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# Identification of a Person by Palmprint images based on Gabor Filter

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## ABSTRACT

Multibiometrics can provide higher identification accuracy than single biometrics, so it is more suitable for some real-world personal identification applications that need high-standard security. Among various biometrics technologies, palm print identification has received much attention because of its good performance. Previous technique is based on multibiometrics by comprehensively combining the left and right palm print images. This framework integrated three kinds of scores generated from the left and right palm print images to perform matching score-level fusion. The first two kinds of scores were, respectively, generated from the left and right palm print images and can be obtained by any palm print identification method, whereas the third kind of score was obtained using a specialized algorithm. The proposed work is based on the Gabor filter where the gradient and magnitude of an image is calculated on a palmprint for Person Identification. In this there are two steps .They are enrollment and verification steps. In enrollment step first palm print acquisition, palm print preprocessing and the texture and feature extraction are done. The database is found based on the enrollment step .Next the same process is followed in verification step. Then matching of the query image with the database is verified .After matching the matched result is obtained. This method achieves better performance and obtained valid and accurate results than the other state of art methods.


**Keywords:** Palmprint Recognition, Biometrics, Multibiometrics, Gabor Filter

## I. INTRODUCTION

Palm print recognition has emerged as a highly accepted biometric system due to its easy acquisition and reliability. Palm is the inner surface of hand between wrist and fingers. The inner surface of palm contains three flexion creases, secondary creases, and ridges for each finger. The flexion is also called as principal lines and secondary creases are called wrinkles. Palm feature also includes singular points, ridges, wrinkles, and delta, datum and minutiae points. Palm features are unique for every individual and have rich information that can be used for feature extraction. The palm lines and wrinkles are formed during third and fifth month of the formation of fetus. The wrinkles, ridges, principal lines namely heart lines, headlines; life lines. A region of interest (ROI) is extracted from the palm area for processing. Palm recognition process includes feature extraction (stored as template in the database) matching (input query features are matched with stored features) and decision making (to accept or reject the query based on match score). In this chapter an over view of palm print recognition system, processing stages and approaches is presented.

In image processing, a Gabor filter, named after Dennis Gabor, is a linear filter used for texture analysis, which means that it basically analyses whether there are any specific frequency content in the image in specific directions in a localized region around the point or region of analysis. Frequency and orientation representations of Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for texture representation and discrimination. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave .Simple cells in the visual cortex of mammalian brains can be modeled by Gabor functions. Thus, image analysis with Gabor filters is thought to be similar to perception in the human visual system.

Gabor filters are directly related to Gabor wavelets, since they can be designed for a number of dilations and rotations. However, in general, expansion is not applied for Gabor wavelets, since this requires computation of bi-orthogonal wavelets, which may be very time-consuming. Therefore, usually, a filter bank consisting of Gabor filters with various scales and rotations is created. The filters are convolved with the signal, resulting in a so-called Gabor space. This process is closely related to processes in the primary visual cortex. Jones and Palmer showed that the real part of the complex Gabor function is a good fit to the receptive field weight functions found in simple cells in a cat's striate cortex.

In document image processing, Gabor features are ideal for identifying the script of a word in a multilingual document. Gabor filters with different frequencies and with orientations in different directions have been used to localize and extract text-only regions from complex document images (both gray and color), since text is rich in high frequency components, whereas pictures are relatively smooth in nature It has also been applied for facial expression recognition Gabor filters have also been widely used in pattern analysis applications. For example, it has been used to study the directionality distribution inside the porous spongy trabecular bone in the spine The Gabor space is very useful in processing applications such as optical character recognition, iris recognition and fingerprint recognition. Relations between activations for a specific spatial location are very distinctive between objects in an image. Furthermore, important activations can be extracted from the Gabor space in order to create a sparse object representation.

## II. EXISTING METHOD

**Similarity between the Left and Right Palm prints**

In this subsection the illustration of the correlation between the left and right palm prints is presented. It can be seen that the left palm print image and the reverse right palm print image of the same subject are somewhat similar.

