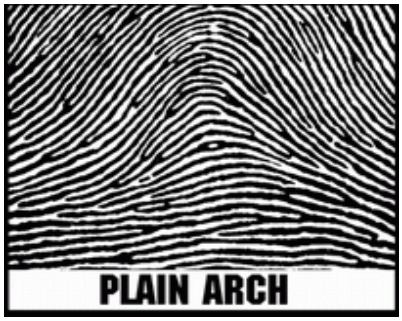

FIGURE: 2

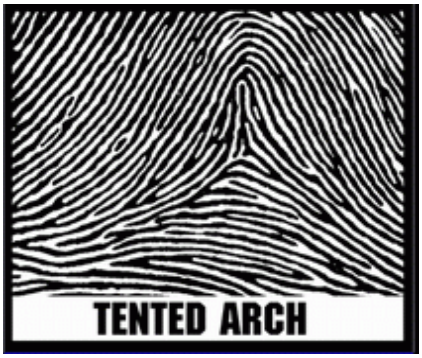

FIGURE: 3

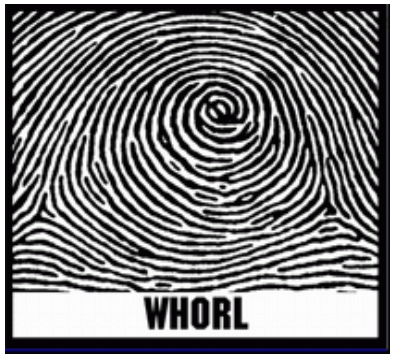

FIGURE: 4

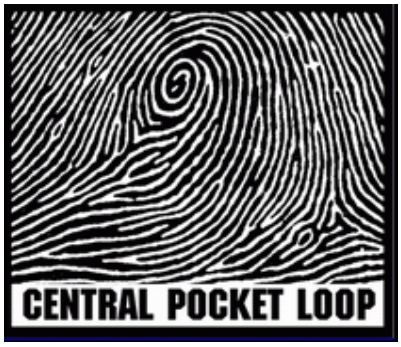

FIGURE: 5

FIGURE: 6

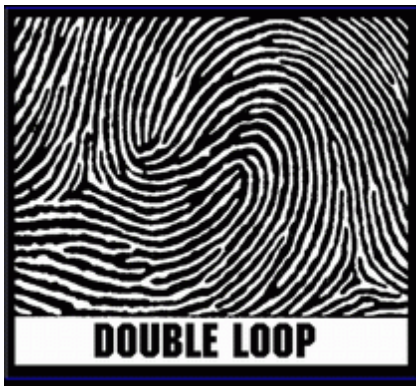

FIGURE: 7

III. LITERATURE REVIEW

There are three categories of fingerprint matching techniques:

a. Correlation-based technique.
b. Minutiae-based technique.
c. Pattern based technique.

a) Correlation-based technique: Two fingerprint images are super overlapped and the correlation between corresponding pixels is computed for different alignments (e.g. various displacements and rotations).

b) Minutiae-based technique: This is the most popular and widely used technique. Here the two basic steps are 1. Minutiae Extraction. 2. Minutiae matching. Minutiae's are removed 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 the result in the maximum number of minutiae pairings.

c) Pattern-based technique: Pattern based algorithms compare the basic fingerprint patterns (arch, whorl, and loop) between a previously stored template and a candidate fingerprint. This requires that the images be aligned in the same orientation. To do this, the algorithm finds a central point in the fingerprint image and centers on that. In a pattern-based algorithm, the template contains the type, size, and orientation of patterns within the aligned fingerprint image. The candidate fingerprint image is graphically compared with the template to determine the degree to which they match.

