Cryptographic Fingerprint Matching Using The Descriptor-Based Hough Transform

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Abstract- *Identifying suspects based on fingerprints removed from crime scenes (hidden prints) is a common process that is very important for forensics and law enforcement agencies. Guptas are partial fingerprints, which are usually blurred, have a small area and a large distortion. Because of these characteristics, crypto currencies have a much smaller number of dots compared to full (wrapped or plain) fingerprints. The low number of miniatures and latent noise feature makes it very difficult to automatically compare lanterns with paired complete prints stored in law enforcement databases. Although many algorithms for complete matching with full fingerprints have been published in the literature, they do not work well on the issue of complete matching from crypto currency. Furthermore, they often rely on features that are not easy to extract from poor quality crypto currencies. In this paper, we propose a new fingerprint matching algorithm designed specifically for encrypted fits. The proposed algorithm uses a robust alignment algorithm (descriptor-based half transformer) to align fingerprints and measures the similarity between fingerprints using a multi-doubt process that takes into account both micro and trend field information.*

Keywords- fingerprint, Hough Transform, Cryptographic

I. INTRODUCTION

A common challenge in fingerprint recognition systems is the variation of fingerprint features collected from two fingerprint images of the same finger captured at different times. As a result, the coordinates and trends of the corresponding fingerprint features are different. In addition, the number of features extracted from different fingerprint images is usually not equal because different areas of the fingerprint image can be captured. In other cases, some features may not be captured due to a defect in the fingerprint image quality or feature extractor. The most effective variations considered in this project are caused by transition; Rotation and translation. Usually, this happens because the finger is not always in the same position (as a result of translation) and orientation (as a result of rotation) on the scanner. For example, 2mm rotation or translation can result in a change of approximately 40 pixels of the fingerprint image, making fingerprint recognition a challenging issue. In the case of micro-based fingerprint matching, these changes of translation and rotation can lead to corresponding thumbnails that have a different position and orientation from the same finger, so:

1) Two sets of droplets coming from the same finger usually have an unequal number of droplets,
2) All thumbnails in each set do not have a corresponding dot in the other set,
3) Relevant thumbnails can be represented by different position and orientation values. However, one before the calibration problem or during the solution, performing the calibration before or during the matching process. The purpose of the alignment is to simplify the process of determining the corresponding features collected from a single finger. The alignment is done by first determining the alignment parameters (rotation and translation) and then exaggerating the fingerprint features using the determined parameters. Managing the alignment simplifies the process of finding the corresponding points, as the alignment involves modifying the fine point data of one or two minute point sets.

Approximately equal to. This can simplify the matching problem into an issue that determines the relevant points from the aligned fingerprint representations. In this project presented, identification and classification of the various methods used by Half Transform (HT) for the calculation of the angle of rotation and translation vector required to align two sets of micro points. Classification procedures are then implemented and their performances are compared with different displays of tiny dots collected in different impressions of the same finger. This study contributes to the classification, performance and requirements of a wide variety of existing HT-based fingerprint alignment methods and to assist in selecting the most appropriate method for translated and rotated fingerprint minute points.

II. BLOCK DIAGRAM

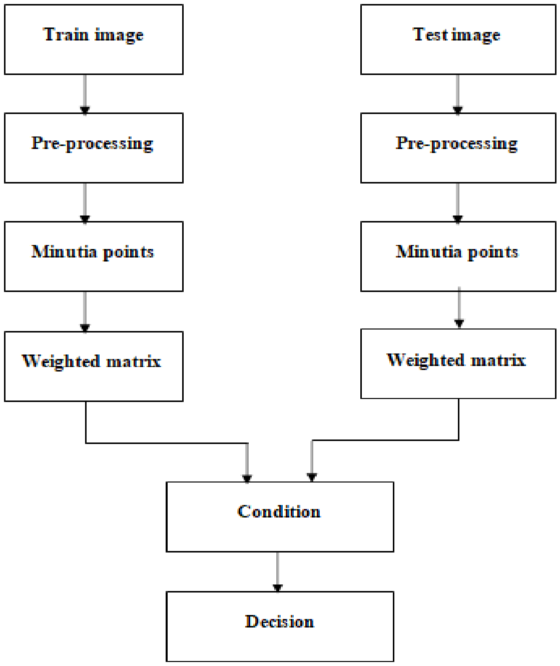

Fig: 3.1 Block Diagram

The block diagram of Latent Fingerprint Matching Using Descriptor Based Hough Transform is above.

