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Recognition And Refinement Of Distorted Fingerprints

V SINDHU
M. Tech student, Dept of ECE, Siddhartha Institute of Engineering And Technology, Hyderabad, TS, India.

Dr. FARHA ANJUM
Professor, Dept of ECE, Siddhartha Institute of Engineering and Technology, Hyderabad, TS, India.

Abstract: **Although automatic fingerprint recognition technologies have rapidly advanced during the last forty years, there still exist several challenging research problems, for example, recognizing low quality fingerprints. Elastic distortion of fingerprints is one of the major causes for false non-match. While this problem affects all fingerprint recognition applications, it is especially dangerous in negative recognition applications, such as watch list and deduplication applications. In such applications, malicious users may purposely distort their fingerprints to evade identification. In this paper, we proposed novel algorithms to detect and rectify skin distortion based on a single fingerprint image. Distortion detection is viewed as a two-class classification problem, for which the registered ridge orientation map and period map of a fingerprint are used as the feature vector and a SVM classifier is trained to perform the classification task. Distortion rectification (or equivalently distortion field estimation) is viewed as a regression problem, where the input is a distorted fingerprint and the output is the distortion field. To solve this problem, a database (called reference database) of various distorted reference fingerprints and corresponding distortion fields is built in the offline stage, and then in the online stage, the nearest neighbor of the input fingerprint is found in the reference database and the corresponding distortion field is used to transform the input fingerprint into a normal one.**

Keywords: **Fingerprint; Distortion; Registration; Nearest Neighbor Regression; PCA**

I. INTRODUCTION

In a positive recognition system, low quality will lead to false reject of legitimate users and thus bring inconvenience. The consequence of low quality for a negative recognition system, however, is much more serious, since malicious users may purposely reduce fingerprint quality to prevent fingerprint system from finding the true identity. In fact, law enforcement officials have encountered a number of cases where criminals attempted to avoid identification by damaging or surgically altering their fingerprints. Elastic distortion is introduced due to the inherent flexibility of fingertips, contact-based fingerprint acquisition procedure, and a purposely lateral force or torque, etc. Skin distortion increases the intra-class variations (difference among fingerprints from the same finger) and thus leads to false non-matches due to limited capability of existing fingerprint matchers in recognizing severely distorted fingerprints. In Fig. 1, the left two are normal fingerprints, while the right one contains severe distortion. According to Veri- Finger, the match score between the left two is much higher than the match score between the right two. This huge difference is due to distortion rather than overlapping area. While it is possible to make the matching algorithms tolerate large skin distortion, this will lead to more false matches and slow down matching speed.

Fig.1. Sample Fingerprint

II. LITERATURE SURVEY

2.1 FINGERPRINT RECOGNITION Automatic fingerprint recognition technologies have quickly advanced throughout the last forty years, there still exists many difficult analysis issues, and for example, recognizing caliber fingerprints [2]. Fingerprint marriage broker is extremely sensitive to image quality as determined. In the FVC2006 [3], wherever the matching accuracy of identical algorithmic program varies considerably among totally different datasets owing to variation in image quality. The distinction between the correctness's of plain, rolled and latent fingerprint coordinating is much bigger as decided in innovation assessments led by the workplace [4]. The result of bore fingerprints relies on upon the sort of the unique finger impression acknowledgment framework.

2.2 FINGERPRINT DISTORTION Versatile bending is presented in view of the innate adaptability of fingertips and a designedly sidelong drive or constrained. Skin distortion will increase the intra-class variations and so ends up in false non-matches because of restricted capability of existing fingerprint matchers in recognizing severely distorted fingerprints. This large distinction is because of distortion instead of overlapping space. Whereas it's attainable to form the matching algorithms tolerate giant skin distortion, this can result in additional false matches and impede matching speed.

2.3 DISTORTION DETECTION It is seen as a two class arrangement. This report tends to use the registered ridge orientation map and amount map because the feature vector, which is assessed by a SVM classifier higher core points aren't properly detected, This report tend to manually estimate the middle purpose. Finger direction is outlined to be vertical to finger joint and was manually marked for all reference fingerprints [5]. Since the reference fingerprints were registered within the offline stage, manual intervention is acceptable. The planned distorted fingerprint rectification algorithmic rule consists of Associate in Nursing offline stage and a web stage. In the offline stage, an info of distorted reference fingerprints is generated by reworking many traditional reference fingerprints with numerous distortion fields at that point utilize the reverse of the relating contortion field to correct the distorted info of input fingerprint. Within the on-line stage, given a distorted input fingerprint it tends to retrieval its nearest neighbor within the distorted reference fingerprint info [6] and at that point utilize the reverse of the relating contortion field to correct the distorted info of input fingerprint.

