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IMAGE BASED FINGERPRINT VERIFICATION

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ABSTRACT: With the increasing fraud in society, now it is time to replace the traditional methods of personal identification with automatic and accurate biometric based identification. Among all available biometrics (face, voice, iris, retina, etc.) fingerprint identification is receiving a lot of attention, since it is one of the most ancient and proven popular fingerprint matching techniques can be broadly classified as 1)Minutiae based, 2)Correlation based, 3)Texture based. The proposed image based method is correlation type in which two –dimensional Fast Fourier Transform(FFT) on both the input and the template fingerprints is computed then the sum of the pixel to pixel multiplication of the two frequency domain representations of the fingerprint images is then compared to a threshold to make a decision. One of the advantages of performing correlation in the frequency domain is that the frequency representations of the fingerprint are translations invariant. The image based approach do not use minutiae features for fingerprint matching. This correlation coefficient approach is capable of finding the correspondence between the input fingerprint image and the stored enrolled template at higher computational efficiency than minutiae based method. The high matching rate achieved in this paper suggests that an efficient small scale fingerprint verification system is feasible.

KEYWORDS: Biometrics, fingerprint, correlation, verification and minutiae.

I. INTRODUCTION

With the widespread use of Internet, ATM, Cellular phones, Smart cards etc. automatic personal identification has gaining more importance, provided that this identification should be automatic and accurate[1]. The only solution to this problem is biometrics based automatic identification of the person. Biometrics is the way of identifying the person based on his/her personal physiological or behavioral characteristics. Among all the biometrics, fingerprint based identification is one of the most ancient, proven and popular techniques. A fingerprint is the pattern of ridges and valleys on the surface if the finger.

A fingerprint image incorporates many features used for identification purpose. Also there are various approaches of automatic fingerprint verification that has been proposed which includes 1)Minutiae based matching, 2)Correlation based matching, 3)Texture based matching. Minutiae based approaches are the most popular ones being included in almost all fingerprints verification identification systems. However Minutiae based approaches require s extensive preprocessing to enhance the mage quality, because the poor quality images leads to many problems. 1)a significant number of spurious minutiae may be created. 2)a large number of genuine Minutiae may be ignored. 3)large errors in their localization.

The proposed image based approach on other hand can be directly applied to the grayscale fingerprint image with little preprocessing and hence they may achieve higher computational efficiency than Minutiae based methods. Image based approach may be the only choice to match fingerprints, which have too low image quality to allow a reliable Minutiae extraction.

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II. PREPROCESSING

Fingerprints are slightly different each time they are captured. Therefore simply calculating the correlation of two prints cannot carry out matching. There are two types of distortions when comparing one fingerprint to another print of the same finger.

- Noise is caused by the capturing device or by e.g dirty fingers. This noise can be reduced by application of appropriate filters.
- Shape distortions can be caused by pressing the convex elastic fingerprint surface on a flat sensor. This may result in stretch, rotation and shear, which also might be present only in certain parts of the fingerprint due to non-uniform finger pressure. Shape distortions cannot be compensated easily.

Most fingerprint recognition systems first extract the Minutiae from fingerprints, and then compare the Minutiae sets of two prints. To eliminate some of the drawbacks of the Minutiae based systems, we have chosen to design a system that directly uses the gray level information. Even the correlation based fingerprint verification system does not necessarily require fingerprint image enhancement, some preprocessing is proposed to acquire greater efficiency. The main steps in preprocessing are as follows:

1.NOTATION

Gray-level fingerprint image 'I' is defined as an N*N matrix, where (I,j) represents the intensity of the pixel at the ith row and jth column. We assume that all the images are scanned at a resolution of 500 dots per inch(dpi), which is the resolution recommended universally.

2.NORMALIZATION

Let I(i,j), Mi and Vi denote the estimated mean and variance of I respectively, and G(i,j) denote the normalized gray level value at pixel (i,j).

Normalization is a pixel wise operation. It does not change the clarity of the ridge and valley structures. Te main purpose of normalization is to reduce the variations in gay level values along bridges and valleys which facilitates the subsequent processing.

3.BINARIZATION AND THINNING

In order to prepare the image for operations to be performed binarization and thinning must be done in order to achieve consistent results. Binarization is the process of converting grayscale fingerprint image to a binary(black and white) image while thinning is the process of eroding the ridges of fingerprint until they are one pixel wide.

III. CORRELATION

Correlation is the simplest technique is to align the two fingerprint images and subtract the input from the template to see if the ridges correspond. If the correlation exceeds a certain threshold the two fingerprints are declared to originate from the same finger. A variant of the correlation technique is to perform the correlation in the frequency domain instead of the spatial domain by performing a two dimensional fast fourier transform on both the input and the template fingerprints. The sum of the pixel to pixel multiplication of the two frequency domain representations of the fingerprint imagesis then compared

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to the threshold to make a decision. One of the advantages of performing correlation in the frequency domain is that the frequency representation of the fingerprint are translation invariant.

IV. EXPERIMENTAL RESULTS

Accuracy and reliability in fingerprint recognition is a challenging problem often which require robust algorithm. This performance evaluation has been carried out as an attempt towards establishing a benchmark. Internal tests can be performed over standardized database collected by universal sensor from FVC2000. This database contains 58 fingerprints and 8 different fingers. Database has an image size of 300*300 dpi. These fingerprints were manually analyzed to assure false acceptance and genuine acceptance.

V. CONCLUSION

The correlation-based fingerprint verification system provides a very simple and direct solution to the fingerprint matching problem. Unlike the Minutiae based systems, this approach does not require much preprocessing. As a consequence, there will be no errors introduced in these steps. This system uses the much richer gray-level information a fingerprint image. It is capable of dealing with bad image quality fingerprints and missed and spurious minutiae. Due to paired templates, the decision stage is much simpler and it is able to deal with some non-uniform shape-distortion problems. Experiments have shown that the correlation based fingerprint verification system performs approximately as well other types of system. The performance of the system be enhanced by solving the problems of fingerprints that show more than some amount of notation with respect to each other.

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