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A Review on Palm Print Recognition System

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***Abstract*—** Biometrics based authentication and recognition system helps to identify individuals based on various behavior and physical characteristics, which can be used for their unique personal identifications. Various physical characteristics like iris patterns, facial features, fingerprint patterns, retina patterns, palmprint patterns etc. are utilized for such identification purposes, Palm print recognition is counted as most suitable and reliable biometric recognition system because of its merits, such as user friendliness, low cost, high accuracy and high speed. A system that uses palmprint as recognize individuals involves the matching of the various principal lines, creases and wrinkles on the palm surface. Since the random orientations of muscles and tissues of the hand create the palmprint patterns during birth, these patterns are unique so no two palmprint patterns are exactly same for any individuals. This paper provides a detailed overview of palmprint recognition approaches, by describing the various steps and processing involve in palmprint identification.

Keywords- *palmprint acquisition, recognition, matching, distance metrics, feature extraction*.

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I. INTRODUCTION

The inner part of a person's hand is its Palmprint that contain line pattern, which is used for centuries to predict a person's future .Biometric is system that is used to recognizing a person identity based on characteristic like a physical or behavior. For this identification purpose we can use hand geometry, face, fingerprints, voice, iris, retinal, vein and handwriting. Biometrics provides the reliable, stable and unique personal physical characteristics for identification.

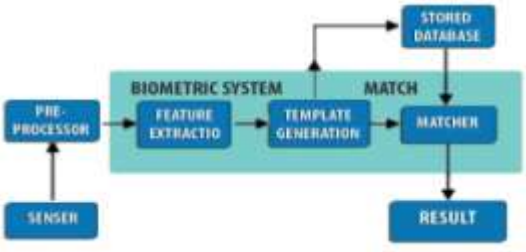

Figure 1: Biometric System

Palm print is preferred for identity matching if we compare it to some other identity matching methods such as iris or fingerprint because it is easy to capture palm print with any available device having low resolution with distinctive feature of users beside of that it contains some other features like principal lines. Currently available input devices for iris are very costly and it also fears the users for adverse effects on their eyes. Input devices for finger print are also very costly because such system requires devices with capturing ability of high resolution and sometime some users could be finger deficient. Therefore palm print can be a better alternative because input devices for palm print are less costly and it fears the users for adverse effect on their eyes. The surface area between the wrist and the fingers of a hand is known as palm. Palm print contains some features like small wrinkle line, major principal lines and ridges area on the palm. Similar to finger prints palm print has also been used as powerful tools for enforcement of law to identify criminal because of its unique and stability features. There are many features that are available in palm print which can be used for identification of a user. These features are principal lines, minutiae points, ridges, singular points, wrinkles and texture that are helpful for representing and identifying a palm print. Here selection of palm print features depending on security requirement of individuals and businesses.

II. PALMPRINT

A. Palmprint Classification

In palmprint identification we uses palm features for identification of a person. We can classify palmprint as online and offline. Online palm print are acquire directly by using input devices which are connected to a computer and can immediately transfer palm print for real time processing. Offline palm print are acquire by using inked pad or other image capturing method then convert those print into digital image by using a digital scanner. Figure 2 (a) and 2 (b) show an on-line palmprint image and an offline palmprint image, respectively.

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Figure 2 online and offline palm print image

B. *Palm Features*

Among the various features that are available on a palm, some of the main features are defined as Palm geometric features: This feature includes width, length and area of palm's shape. Principle line features: This feature include important line such as line of head, life and heart in a palm print. They are mostly having features like stability and uniqueness thus are an important physiological characteristics to identify individuals identification. Palm texture feature: This feature includes wrinkles of palm, they are very lighter and more zigzag thus are difficult to separate uniquely compare to the principle lines and are also less important. Data point features: This feature include delta-like central region of a palm print, which is usually situated in the bottom area of finger and in outer region of the palm print.

III. PALMPRINT RECOGNITION SYSTEM

In past few years the main focus of research is on offline palmprint identification. This is because the resolution of offline palmprint images is high (up to 500 dpi), so it contains a large information that can be used for identification. Identification techniques that applied to fingerprint images can be useful for offline palmprint identification, where datum points, lines and singular points can be extracted. For on-line palmprint authentication, the samples are directly obtained by a palmprint scanner . Figure 3 shows a captured palmprint image by a scanner and scanning device .

Figure 3: Captured image of palmprint and scanning device

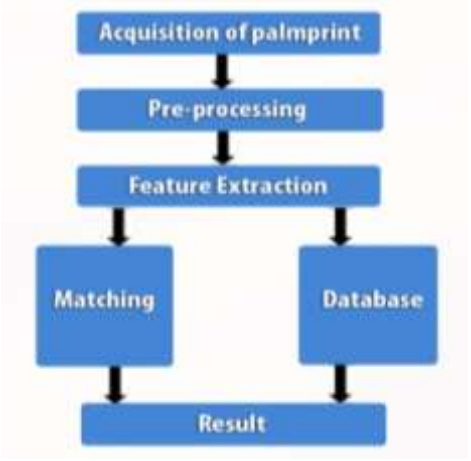

Figure 4: Steps of Palmprint Recognition

Every person has unique palm print and they remain unchanged for a long period during the lifetime of an individual. In systems for palm print recognition we can either use high or low resolution images, but most of the research uses the low resolution images for palm print recognition. The palm prints are processed through four stages: Acquisition palmprint image, Preprocessing, Extraction feature and matching as shown in above figure. The palmprint scanner is used for acquiring palm print images. Preprocessing has two parts, image alignment and then region of interest selection. Key points referring are used for Image alignment, cropping the region of Interest selection is done on palmprint image; Extraction of features is done on the preprocessed Palmprint. Finally by matching we can compares the captured image features with the database.