2.4 DISTORTION RECTIFICATION A distorted fingerprint may be thought of being generated by applying Associate in nursing unknown distortion field d to the conventional fingerprint, which is additionally unknown. If this report will estimate the distortion field d from the given fingerprint, this report can easily rectify it into the normal fingerprint by applying the inverse of d. during this report a nearest neighbor regression approach is used for this task.

III. EXISTING SYSTEM

Fingerprint matcher is very sensitive to image quality as observed where the matching accuracy of the same algorithm varies significantly among different datasets due to variation in image quality. A fingerprint recognition system can be classified as either a positive or negative system. In a positive recognition system, such as physical access control systems, the user is supposed to be cooperative and wishes to be identified. In a negative recognition system, such as identifying persons in watch lists and detecting multiple enrollments under different names, the user of interest (e.g., criminals) is supposed to be uncooperative and does not wish to be identified. In Existing System, since existing fingerprint quality assessment algorithms are designed to examine if an image contains sufficient information (say, minutiae) for matching, they have limited capability in determining if an image is a natural fingerprint or an altered fingerprint. Obliterated fingerprints can evade fingerprint quality control software, depending on the area of the damage. If the affected finger area is small, the existing fingerprint quality assessment software may fail to detect it as an altered fingerprint.

Disadvantages of Existing System • Distortion rectification (or equivalently distortion field estimation) is viewed as a regression problem, where the input is a distorted fingerprint and the output is the distortion field. • They require special force sensors or fingerprint sensors with video capturing capability • They cannot detect distorted fingerprint images in existing fingerprint databases. • They cannot detect fingerprints distorted before pressing on the sensor. • However, allowing larger distortion in matching will inevitably result in higher false match rate. For example, if we increased the bounding zone around a minutia, many non-mated minutiae will have a chance to get paired. • In addition, allowing larger distortion in matching will also slow down the matching speed.

IV. PROPOSED SYSTEM

In Proposed System was evaluated at two levels: finger level and subject level. At the finger level, we evaluate the performance of distinguishing between natural and altered fingerprints. At the subject level, we evaluate the performance of distinguishing between subjects with natural fingerprints and those with altered fingerprints. This paper described a novel distorted fingerprint detection and rectification algorithm. For distortion detection, the registered ridge orientation map and period map of a fingerprint are used as the feature vector and a SVM classifier is trained to classify the input fingerprint as distorted or normal. A nearest neighbor regression approach is used to predict the distortion field from the input distorted fingerprint and then the inverse of the distortion field is used to transform the distorted fingerprint into a normal one.

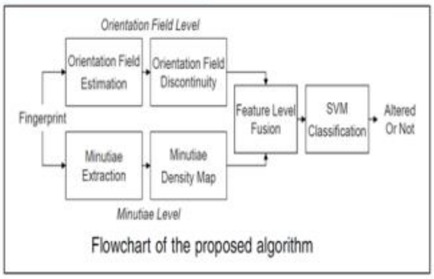

Fig.2. Flowchart of Proposed Algorithm

Advantages of Proposed System • Fingerprint rectification algorithm consists of an offline stage and an online stage. In the offline stage, a database of distorted reference fingerprints is generated by transforming several normal reference fingerprints with various distortion fields sampled from the statistical model of distortion fields. • The proposed distortion rectification algorithm by performs well by performing matching experiments on various databases. • The proposed algorithm can improve recognition rate of distorted fingerprints evidently.

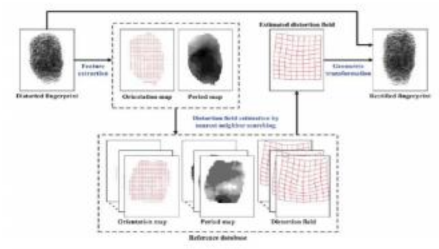

Fig.3. System Architecture

Normalization: An input fingerprint image is normalized by cropping a rectangular region of the fingerprint, which is located at the center of the fingerprint and aligned along the longitudinal direction of the finger, using the NIST Biometric Image Software (NBIS). This step ensures that the features extracted in the subsequent steps are invariant with respect to translation and rotation of finger.

