Latent Fingerprint Matching based on Texture Descriptor using Hough Transform

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ABSTRACT
Latent fingerprint matching has played a critical role in identifying the suspects and criminals. Latent fingerprints are fingerprints which are obtained from crime scence. These are essential to forensics as well as law enforcement agencies to match & identify the criminals. Latents be the incomplete fingerprints to facilitate be regularly smudgy and blurred among small area, it contains huge deformation. Latent fingerprints are those that are not visible to the naked eye these prints consist of expected secretions of person skin. Here a new matching technique is planned for matching a Latents.This algorithm uses the Texture Descriptor with Hough Transform. The new fingerprint matching algorithm that uses both orientation field and minutiae information. The proposed matching technique perform the alignment between the Latent fingerprint and fingerprints in the database and also compute the match score.

Keywords
Latent, Texture descriptor, Hough Transform, minutiae

1. INTRODUCTION
Fingerprints are created in the month of 6th for every human beings[5]. Fingerprints remains same from the birth and it will be remain same throughout the life no two persons will have same fingerprints and even no two fingers of the same person will be same. In law enforcement application three types of fingerprints are used they are (i) rolled fingerprints; these prints are obtained by rolling the finger. (ii) Plain, these prints are taken the platen of the scanner without rolling (iii) Latent, which are taken from surface at crime scence [1]. Exciting of Latents could engage a difficult procedure, it can vary from purely photograph the feature to extra difficult.

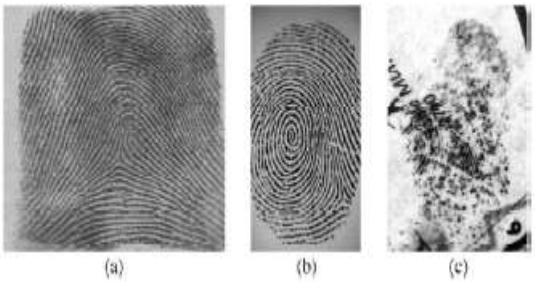

Fig1. Three classes of fingerprints (a.) rolled (b.) plain (c.) Latent

Latent fingerprint refers to fingerprints lift from surface of things accidentally touched or handle by individuals normally at crime scence. Latents are typically poor quality in terms of ridge structure; it contains background noise and non-linear distortion [2].

Fingerprint segmentation refers to the process of decomposing a fingerprint representation interested in two regions background & foreground[7]. The foreground, known as the region of interest (ROI) consists of the preferred fingerprints. Background contains the piercing & unrelated contents.

2. PROPOSED ALGORITHM

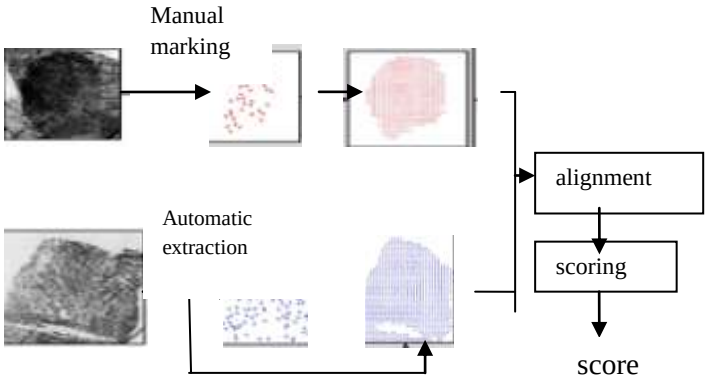

Fig2.Overview of Proposed algorithm

The planned matching approach uses orientation field as well as minutiae from both rolled and latent prints [10]. Latent examiners manually marks the minutiae within the latent, by using the commercial matchers rolled prints are extracted automatically. Orientation field is used for improving the matching performance in fingerprints, such as matching a fusing scores and orientation fields directly with other matching score [4]. Fingerprint registration or alignment consists of estimating the parameter to align the two fingerprints. There are many features used to estimate alignment parameters such as ridges and minutiae, singular points, orientation field [3]. For the specified alignment calculate the minutiae match score [8] , get the corresponding minutiae pairs (one within the rolled, one within latent prints). Align with the two fingerprints with minutiae sets & by using the greedy algorithm calculate the one toward one matching between the two minutiae sets & Matching is performed based on the minutiae.

