

REVIEW: PALM RECOGNITION TECHNIQUES

Nancy

Computer Science Engineering Department
Giani Zail Singh PTU Campus Bathinda, India
nancytaneja225@gmail.com

Abhilasha

Computer Science Engineering Department
Giani Zail Singh PTU Campus Bathinda, India
abd_jain@rediffmail.com

Name of Department

Abstract—Palm recognition system is used in order to improve the performance and reliability. The physical dimensions of a human palm contain evidence that is capable of verifying the identity of an individual. Palm geometry based verification systems utilize the geometric features of the palm like length and width of the palm, diameter, area and perimeter. The biometric system is a confirmation system which utilizes these palm geometry features for user authentication. It is being extensively used in various applications like attendance, access control, anti-pass back, point-of sale and interactive kiosks etc. The main objective of designing this system is security. In this paper various techniques of Palm Recognition has been presented.

Keywords— Biometrics, Palm Print.

I. Introduction

Biometrics plays an gradually important part in confirmation and verification systems. The practices of biometric recognition allow the verification of individual based on the physical or behavioral characteristics. Different technologies were developed such as palm, fingerprint, retina, iris, voice, face, hand and signature. Palm has many advantages compared to other technologies. Firstly, the captured device has to be less expensive than that for iris recognition, the palm characteristics are more numerous than those of other technologies like fingerprints, iris, retina and they can be specified with low resolution images. Moreover, this system is well accepted by users

Automatic personal verification is a substantial component of security systems with many challenges and real-world applications. The improvements in biometric technology have led to the very swift growth in individuality verification. This paper presents an approach to personal identification using palm geometry. Palm geometry based biometric systems are ahead acceptance in low to medium safety applications. Some palm acknowledgment systems test the entire palm, while others allow the palm image to be

segmented in order to improve performance and consistency. In general terms, consistency and correctness is improved by searching smaller data sets. Palm systems categories data based upon the location of a friction ridge area as shown in Figure 1. Computer-aided personal acknowledgment is becoming progressively important in our information society, and in this field biometrics is one of the most significant and dependable methods. A palm is the inner-surface of the hand between the wrist and the fingers. A palm print is divergent as the prints on a palm, which are mainly poised of the texture patterns, datum points ridge, valley points.

Early works in automatic palm print verification utilized palm print images obtained off line[1,2,3,4], while the newer systems usually obtain palm print image by using a scanner or a CCD camera. In general, methods for palm print recognition can be divided into feature-based and appearance-based approaches. Feature-based approaches localize points of interest on the palm image or use other methods to locate and excerpt local features, where appearance-based approaches perceive the entire palm image as a feature vector.

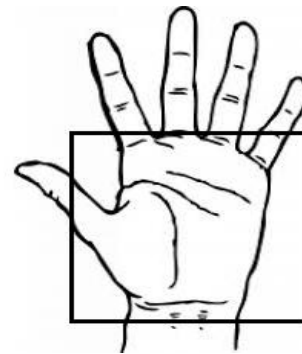


Figure 1: Palm

II. APPROACHES OF PALM RECOGNITION

Feature-Based Approaches: - It can be extracted from palm print images and use for acknowledgment. These features include:

- □ Geometry features like area, height, width, diameter, perimeter of palm.
- Principal lines
- Wrinkles, which are slighter and less regular than principal lines.
- □ Deltapoints, distinct as the centers of delta-like regions inside the palm,
- □ Minutiae, which are like the features typically extracted from fingerprints and require a high Steadfastness input image to extract.

In Shu and Zang [1]discusses number of features that are extracted from palm print images and used for image recognition. In their offline system, user used palm height and width, as well as features of principal lines. On small database considering 48 honest persons and 844 pretender experiments, and achieved results as FAR=0% and FRR=0%.

Zhang and Shu[2]considered datum points to align the coordinates of different palm prints. Principal Lines were also used for recognition. They experimented the system with database of 20 images and results with FAR=0% and FRR=0% were obtained.

Duta et al.[3] used feature points and corresponding orientation was extracted for each palm and then matching was done. The system was tested on 30 palm images and mTER= 5.7% was obtained as a result.

You et al.[4] presented a hierarchical palm print identification system which is based on global texture energy. The system was tested on 200 palm print images and average recognition of 95% was obtained.

Han et al.[5]proposed a palm print verification system which used palm print images obtained by table scanner. Palm print features are mined using Sobel Edge Detection and morphological operations. Various approaches were used like template matching and neural networks. Results obtained were efficient i.e. FAR and FRR below 10% with template matching and below 2% using back propagation neural networks.