Orientation Field Estimation: The orientation field of the fingerprint is computed using the gradient-based method. The initial orientation field is smoothed averaging filter, followed by averaging the orientations in pixel blocks. A foreground mask is obtained by measuring the dynamic range of gray values of the fingerprint image in local blocks and morphological process for filling holes and removing isolated blocks is performed.

Orientation Field Approximation: The orientation field is approximated by a polynomial model to obtain. d. Feature Extraction The error map is computed as the absolute difference between and used to construct the feature vector.

Analysis of Minutiae Distribution: In this module, a minutia in the fingerprint indicates ridge characteristics such as ridge ending or ridge bifurcation. Almost all fingerprint recognition systems use minutiae for matching. In addition to the abnormality observed in orientation field, we also noted that minutiae distribution of altered fingerprints often differs from that of natural fingerprints. Based on the minutiae extracted from a fingerprint by the open source minutiae extractor in NBIS, a minutiae density map is constructed by using the Parzen window method with uniform kernel function.

V. RESULT

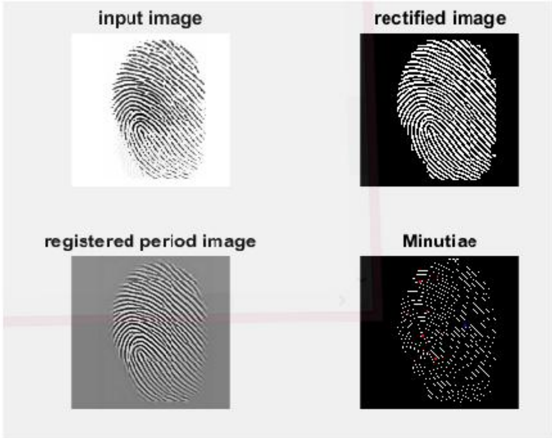

Fig.4. Rectification of fingerprints

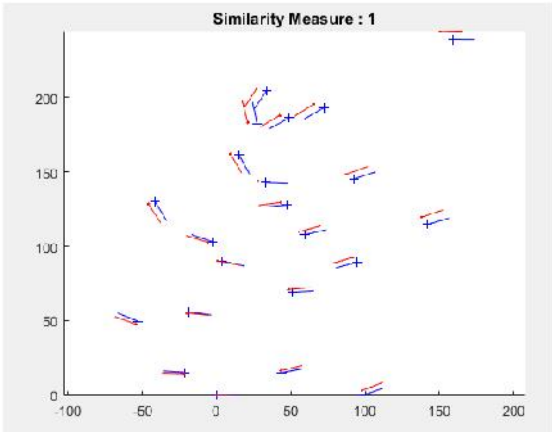

Fig.5. Detection of fingerprints

VI. CONCLUSION

The above effectuation was an attempt to understand how Fingerprint Recognition is utilized as a form of biometric to sustain individuality of human beings. All the stages are included in this that is, minutiae extraction from fingerprints to minutiae matching that are utilized to generate a match score. Several standard techniques are utilized in the intermediate stages of processing. Comparing with other forms of biometrics the comparative low percentage of substantiation rate indicates that the algorithm utilized is not very robust and is vulnerable to effects like scaling and elastic deformations. Various new methods and algorithm have been deduced which give better results. False nonmatch frequency of fingerprint matchers is comparatively high in gravely distorted fingerprints. This is creating a security hole in automatic fingerprint detection systems that could be utilized by criminals and terrorists. So, it is a must to fill the hole by building up of fingerprint distortion scrutiny and reformation algorithms. This paper exhibits a new distorted fingerprint detection and rectification algorithm. By the utilization of registered ridge orientation map and period map of a fingerprint as the feature vector distortion detection is done, a SVM classifier is made to categorize the input fingerprint as distorted or normal one. In distortion rectification, a nearest neighbor regression method is utilized to look for the distortion field from the input distorted fingerprint, later the inverse of the distortion field is employed to alter the distorted fingerprint into a normal one. Further betterment in matching accuracy can be anticipated by tuning the matcher to work with the distortion removal system.

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