Recognition of persons by means of biometric characteristics is an emerging technology in our society. Among the possible biometric traits like face, iris, speech, and hand geometry, fingerprint is the most widely used trait, because of its distinctiveness and persistence over time. Fingerprint is a reproduction of the fingertip epidermis, produced when the finger is pressed against a smooth surface. The most evident structural characteristic of a fingerprint is a pattern of interleaved ridges and valleys. Ridges vary in width from 100 µm, for thin ridges, to 300 µm for thick ridges. Generally, the period of a ridge/valley cycle is about 500 µm [2]. Ridges and valleys often run in parallel, and sometimes they can suddenly come to an end (termination), or can divide into two ridges (bifurcation). Ridge terminations and bifurcations are considered minutiae (small details). There are other types of minutiae in a fingerprint, but the most often used are terminations and bifurcations. Fingerprint recognition is a complex pattern recognition problem. Designing algorithms capable of extracting salient features and matching them in a robust way is quite hard, especially for poor quality images.

The problems with minutiae extraction can be more severe if the fingerprint is acquired using a compact solid-state sensor. Solid-state sensors provide only a small contact area for the fingertip and, therefore, capture only a limited portion of the fingerprint pattern. Given that it is difficult to reliably obtain the minutia points from poor quality fingerprint images or from the small sensor images, other features like ridge orientation and ridge shape should be used for fingerprint matching. Matchers based on the orientation and shape features can also be used to complement the minutia- based techniques.

In this project, we used a ridge-based technique for fingerprint matching. This technique extracts the major straight lines that match the fingerprint ridges and uses these lines to estimate the rotation and translation parameters necessary to register the query and the template fingerprint images. After the registration, the matching score is computed based on the ridge alignment.

The proposed ridge-based technique for fingerprint matching consists of the following steps:

- The gray-scale query fingerprint image is preprocessed and converted into a thinned image where the fingerprint ridges are detected and represented by a single pixel-width;
- The ridges of the query and the template fingerprints are detected and stored in two lists of ridges, Rq and Rt , respectively;
- In order to detect only the straight lines which better match each ridge, the Hough transform is applied on each ridge separately;
- A threshold is used to detect the peaks of the Hough space for each ridge. The Hough space peaks of the query and template fingerprint are stored in two sets of peaks, Sq and St , respectively;
- The straight lines (Hough space peaks) detected from each ridge are used to classify it into one of five categories. The ridge category number is proportional to the ridge curvature (category 1 is for almost straight ridges, and category 5 is for almost circular ridges).
- Each element of the sets Sq and St is characterized by a triplet (θi , ρi , vi), where θi is the orientation of the perpendicular to the i-th straight line, ρi is the distance of the i- th straight line to the origin, and vi is the value of the peak pi (the number of collinear ridge pixels that lie on that straight line);
- The query fingerprint is aligned to the template fingerprint using the rotation and translation parameters estimated from their Hough space peak sets;

- Finally, a matching score is computed for the alignment using a matrix of ridge alignments.

III. RESULT

This paper gives the output if the extracted parameters of an input fingerprint image after undergoing transformation matches with the extracted parameters of an image that is present in the database as Person matched else if the parameters are not matched then it display Try again.

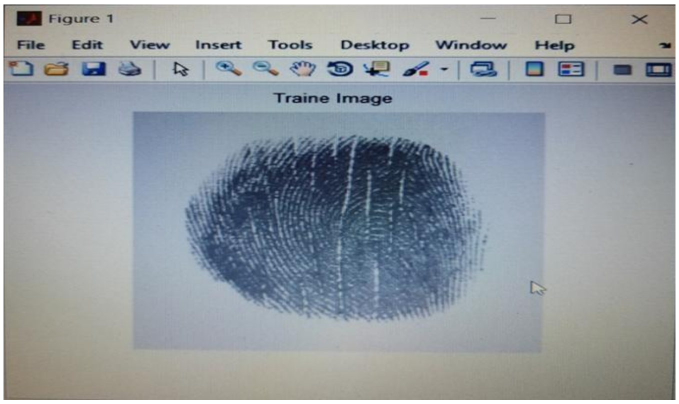

Fig : 5.1 Train image

The figure 5.1 represents the train image that is present in the database and it is already preprocessed.