C. *Acquisition of palmprint*

In this phase, palmprint image is first capture by using digital devices like digital cameras. These Acquired image may contain noise or be blurred, which reduced image quality and affects the correctness of system directly. The acquired palmprint image may be vary in direction, position and stretching degree.

D. *Pre-processing*

After capturing the image of the palmprint, preprocessing is performed on image. This is done to reduce the distortion, to align the palmprints and to crop the selected region of interest. Then this processed and cropped ROI is used to extract features. It requires five steps:

1. Palm image Binarizing.
2. Tracking Boundary.
3. Detection of key points.
4. Coordination system establishment.
5. Extracting the ROI.

The detection of key points can be accomplished by two ways, first by using tangent which considers the tracing of the 2 finger edges holes on the binary image. The two finger

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common tangent is considered to be the axis and the key points are calculated as the midpoint for the two tangent points for the coordination system. The second way is by using figures. But the preferred is the tangent base approach.

E. Feature Extraction and Matching

Feature extraction is performed after pre-processing. The main aim at this stage is to extract variables that contain information's like principal lines, minutiae, singular points, density map, orientation field, texture etc. These features play an important role for identification or verification of individual. These extracted features can be stored in database for future verification and matching purpose.

IV. PREVIOUS WORK REVIEW

Here are some reviewed papers for Palmprint recognition:

Junlin Hu, YanxueXueYongwei. Et al proposed a technique where they used MFRAT, 2D Gabor channel and ODLPP to combine three different types of palm print elements 1. Composition highlights 2. Vital lines 3. Appearance highlight. This strategy was applied on Poly U palm print database [3].

Puranik et al. proposed a web camera based and touch-less palm print image recognition system. It uses a low-resolution image captured using web camera to with hand at a equal distance. For this system user does not require to touch any surface of device for acquiring their palm print [4].

Gayathri et al. proposed multiple feature extraction by using gabor wavelet which are available on the palmprint, and then it employs a fusion at feature level and classified it by using nearest neighbour approach. Palmprint matching is performed by the use of nearest neighbour classifier [5].

Seshikala et al. proposed a wavelet edge detection technique using multi scale for extracting the feature of palm print, and the result is compared with common edge detection techniques like canny and Sobel edge detection techniques [6].

Malik et al. proposed a way in which several feature extraction techniques are used like Sobel and canny edge detection and Phase Congruency that are applied to palmprint image for palmprint features extraction. Then these feature vectors are matched with database using hamming distance with sliding window. They also describe a Min Max Threshold Range (MMTR) method that helps in increasing overall accuracy of the system and reduces the False Acceptance Rate (FAR) [7].

Shashikala et al. proposed a DCT, DWT and QPCA (PIDDQ) based system for palmprint identification. It first apply histogram equalization on palmprint image to enhance its contrast, after that DWT is applied on it to generate HL, LH, LL and HH bands. By using DCT coefficient LL band is transformed into DCT coefficients. On DCT coefficients QPCA is applied to generate features. These features are compared with palmprint features database using Euclidean Distance (ED) [8].

Sang et al. proposed a color palm print based touch less palmprint recognition system which uses threshold of skin-color and an algorithm for hand valley detection for extracting palmprint. Then, the palmprint features are extracted using local binary pattern (LBP). Finally, for classification it uses chi square statistic [9].

Khalifa et al. proposed discrete wavelet transform based techniques that focused feature extraction like, the Gabor filters and the co-occurrence matrix. The vector machine support is used for the purpose of classification step [10].

Kumar et al. proposed a technique in which the palmprint images are mapped on to Eigen-space and it generates a robust code signature using different camera snapshots for same palm to adjust lighting and tonal variations. For its real-time implementation, it reduces computation overhead by representing the signature in low dimensional vector of features [11].

Guo et al. proposed a technique which uses five methods for extracting features. They are DCT transform, statistics feature, Gabor transform, Fourier transform and local binary pattern (LBP). Then all feature vectors are combined to form the resultant vectors of feature for the palmprint image. Finally the palmprint matching is performed by the use of nearest neighbour classifier [12].

Yih et al. proposed a way in which different feature extraction method used like Discrete Cosine Transform energy, Wavelet Transform energy and Sobel Code that are applied to the cropped and resized image to obtain vectors of feature [13].

V. CONCLUSION AND FUTURE SCOPE

In biometric recognition systems palmprint plays an important role. In fact it is the most important because we do not need any specific device for acquisition of palmprint image; rather we can use web cam, camera or even mobile camera for this purpose. And also palmprint contain lots of unique and different types of features that we can use for purpose of individual identification. Lots of work is already done on palmprint recognition sytem but there are possibilities to improve extraction of features and matching of those features by using an image of low resolution, so that better accuracy can be achieved with less processing and increased speed.

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