Zhang et al.[6] presented a palm print recognition system which used palm print images obtained by CCD cameras. It considered valley points and used 2D Gabor filter. Experiments were conducted on database of 193 persons. Results were calculated on various operating

modes of Biometric System i.e. FAR=0.04%, FRR=2% was obtained in verification mode and in identification mode results obtained were FRR=3%, FAR=0.1%. The system was further extended to multiple Gabor filters. Here, Hamming Distance was used to compare fusion codes of different palm prints. The improved system was experimented with 284 persons. Results obtained after utilizing fusion codes were FAR=0.014% and FRR=3.66%.

Appearance Based Model- It detects the entire palm image as a vector i.e. with pixel intensities as its components. This vector is usually exposed to different alterations in order to select a small feature set suitable for verification.

Previously approaches usually used fixed transforms like Fourier Transforms [7] whereas latest approaches use transformations which maximize some criteria function on training data set in order to choose the finest features.

These transformations includes Principal component Analysis(PCA)[8,9], linear discriminate analysis(LDA)[10] and component analysis(ICA)[11]

III. TECHNIQUES OF PALM RECOGNITION

A. Ridge based matching

A matching using the ridge characteristics in form of finger code consists in calculating the difference of two finger code vectors (query and reference). However, before relating the finger code it is important to align the fingerprint images, which is truly a big problematic, as in the case of other methods. In some case the distinctiveness may be used for that purpose(shown in Figure 2). A finger code also may be used as a corresponding to minutiae based method in order to progress the overall matching accuracy. The innovative approach of this method used considering as center the core point and circular finger codes. The final consequences of the finger code modification are regulated and averaged using the 8 strategies and obtained a value that varies from 0 to 1. The lower the score the more comparable are the fingerprint. Some threshold value are used to adopt whether there is matching or not.



Figure 2: Ridge Based Matching

B. Minutiae Based Matching

This is the most prevalent and widely used in profitable applications, because of its upright presentation and low calculation time, especially for good excellence images. This technique tries to support the minutiae of the query template and reference template and discover the number of coordinated minutiae. After arrangement, two minutiae are measured in matching if the spacial distance and direction alteration between them are smaller than a given broadmindedness. A precise aligning of fingerprint is very significant in order to exploit the number of matched minutiae; this requires the calculating of the transformation and alternation information, as well as other geometrical alterations such as scale and falsification. In order to compute professionally aligning information there has been proposed many methods. In this section we present a technique that uses segments (formed by minutiae) instead of inaccessible minutiae. A segment is shaped by two pair of minutiae of the same fingerprint, the way how the set of segments are created may vary. The figure below displays the segments created from the set of minutiae.

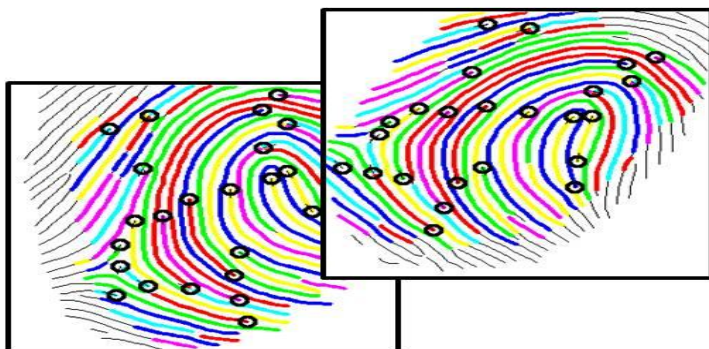


Figure 3: Minutiae Based Matching

C. Correlation based matching

Correlation based corresponding is used to match two palm prints. The palm print are associated and calculated the correlation for each consistent pixel, however as the movement and rotation are unknown it is essential to apply the correlation for all possible arrangements. The distinctiveness information may be useful in order to find an estimated alignment. The main drawback of this method is its computational involvedness and less forbearance to non-linear alteration and contrast variation. There has been proposed some substitute that calculates the correlation locally instead of globally, in which only stimulating regions (e.g., minutia and singularity regions) are designated and matched.

