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Palmprint Recognition Using Ridge Features

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Abstract: This Palm print recognition implements many of matching characteristics as of finger print recognition and both biometrics are represented by the information present on the friction ridge impression. Palm prints differ from finger prints in a way since they contain many features and they have more discriminative regions than fingerprints. Because palm prints are both unique and permanent, they have used over a century as a trusted form of identification .Existing research on palm prints was based on low resolution and by this we can only identify the creases of a palm. The proposed system is based on High resolution images and by this we can able to identify the ridge features. Overcoming these issues many palm print systems have been proposed and are becoming a challenging task in criminal and forensic applications. An efficient Palm print recognition system has to be designed with increased matching accuracy and hence with more efficiency in forensic applications. The absolute aim of this project is an attempt to design such a system that can bring out an efficient authentication system for Palm print recognition.

Keywords: Biometrics, Cascade Filter, Full palmprints, Minutiae

I. Introduction

Biometrics refers to the identification of humans by their characteristics or features. Biometrics is used as a form of identification and authentication. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are the distinctive, measurable characteristics used to tag and describe each unique personality. Biometric identifiers are often divided as physiological versus behavioral Physiognomies.

Physiological Physiognomies are related to the shape of the body. Behavioral characteristics are related to the pattern of behavior of a person, including gait, and voice .Some researchers have coined the term behaviometrics to describe the latter class of biometrics. In this paper proposes an efficient Palm Print recognition using ridge features. Palm print is a combination of two unique features, namely, the palmar friction ridges and the palmar flexion creases.

Palmar friction ridges are the corrugated skin patterns with sweat glands but no hair or oil glands. Discontinuities in the epidermal ridge patterns are called the palmar flexion creases. These are the firmer attachment areas to the basal (dermis) skin structure. Flexion creases appear before the formation of friction ridges during the embryonic skin development stage, and both of these features are claimed to be immutable, permanent, and unique to an individual.

The three major types of flexion creases that are most clearly visible are distal transverse, proximal transverse, and radial transverse creases. Based on these major creases, three palm print regions are defined: interdigital, thenar, and hypothenar. Various features in palm prints can be observed at different image resolutions. While major creases can be observed at less than 100 ppi, thin creases, ridges, and minutiae can be observed only at _400 ppi and resolutions greater than 500 ppi are needed to observe pores [1]. The ridges of a palmprint are shown in the following Fig 1.

Fig 1: Ridges present in palmprint

II. Intended works

Palm print recognition systems have been developed for civilian (mainly access control). But these systems typically utilize low-resolution images and only support full-to-full palm print matching. To facilitate palm print matching, these systems use pegs to fix hand position and detect gaps between fingers for alignment. Matching is based on texture or crease information in palm print images.

In forensic applications, on the other hand, 500 ppi is the standard resolution and latent-to-full matching must be

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supported [1].As many palm print matching systems have been developed this base system has not been implemented yet. In this paper, the base system is implemented for full to full palm print matching [2].

A. Registration

Registration is basically for reducing the computational complexity in palm print matching. It brings the all different images to the same coordinate system hence improving the matching speed and accuracy. Fig 2 illustrates the process of registration. Here the input is the palm print and the output is the aligned palmprint image.

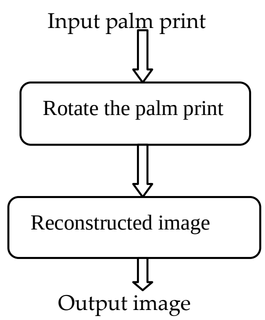

Fig 2: Registration Process

The registration is performed for both palm prints in both enrolment stage and identification stage for gallery palm prints and test palm print separately. The two sub modules present are: i) Estimation of orientation field ii) Estimation of rigid transformation for alignment.

B. *Feature Extraction*

Here the features required for palm print matching are being extracted. These features are hence being used for matching of palm prints. The region mask is a binary image the indicates the valid palmar region as 1 and the other as 0.The orientation field represents the direction of ridge flow and hence is unique for each and every person. A gradient based method is used to find the orientation field of palm print.

Palm print matching techniques fall in three categories such as minutiae based matching, correlation based matching and ridge based matching. Minutiae based matching relies on the minutiae points specifically with orientation, location and direction of each minutiae point. Correlation based matching involves simply lining up the palm images and subtracting them to determine if the ridges in the two palm images correspond. Ridge based matching depends on the ridge pattern features such as sweat pores, spatial attributes and geometric characteristics of the ridges. In this system, minutiae features are being used for matching process.

Minutiae are a major feature of palmprint in biometrics. The features of minutiae include, ridge ending, ridge bifurcation, short ridge, delta core and so on. From this, the ridge ending and ridge bifurcation are the two most major features that are present in the palmprints. Ridge ending is an abrupt ending of a ridge. Ridge bifurcation is where a single ridge divides into two ridges. The process of the features of palmprint extraction is shown in the Fig 3.