**Procedure of the Proposed Framework**

This subsection describes the main steps of the proposed framework. The framework first works for the left palm print images and uses a palm print identification method to calculate the scores of the test sample with respect to each class. Then it applies the palm print identification method to the right palm print images to calculate the score of the test sample with respect to each class. After the crossing matching score of the left palm print image for testing with respect to the reverse right palm print images of each class is obtained, the proposed framework performs matching score level fusion to integrate these three scores to obtain the identification result.

**Matching Score Level Fusion**

In the proposed framework, the final decision making is based on three kinds of information: the left palm print, the right prlm print and the correlation between the left and right palm print. As we know, fusion in multimodal biometric systems can be performed at four levels. In the image (sensor)level fusion, different sensors are usually required to capture the image of the same biometric. Fusion at decision level is too rigid since only abstract identity labels decided by different matchers are available, which contain very limited information about the data to be fused. Fusion at feature level involves theuse of the feature set by concatenating several feature vectors to form a large 1D vector. The integration of features at the earlier stage can convey much richer information than other fusion strategies.

So feature level fusion is supposed to provide a better identification accuracy than fusion at other levels. However, fusion at the feature level is quite difficult to implement because of the incompatibility between multiple kinds of data. Moreover, concatenating different feature vectors also lead to a high computational cost.

Differing from the conventional matching score level fusion, the proposed method introduces the crossing matching score to the fusion strategy. When w3 = 0, the proposed method is equivalent to the conventional score level fusion. Therefore, the performance of the proposed method will at least be as good as or even better than conventional methods by suitably tuning the weight coefficients.

**Palm print Databases**

The Poly palm print database (version 2) contains 7,752 palm print images captured from a total of 386 palms of 193 individuals. The samples of each individual were collected in two sessions, where the average interval between the first and second sessions was around two months. In each session, each individual was asked to provide about 10 images of each palm. We notice that some individual provide few images. For example, only one image of the 150th individual was captured in the second session. To facilitate the evaluation of the performance of our framework, we set up a subset from the whole database by choosing 3,740 images of187 individual, where each individual provide 10 right palm print images and 10 left palm print images, to carry out the following experiments.

**Matching Results Between the Left and Right Palm print**

To obtain the correlation between the left and right palm print in both the PolyU and the IITD databases, each left palm print is matched with every right palm print of each subject and the principal line matching score is calculated forthe left palm print and this subject. A match is counted as a genuine matching if the left palm print is from the class; if otherwise, the match is counted as an imposter matching.