Most of the automatic fingerprint recognition systems today depend on minutiae-based matching because minutiae are easy to store and take much lesser space than correlation based technique but are more time consuming. Sangram Bana nad Dr. Davinder Kaur [4] proposed minutiae extraction and minutiae matching using segmentation and thinning for fingerprint recognition. Sarnali Basak, Md. Imdadul Islam, M. R. Amin [5] proposed a new method of virtual core point detection based on the change in gradient of maxima and minima points and the region of interest is obtained for further processing. Ashish Mishra and Dr. Madhu Shandilya[6] introduced gradient based technique and optimized neighborhood averaging to generate a smoother orientation field for detecting core point. Dr. H.B.Kekre, Dr.Tanuja Sarode and Rekha Vig[7] proposed image based method for extraction of feature vectors using sectorization of cepstrum. K.B.Raja, Shashi Kumar D R, R K chhotaray, Sabyasachi Pattanaik[8] proposed a DWT based recognition using Non-Minutiae (DWTFR) algorithm. Vipul Awasthi, Vanchha Awasthi and Krishna Kumar Tiwari[9] proposed a technique of minutiae extraction with a combination of several pre-processing and post-processing and also termination and bifurcation are used.

The correlation-based fingerprint verification that is proposed in this section, it is compared to the traditional minutiae-based methods:

The advantages of the correlation based method over minutiae are:

- The method uses the much richer gray-level information of the fingerprint image instead of only positions of minutiae.
- The method is also accomplished of dealing with fingerprints of bad image quality from which no minutiae can be extracted reliably.
- False and missed minutiae do not decrease the matching performance.
- Unlike the minutiae templates, the template locations are already paired, which results in much simpler matching methods. When registering minutiae sets, it is not known in advance which minutiae from both sets should correspond.
- The first decision stage only classifies relative template positions. This method tolerates non-uniform local shape distortions in the fingerprint, unlike the minutiae templates for which the optimal global transform is searched.

The disadvantages of the correlation-based fingerprint verification method are:

- Template matching requires high computational power, which makes the method less applicable for real time applications.
- The method is at the instant not capable of dealing with rotations of more than about 10 degrees. This is caused by the actuality that for larger rotations, the templates don't match well anymore, causing incorrect positions to be found. A solution to this problem is rotating the templates and then performing the matching again. However, this is a solution that requires a lot of additional computational power.
- Problems might come if the minutiae-based or coherence-based template selection methods are used while 2 minutiae surroundings look like a lot. In this case, there is a probability that template matching will and the incorrect template position, which degrades the matching performance. Use of the correlation characteristic template selection will solve this problem.

IV. CHALLENGES WITH FINGERPRINT IDENTIFICATION

Some of the common challenges related to fingerprint technology are low quality or corrupted input images, noise reduction, etc. The low quality or degraded images is the most common problem. The degradation can be due to burns, cuts, dust particles, etc. The fingerprint enhancement techniques not only enhance the low quality image but also remove the noise.

O'Gonnan and Nickerson [10] proposed the method contextual filtering for fingerprint enhancement. Shlomo Greenberg [11] applied anisotrophic filter for fingerprint enhancement. Hong et al. [12], reported fingerprint enhancement based on the estimated local ridge orientation and frequency clarification of ridge and valley structures of input. Lin Hong [13] employed Gabor filter in enhancing the image because gabor filters have both frequency selective and orientation selective properties. D.Maio [14] used a Gaussian shape mask filter to filter selected section in every step. Wang [15] proposed a method of Log-Gabor filter. Cavuso Glu [16] proposed a fast filtering method based on reference mask of parabolic coefficients.

V. CONCLUSION

Fingerprint identification is one of the common and oldest forms of biometrics but the actual truth is that still a lot of research is to be done due to its complexity and Intractability. The future research work in this field is:

a. Secure biometric systems: The fingerprint has proved to be secure due to its unique and unchanging behavior but there are various threats like attacks on communication, attack on database like able to obtain a fingerprint from database or injecting a new fingerprint in database, presenting fake fingerprint.
b. Better feature extraction: We need to improve the various extraction algorithms for feature extraction and give accurate result and more features to be extracted in less time.
c. Better matching and alignment: The matching and alignment needs to be faster and accuracy should be improved.

