RELIABLE FINGERPRINT MATCHING Reliable Matching

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Abstract*:* This paper concerns analysis of fingerprint images and fingerprint matching based on extraction of minutiae. The algorithms are based on ridges in fingerprint. Proposed Algorithm makes use of characteristic features from patterns of neighboring ridges in order to find the minutiae probability of ridges and peres. The analysis of live-scan images is a crucial problem to find out the pattern matching. This method shows to be efficient in proper minutiae detection and gives the solution of fingerprint features to be useful for filtration of fingerprint images in live scan process.

Keywords: Biometrics, FingerCode, fingerprints, flow pattern, verification

I. INTRODUCTION

The Fingerprint image is obtained from a known user at a time of enrolled into the system. Second segment of fingerprint image results from a live scan acquired for the purpose of verifying user identify .When two segments are compared and two possible outcomes are retrieved - match and fake. The process is identified for matching and to give accuracy to the user. In the live scan process, image has compared and give the authentication.

Figure 1. (a)Difficulty in fingerprint matching (b) The global configuration images of two different fingers.

II. FILTER-BASED FEATURE EXTRACTION

It is desirable to obtain representations for fingerprints which are scalable, translational and rotational invariant. Scale invariance is not a significant problem since most fingerprint images could be scaled as per the dpi specification of the sensors. The rotation and translation invariance could be accomplished by establishing a reference frame based on the intrinsic fingerprint characteristics which are rotation and translation invariant. It is also possible to establish many frames of reference based upon several landmark structures in a fingerprint to obtain multiple representations.

At the expense of additional processing and storage cost, the multiple representations offer robust matching performance when extraction algorithm fails to detect one or more frames of reference. In the proposed feature extraction scheme, translation is handled by a single reference point location during the feature extraction stage. The present implementation of feature extraction assumes that the fingerprints are vertically orientation.

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Figure 2. Reference point (x), the region of interest and sectors superimposed on a fingerprint

The four main steps in the feature extraction algorithm are

- Determine a reference point and region of interest for the fingerprint image;
- The region of interest around the reference point;
- Filter the region of interest in eight different directions using a bank of Gabor filters (eight directions are required to completely capture the local ridge characteristics in a fingerprint while only four directions are required to capture the global configuration
- Compute the average absolute deviation from the mean of gray values in individual sectors in filtered images to define the feature vector or the Finger Code.

Fingerprints have many conspicuous landmark structures and a combination of them could be used for establishing reference point. The reference point of a fingerprint is defined as the point of maximum curvature of the concave ridges in the fingerprint image.

A. Alignment of Point Patterns

It is well known that corresponding curve segments are capable of aligning two point patterns with high accuracy in the presence of noise and deformations. Each minutia in a fingerprint is associated with a ridge. A true alignment can be achieved by matching and aligning the corresponding ridges. By matching the corresponding normalized ridges, the relative pose transformation between the input minutiae and the template can be estimated. With the estimated pose transformation, the input minutiae can then be translated and rotated to align the template minutiae.

B. Aligned Point Pattern Matching

If two identical point patterns are exactly aligned, each pair of corresponding points is completely overlapping. In such a case, a point pattern matching can be simply achieved by counting the number of overlapping pairs. However, in practice, such a situation is rarely encountered.

C. Minutae Configuration

When matching is based on minutiae the template consists of vital information about the features.

(Rp, Ro, Rt, …….. Rpme, Rome, Rtme)

Rp - Ridge position

Ro - Ridge orientation (flow of direction)

Rt - Type of the ridge

Me - Minutiae Enrolled

Configuration=P*(1/No)^Np

P - Configuration with Orientation

No - Number of different orientation

Np - Number of points in the configuration

D. PORE CONFIGURATION

Neighboring pores are separated by constant distance‘d’. d represents average distance between neighboring pores. The value of‘d’ is calculated by

d = (area of ridge / No. of pores) ^1/2

The pores are approximately equal in width and length (0.48mm), the pores are unique in shape vary in size (88-220 micro meter) and change only in size due to growth of the skin.

Configuration = distance*Np *0.48micro meter

E. MATCHING SCORE

All references to probability of matching or uniqueness of a set of features. Every feature was required to match for the entire set approach is taken in this section a more realistic approach is taken in which the number of features in both the segments as well as the number that actually match are taken into account. A matching score provides the degree of matching between two segments with a range of complete match.

Matching score = ((Minutiae configuration + pore Configuration) /2)*100

III EXPERIMENTAL RESULTS

The verification accuracy of the fingerprint representation and matching approach, each fingerprint image in the database is matched with all the other fingerprints in the database. A matching is labeled correct if the matched pair is from the same finger and incorrect, otherwise. None of the genuine (correct) matching scores was zero; the images from the same finger did not yield an identical Finger Code because of the rotation and inconsistency in reference point location. For the database, a total of 100 matching were performed. The probability distribution for genuine (correct) matches was estimated with 90 matches and the imposter distribution was estimated with 85 matches.

In a biometric system operating in a verification mode, there are four possible outcomes:

- genuine acceptance;
- imposter rejection;
- genuine rejection (false reject);
- Imposter acceptance (false accept).

The first and the second outcomes are correct while the third and the fourth outcomes are errors. The performance of a biometric system is specified in terms of false accept rate (FAR). The decision scheme should establish a decision boundary which minimizes the false reject rate (FRR) for the specified FAR. The Euclidean distance between two Finger Codes is calculated. The two sets of fingerprint images are tested as following:

TABLE 1

	Thumb Finger	**Index Finger**	**Ring Finger**
Live-scan Matching score	60%	55%	54%
Algorithm Using Matching score	95%	94%	99%

Figure 3. Two Sets of Finger Prints

CONCLUSION

Proposed enhancement of algorithm for detection of minutiae give good results in reducing false minutiae improvement. Due to low quality level can also refer to the unification of image filtering and segmentation algorithm and minutiae detection. In order to make the entire process faster, the application of the ridge analysis is proved to be useful for fingerprint authentication. Experimental results show that performance and the efficiency are improved with the implementation.

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