## III. PROPOSED METHOD

The method can be done in two steps .They are

1.Enrollment step

2.Verification step

The block diagram of proposed methodology is as follows

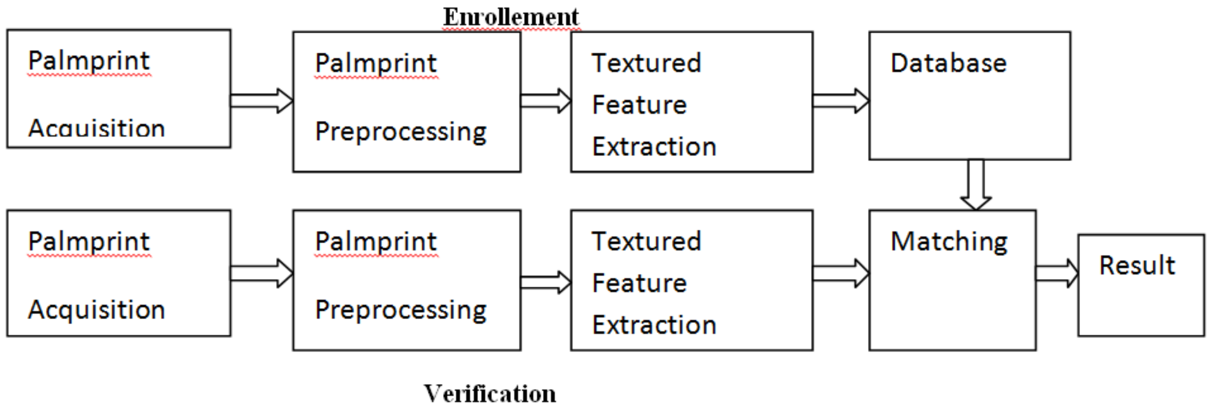


**Figure 2.** Block Diagram of Proposed Method

**Palm print acquisition**

It is the first step in any biometric system where the image of palm is captured for person identification. Different types of sensors like palm scanners, digital cameras, high and low resolution cameras are used for image acquisition. Depending on the applications sensors are chosen. For a civilian, commercial applications low resolution images and for forensic, criminal detection high resolution images are used for processing.

**Palm print pre-processing**

Pre-processing Palm images acquired are pre-processed to extract its features. The principal lines are significant and minutiae and textures are used as unique information in forensic .The pre-processing steps involve converting the image to binary, extracting the region of interest and segmenting, key point detection and establishing the coordinating system. The pre-processing can be summarized as

- ✓ Low pass Gaussian filter is applied to smoothen the palm image.
- ✓ Binarize the palm image with a proper threshold.
- ✓ Apply morphological operations
- ✓ Trace the boundary of palm image to identify and fix the key points
- ✓ Find the orientation of palm image and find the coordinate system to crop the region of interest.

Extracting the region of interest is carried out using many methods . Centre of palm is used as region of interest in many methods as it covers most of the palm features and has unique texture for each person. To extract the centre of palm image first it has to be aligned and oriented to crop the centre portion. Many methods are used for orientation, like elliptical method where an ellipse that's fit the boundary of palm is obtained and orientation of palm is obtained by major axis of ellipse. In key point extraction the valley points from middle finger, ring finger, little finger and the line joining these are taken as orientation and a centre portion of palm image is found and a circular or a squared portion of defined size is cropped.

**Filtering And Feature Extraction Using Gabor Filter**

Generally, principal lines and wrinkles can be observed from our captured palm print images. Some algorithms such as the stack filter can obtain the principal lines. However, these lines do not contribute adequately to high accuracy because of their similarity amongst different palms. Six palm print images with similar principal lines. Thus, wrinkles play an important role in palm print authentication but accurately extracting them is still a difficult task. This motivates us to apply texture analysis to palm print authentication.

This computes the magnitude and phase response of a Gabor filter for the input grayscale image A. wavelength describes the wavelength in pixels/cycle of the sinusoidal carrier. orientation is the orientation of the filter in degrees. The output mag and phase are the magnitude and phase responses of the Gabor filter. Gabor bank is a 1-by-Parray of Gabor objects, called a filter bank. mag and phase are image stacks where each plane in the stack corresponds to one of the outputs of the filter bank. Using imgaborfilt command the feature extraction done using the gabor filter.

**Textured and Feature Extraction**

Feature extraction Once the region of interest is identified the features are extracted from it. The approaches used are of two types. One for verification and the other for identification. Line based, sub-space based and statistical based are used for verification of palm features from the stored templates. Some approaches are also combined and are used to extract palm features. Classifiers are used to make a final decision. Feature extraction of ROI of an image is to locate the points those lie along boundaries i.e., set of pixels that either separate objects from one another or change in the surface geometry of an object. The two types of boundaries can be step edges or crease edges. Step edges identify the discontinuity in depth and can be identified by a gradient magnitude. Palm features may also include texture information which can be extracted using statistical measures and wavelets. Palm shape feature includes global features and local features like boundary segments are extracted using Hough's transform which transforms Cartesian to parametric.

**Matching and Decision Making**

Matching and decision making Features extracted are stored in the database as templates. Each template is unique and has salient features of the image under consideration. When the query image is processed for verification / authentication, the features are compared with the stored template using matching techniques. Match scores are estimated using a threshold and final decision is taken to accept /reject the query image. Classifiers are designed based on three different approaches namely concept of similarity, probabilistic, or a geometric approach. Patterns that are similar are assigned with a class. Based on the similarity of feature vector and the template, each sub system calculates its own matching score value. These individual scores are finally combined to obtain a total score which is then passed to the decision module.