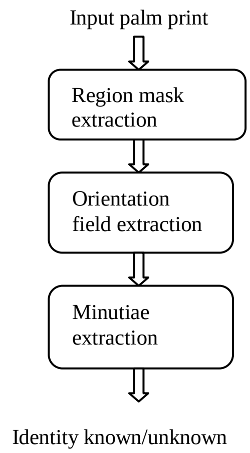

Fig 3: Feature Extraction Process

C. *Matching and Fusion*

The matching algorithm decides whether the user is authenticated or not based on the similarity criteria taken in a palm print authentication system. Here for matching the minutiae is being extracted and together with orientation field and region mask the palm prints are compared and hence it is found out whether the identity is authenticated or not. For matching cascade filtering, a speed up process for matching and euclidean non distance is used for comparing the distance values.

Jifeng dai et al (2012) proposed the method of cascade filtering in matching process. It is a process done in three levels where the images is divided in to 4 x 4 blocks in each block the minutiae and the orientation is compared between the test and reference image database. In the first level, if the features are not matched with the first image in database the test image is compared with the next image in the database and this repeats in a process from the first level and the image that matches with the test image in all the three levels is found to be the correct match. The matching and Fusion process is shown in Fig 4.

Algorithm

STEP1: Divide the image into 512 x 512 blocks
STEP2: In first level, compare the set of block with number of minutiae and orientation features

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STEP 3: In the second and third level, compare the other set of blocks.
STEP 4: if all three levels are satisfied, match found =1.

Similarity matching score

The similarity match score determines if the person is authenticated or not. Here the match score is detected using the euclidean distance. The euclidean distance is defined as,

$$d_{euclid}\,(i_1, j_1)(i_2, j_2) = \sqrt{(i_1 - i_2)^2} - \sqrt{(j_1 - j_2)^2} \quad (1)$$

Here the euclidean distance is calculated using the orientation field and the minutiae of the palmprints. It determines the feature distance in both the full palm prints and determines the match score.

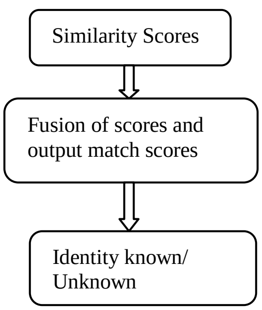

Fig 4: Matching and Fusion Process

III. RELATED WORKS

Many approaches have been proposed for palm print matching in the recent years. These algorithms have been following finger print algorithms. Hence these do not handle blurness and alterations which have been a serious problem. Jifeng Dai et al. in [1] proposed a method for palm print matching that deals with skin distortion, discrimination power and computational complications. The matching algorithms proposed in this paper deals with noise and distortion efficiently. To the computational difficulty, an efficient orientation field based registration algorithm had been proposed that increases the speed of matching. Based on the statistics this palm print system had lower computational cost and higher accuracy as when compared to the other matching algorithms.

Jie Zhou et al. in [2] proposed a method for palm print matching using high resolution images and uses multiple features for matching. Here multiple features such as density, orientation, minutiae, and principle lines were taken to significantly improve the matching performance. Jianjiang Feng et al. in [3] proposed a method for palm print recognition using minutiae features which helps in matching speed and ExactitudesSince latent palm prints have been raised up from crime scenes are of poor image quality and have a complex background, this matching has been a challenging problem.

Anil K.Jain et al. in [4] proposed an automatic latent to rolled fingerprint matching system that provides the probability of two fingerprints being compared and that belong to same finger. A new hierarchical orientation field estimation algorithm results in a smoother orientation field which greatly improves the performance of the minutia extraction. A.Ross et al. in [5] proposed a radial method for minutiae modelling and did a comparison for latent to full palm print matching .The proposed approach is evaluated on a database of 177 users acquired in two sessions.

IV. EXPERIMENTAL RESULTS

In recent 10 years, a number of palmprint recognition algorithms have been proposed and most of these algorithms are based on crease features extracted from low resolution contactless palmprints. However, crease-based palmprint recognition has not been successfully used for large-scale person identification applications because of some inherent limitations. Ridge features in palmprints are proven unique and persistent and identification-based ridge features is accepted in courts of law. Recently, a few ridge-based palmprint recognition systems have been proposed.

Although there is some novelty in the feature extraction algorithms, the matching algorithms of these systems are basically adapted from fingerprint matching. Thus, the accuracy of these systems is limited despite heavy computational cost. Motivated by the matching strategies of human palmprint experts, we quantitatively analysed the statistics of palmprint characteristics and proposed a novel palmprint matching algorithm based on the obtained statistics which achieves higher accuracy as well as lower computational cost than the previous systems[7]. The process of segmentation and extraction of features is as follows

V. CONCLUSION

Here the detailed features of the palm prints are taken and hence matching is done the palm prints using local minutiae matching and global minutiae matching. The input is full palm print and the output is a set of matching minutiae. The minutiae based matching score is computed and hence the maximum similarity score of the minutiae is calculated and hence the output is the matched palm print whether authenticated or not. This can be also be implemented in the case of partial palm print also. Thus the person identification will be more effective.

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