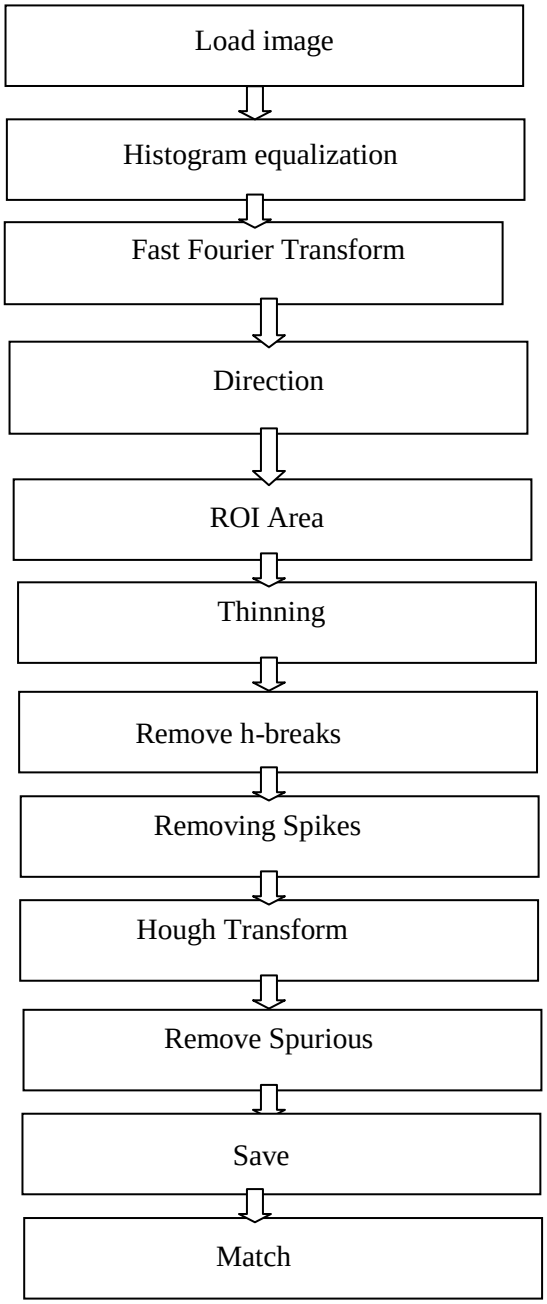

Fig3: Flow chart for proposed algorithm

3. HOUGH TRANSFORM

The Hough transform be a procedure, in an image this technique is used to detach the features of a particular nature. Because it requires features be in some parametric form, for finding the regular curves such as circles, ellipses &lines classical Hough Transform is used. When a simple analytic feature is not possible then use the generalized Hough Transform [1]. In this paper, in an image space for detecting the lines Hough Transform is used. The line can be written as $y = mx + b$ & it can be plotted for each pair of image points (x, y). The main idea of this transform is it considers the uniqueness of the straight lines in terms of its parameters, here the slope parameter m and the intercept parameter b.

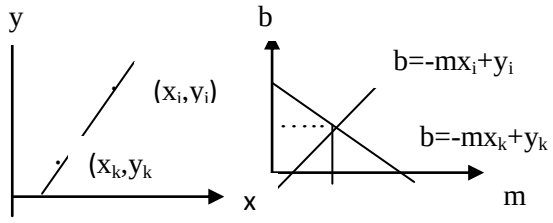

Fig4: General Representation of Hough Transform for two points

A point in the xy-plane is mapped to the a line in the mb-plane. There are large number of points in the xy-plane, but consider only last two points.