## IV. RESULTS


**Figure 1.** Train Image

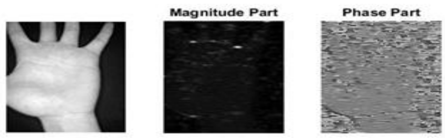


**Figure 2.** Magnitude and Phase Part

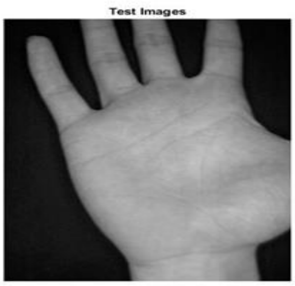


**Figure 3.** Test Image

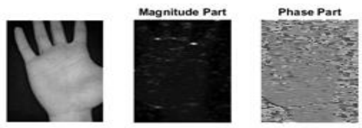


**Figure 24.** Magnitude and Phase Part of test Image

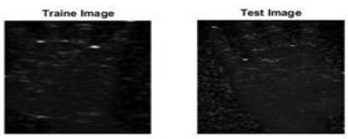


**Figure 5.** Train and Test image

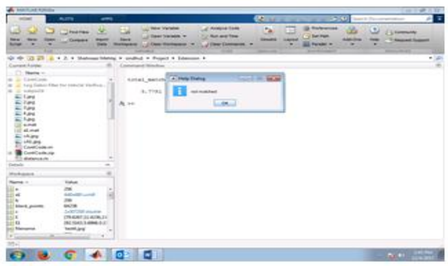

**Figure 6 .** Not matched dialog box

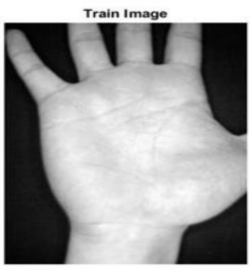


**Figure 7 .** Train image


**Figure 8.** Magnitude and Phase Part of the Train Image

**Figure 9**. Test Image

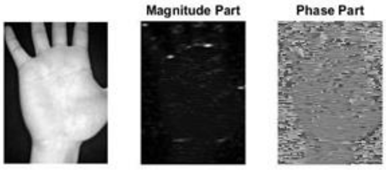


**Figure 10** . Magnitude and Phase Part of the palm

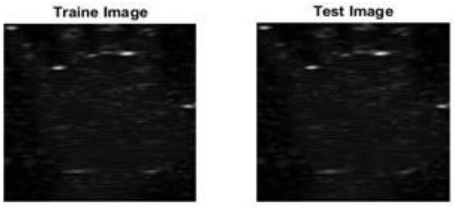


**Figure 11** . Train and Test Image

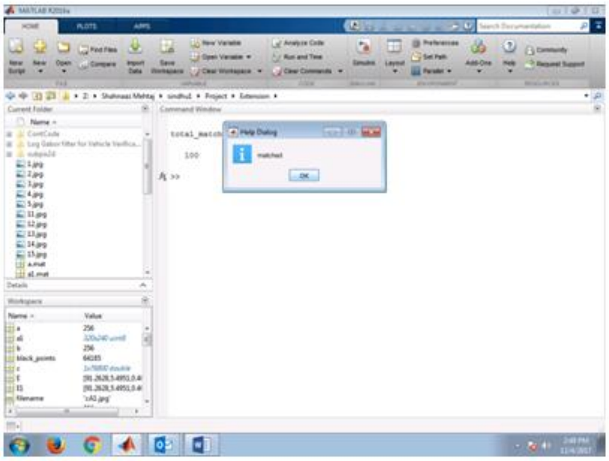

**Figure 12** . Matched Dialog Box

## V. CONCLUSION

This study shows that, the texture of the palm plays an important role in palm print authentication, than principle lines of a palm which has similarity amongst different palms, In this framework the texture analysis of the palm is done by the Gabor filter. Enrollment and verification steps are followed to obtain person identification . Extensive experiments demonstrated that the proposed framework obtains very high accuracy and the use of the texture analysis of the palm print leads to improvement in the accuracy.

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