The process of discrete wavelet transform is performed on the train image in order to perform low low, low high, high low and high high frequency band decomposition of an image In order to calibrate the horizontal, vertical and diagonal values of grey scale pixels.

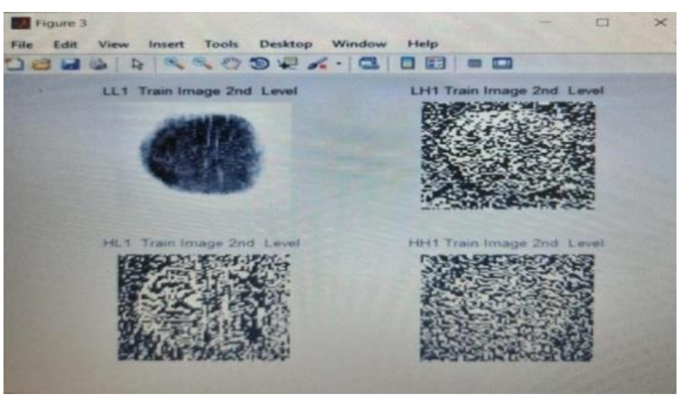

Fig : 5.2 Second level dwt to train image

The above figure 5.2 represents application of discrete wavelet transform for the second time on the low low frequency band decomposition of an image.

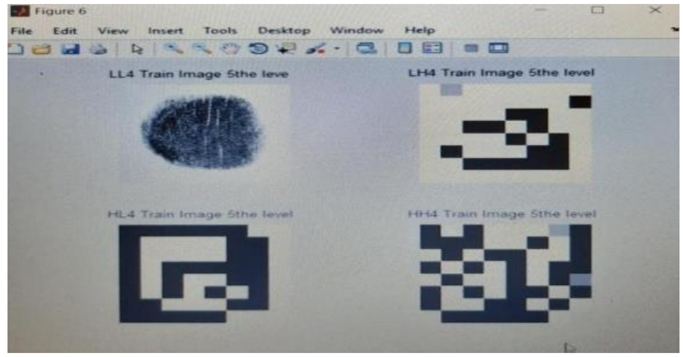

Fig :5.3 Fifth level dwt to train image

The above figure 5.3 represents application of discrete wavelet transform for the fifth time on the low low frequency band decomposition of an image that is obtained in fourth level of application of dwt.

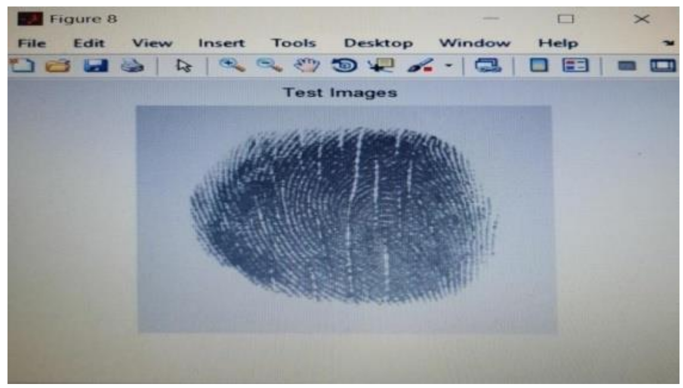

Fig: 5.4 Test image

The above figure 5.4 represents the test image that is applied for transformation to extracts the parameters.