4. TEXTURE DESCRIPTOR

In the existed method, only the local minutiae descriptors are considered, and it is hard to detect different types of minutiae. In the proposed method, texture descriptors are used which is an important quality in order to express an image. The texture descriptors describe image textures or regions. They examine the region homogeneity and the histograms of these region borders. These descriptors, which give information regarding objects and events in the scene, are not easily extractable, even more when the extraction is to be automatically done. Nevertheless they can be physically processed. Texture descriptor considers the ridge orientation and frequency information by the side of some sampling points in the region of a minutia, by using the sampling structure sampling points are defined. In the L circles centered at minutia these sampling points are located. Consider the radius of the l^{th} circle is *rl* & there are *Kl* sampling points equally circulated on the *l*th circle using the origin as minutia as well as in the polar coordinate system the positive direction of *x* axis considers the minutia, the coordinate of the k^{th} sampling point on the l^{th} circle is defined as

$$P_{l,k}=rl,$$

$$\Theta_{l,k}=2k\pi/k_l$$

In case of the fingerprints considers the both orientation & frequency information, the two minutiae pairs can be simply inferred as unmatched.

5. REGION OF INTEREST AND DIRECTION

The ridge orientation map it is possible to define a common orientation for each 32x32 pixel block of the fingerprint image[9]. Thus, for each block of the image, its corresponding orientation is used to select among the filtered images which one shall be used to compose the final filtered image[6]. Direction is used for directing the fingerprint ridges to form a line.

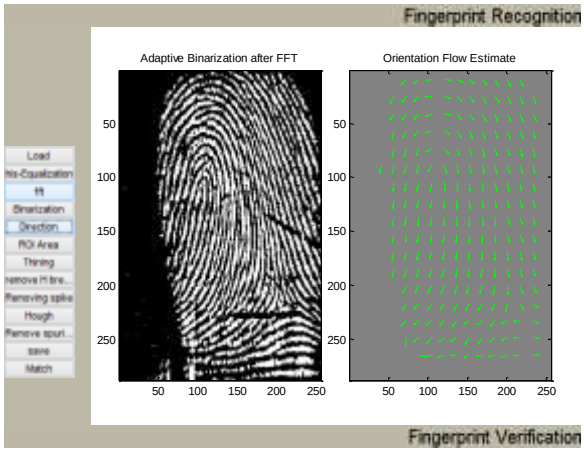

Fig5: After performing the direction

5.1 Thinning, removal of h-breaks & Spikes

Thinning is used to remove multiple paths in the image through iterative steps as shown in Fig 6. After performing the thinning, occlusions which are occurred in the fingerprint are removed by using removal of h- breaks as shown in Fig 7. Spikes are removed as Hough Transform is applicable only for the straight lines which is shown in Fig 8.