REFERENCES:

[1] Woodward, J. ,Orlans, P. , Higgins T.(2003), Biometrics, McGraw-Hill/Osborne.
[2] D. Batra, G. Singhal and S. Chaudhury, 'Gabor filter based fingerprint classification using support vector machines', IEEE India Annual Conference, pp. 256-261, Dec. 2004.
[3] E. R.Henry, 'Classification and uses of finger prints, London: George Rutledge & Sons, Ltd., pp. 17-18', 1900.

[4] Sangram Bana, Dr. Davinder Kaur , 'Fingerprint Recognition using image segmentation' , feb-2011
[5] Basak, Md. Imdadul Islam, M. R. Amin, 'Detection of a virtual core point a fingerprint: A new approach', May-2012
[6] Ashish Mishra, Dr. Madhu Shandilya, 'Fingerprint core point detection using gardient field mask', June-2010.
[7] Dr. H.B.kehre, Dr. Tanuja Sarade, Rekha Vig, 'Fingerprint identification using sectorized cepstrum', oct-2010.
[8] Shashi Kumar D R, K B Raja, R K Chhotaray, Sabyasachi Pattanaik, 'DWT based fingerprint recognition using Non Minutiae features', March-2011
[9] Vipul Awasthi, Vanchha Awasthi, Krishna Kumar Tiwari, 'Fingerprint analysis using termination and bifurcation minutiae', Feb-2012.
[10] L. O'Gonnan, J.V. Nickerson, 'Matched filter design for fingerprint image enhancement, in International Conference on Acoustics, Speech, and Signal Processing', 1988, pp. 916–919
[11] Shlomo Greenberg, Mayer Aladjem, Daniel Kogan , Itshak Dimitrov, 'Fingerprint Image Enhancement Using Filtering Techniques, 15th Int. Conf. on Pattern Recognition, Barcelona, September 3-8, IEEE Computer Society Press'
[12] L. Hong, Y. Wan, A. Jain, 'Fingerprint image enhancement: Algorithm and performance evaluation,IEEE Trans. Pattern Anal. Mach. Intell. (1998) 777–789.'
[13] Lin Hong, Yifei Wan, Anil Jain, 'Fingerprint Image Enhancement: Algorithm and Performance Evaluation', IEEE Trans. Pattern Anal. Mach. Intell. Vol. 20, No.8 pp.777-789, Aug. 1998.
[14] D. Maio, D. Maltoni, 'Direct Gray-scale Minutiae Detection in Fingerprints,' IEEE Trans. Pattern Anal. Mach. Intell.19, pp.27-39, 1997.
[15] W. Wang, J. Li, F. Huang, H. Feng, 'Design and implementation of log-Gabor filter in fingerprint image enhancement, Pattern Recognition Lett. 29 (2008) 301–308.'
[16] A. Çavuso lu, S. Görgüno lu, 'A fast fingerprint image enhancement algorithm using a parabolic mask, Comput. Electr. Eng. (2008) 250–256.'
[17] Dr. Mustafa Dhiaa Al-Hassani, Dr. Abdulkareem A. Kadhim and Dr. Venus W. Samawi, "Fingerprint Identification Technique Based on Wavelet-Bands Selection Features (WBSF)" International journal of Computer Engineering & Technology (IJCET), Volume 4, Issue 3, 2013, pp. 308 - 323, ISSN Print: 0976 – 6367, ISSN Online: 0976 – 6375.
[18] Soukaena H. Hashem, Abeer T. Maolod And Anmar A. Mohammad, "Proposal To Enhance Fingerprint Recognition System" International journal of Computer Engineering & Technology (IJCET), Volume 4, Issue 3, 2013, pp. 10 - 22, ISSN Print: 0976 – 6367, ISSN Online: 0976 – 6375.
[19] Shekhar R Suralkar and Prof (Dr) Pradeep M. Patil, "Fingerprint Verification Using Steerable Filters" International journal of Electronics and Communication Engineering &Technology (IJECET), Volume 4, Issue 2, 2013, pp. 264 - 268, ISSN Print: 0976- 6464, ISSN Online: 0976 –6472.