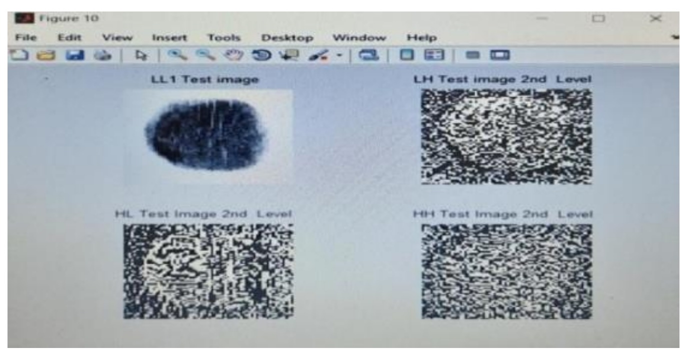

Fig :5.6 First level dwt on test image

The above figure 5.6 represents the process of discrete wavelet transform, that is performed on the test image in order to perform low low, low high, high low and high high frequency band decomposition of an image. In order to caliberate the horizontal, vertical and diagonal values of grey scale pixels.

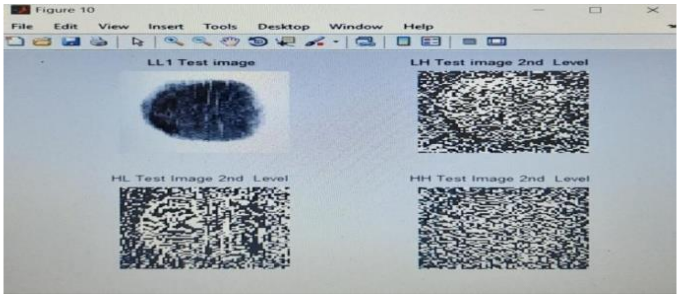

Fig: 5.7 Second level dwt on test image

The above figure 5.7 represents application of discrete wavelet transform for the second time on the low low frequency band decomposition of an image that is obtained in first level of application of dwt

Fig :5.8 Third level dwt on test image

The above figure 5.8 represents application of discrete wavelet transform for the third time on the low low frequency band decomposition of an image that is obtained in second level of application of dwt.

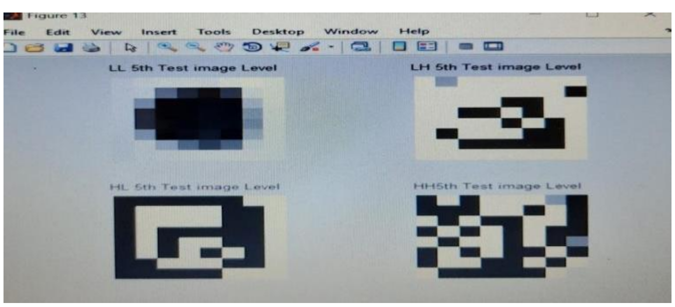

Fig: 5.9 Fifth level dwt on test image

The above figure 5.9 represents application of discrete wavelet transform for the fifth time on the low frequency band decomposition of an image that is obtained in fourth level of application of dwt.

APPLICATIONS:

- In Crime investigations
- In Educational Institutions
- In Ration shops/Aadhar centres

IV. CONCLUSION

We have presented a fingerprint matching technique that uses ridge features to align and match fingerprints. Straight lines that approximate each fingerprint ridge are separately extracted using the Hough transform. All detected Hough space peaks are then used to estimate the rigid transformation parameters between the query and the template fingerprint images. After the alignment, a matching score is computed from a matrix of ridge alignments. Also gives high matching scores for a number of impostor pairs, leading to a lower performance Despite the good performance of the proposed technique for genuine fingerprint alignments, it compared with the minutia-based approach. On the other hand, some genuine fingerprint pairs, which were rejected by the minutia-based matcher, are correctly aligned and accepted by the ridge-based matcher. These results allow us to conclude that combining additional features like the ridge features with minutiae is a promising approach to decrease the error rates of fingerprint matchers, particularly for images of poor quality or images captured by small solid-state sensors.

V. FUTURE SCOPE

In order to increase the genuine fingerprint alignment scores and decrease the false fingerprint alignment scores, we are investigating the use of interridge distance in our matching algorithm. Regarding the processing time, the current algorithm takes around 8 seconds to provide a matching score. We are also working on the development of a faster matching algorithm.

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