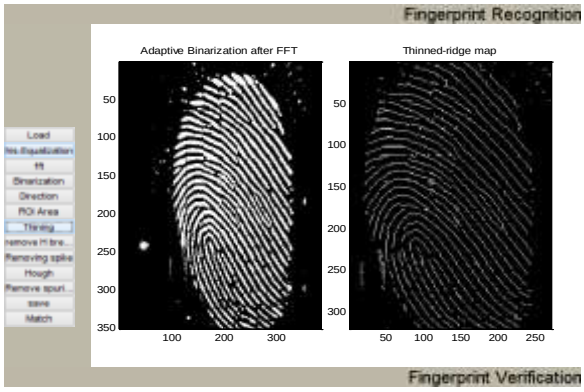

Fig 6: Performing Thinning operation

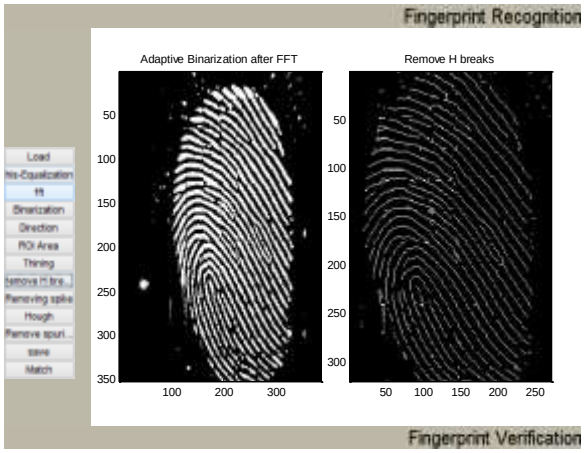

Fig 7: Removal of h-breaks

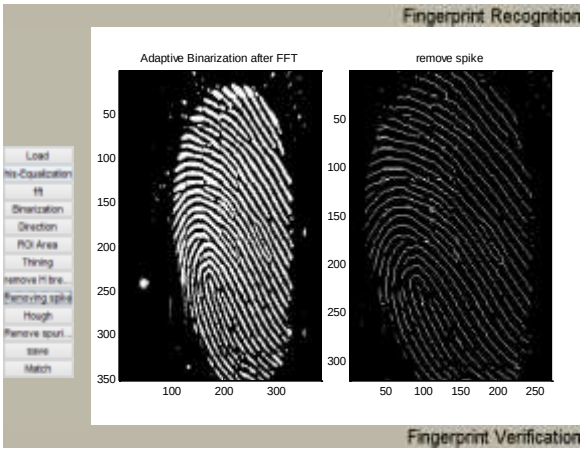

Fig 8: Removal of spikes

6. RESULTS

Fig 5 shows the comparison between the original and histogram equalization which consist of the directions after performing FFT operation. Hough Transform is performed in order to locate the points which is mainly used for comparing the fingerprints as shown in the figure 9.

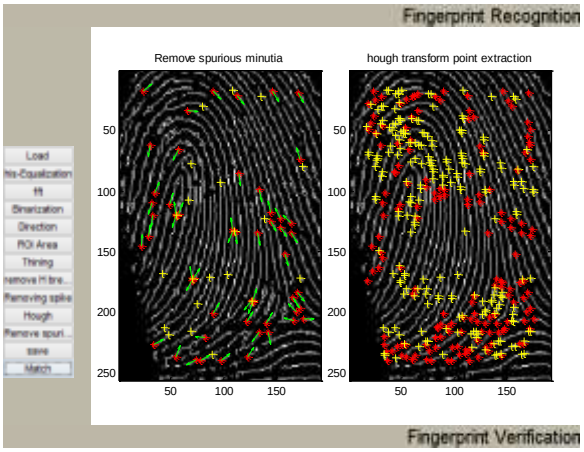

Fig9: Performing the Hough Transform

7. CONCLUSION

A new fingerprint matching technique planned for matching Latents toward plain/rolled fingerprints based on texture descriptor using Hough Transform. Inorder to improve the matching accuracy when there is a overlap between the latent and rolled prints is small texture descriptor is used. The total time required for matching the latent fingerprints is less when compared to the previous algorithm.

8. ACKNOWLEDGEMENTS

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9. REFERENCES

[1] A. A. Paulino, J. Feng, and A. K. Jain, "Latent fingerprint matching using descriptor-based Hough transform," in *Proc. Int. Joint Conf. Biometrics*,Oct. 2011, pp. 1–7.

[2] C. Champod, C. Lennard, P. Margot, and M. Stoilovic, *Fingerprints and Other Ridge Skin Impressions*. Boca Raton, FL: CRC Press,2004.

[3] NIST Special Database 27, Fingerprint Minutiae From Latent and Matching Tenprint Images [Online]. Available: http://www.nist.gov/ srd/nistsd27.cfm

[4] D. R. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*. Boca Raton, FL: CRC Press, 1999.

[5] FBI, Next Generation Identification [Online]. Available: http://www.fbi.gov/about-us/cjis/fingerprints_biometrics/ngi

[6] R. Cappelli, M. Ferrara, and D. Maltoni, "Minutia cylinder-code: A new representation and matching technique for fingerprint recognition,"*IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 32, no. 12, pp.2128–2141, Dec. 2010.

[7] D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, *Handbook of Fingerprint Recognition*, 2nd ed. New York: Springer-Verlag, 2009.

[8] M. Tico and P. Kuosmanen, "Fingerprint matching using and orientation- based minutia descriptor," *IEEE Trans. Pattern Anal. Mach. Intell.*,vol. 25, no. 8, pp. 1009–1014, Aug. 2003.

[9] J. Qi, S. Yang, and Y. Wang, "Fingerprint matching combining the global orientation field with minutia," *Pattern Recognit. Lett.*, vol. 26,pp. 2424–2430, 2005.

[10] J. Gu, J. Zhou, and C. Yang, "Fingerprint recognition by combining global structure and local cues," *IEEE Trans. Image Process.*, vol. 15, no. 7, pp. 1952–1964, Jul. 2006.