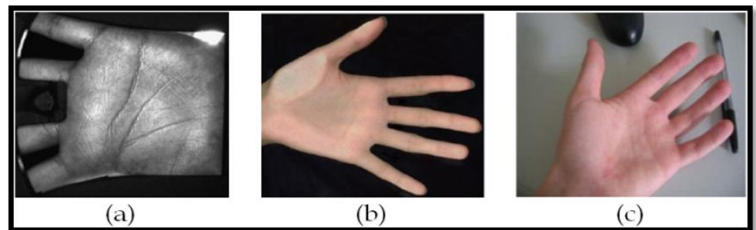


Figure 4: Correlation based matching

D. Active shape model

Active shape models (ASMs) are geometric models of the shape of objects which iteratively distort to fit to an example of the object in a new image, established by Tim Coots and Chris Taylor in 1995. The shapes are embarrassed by the PDM (point distribution model). Statistical shape model to vary only ways seen in a training set of labeled examples. The shape of an object is signified by a set of points. The ASM algorithm purposes to match the model to a new image. It works as:

- □ Look in the image about each point for a improved position for that point
- □ Update the model constraints to finest match to these new found positions

To locate a better location for each point one can look for robust edges, or a match to a statistical model of what is expected at the point. The original practice suggests using to Mahalanobis distance perceive a improved position for each milestone point.

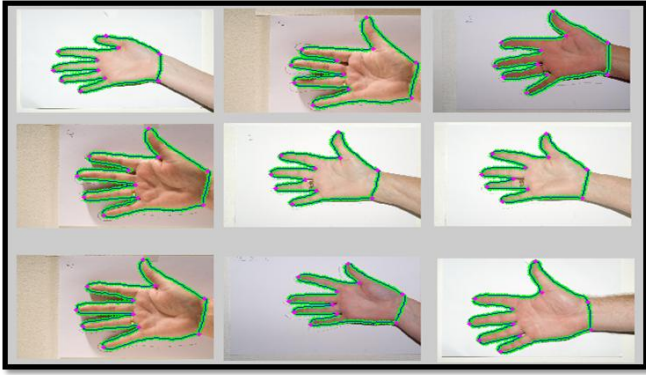


Figure 5: Active Shape Model

E. Phase based palm print recognition algorithm

Palm print recognition algorithm using phase based image identical. The usage of the phase components in 2D (two dimensional) discrete Fourier transforms of palm print images makes imaginable to achieve highly robust palm print recognition. Experimental valuation using palm print images clearly validates an efficient matching enactment of the proposed algorithm. The method has been successfully applied to sub-pixel image recording tasks for computer vision applications.

F. Rotation and displacement alignment

Alternation and movement between the registered image and the input image in order to achieve the high-performance palm print matching. At first, we decrease the effect of background mechanisms in palm print images by smearing 2D spatial window to the two image registered image and input image. The 2D Henning window is applied at the center of gravity of each palm print to align the two images recorded image and input image correctly. The center of gravity of each palm print is spotted by using $n1$ -axis projection and $n2$ -axis projection of pixel values. The palm print images, registered image and input image, after applying 2D Henning window.

G. Common region extraction

To excerpt the covered region (intersection) of the two images. This process progresses the correctness of palm print matching, since the no overlapped areas of the two images become the uncorrelated noise constituents in the BLPOC function. In order to identify the active palm print areas in the registered image and the input image, we observe the $n1$ - axis projection and the $n2$ -axis projection of pixel values. Only the common actual

image areas, with the same size are extracted for the succeeding image equivalent step.

H. Palm print matching

We compute the BLPOC function between the two extracted images and estimate the matching score. The matching score is the maximum peak value of the BLPOC function.

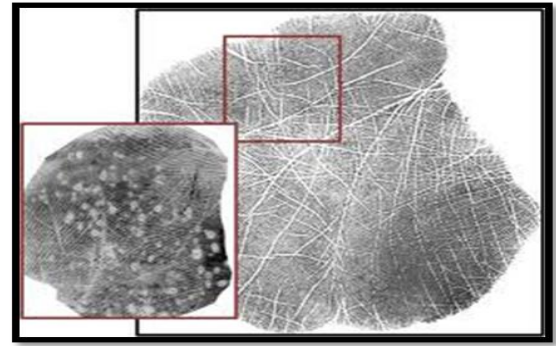


Figure 6: Palm Print Matching

I. Fuzzy clustering method

Fuzzy clustering is a class of algorithms for cluster analysis in which the provision of data points to clusters is not "hard" (all-or-nothing) but "fuzzy" in the similar sense as fuzzy logic. In hard clustering, data is divided into distinctive clusters, where each data element belongs to exactly one constellation. In fuzzy clustering is also referred to as soft clustering, data elements can fit to more than one cluster, and related with each element is a set of attachment levels. These postulate the power of the association between that data element and a particular cluster. Fuzzy clustering is a process of conveying these membership levels, and then using them to allot data elements to one or more clusters.

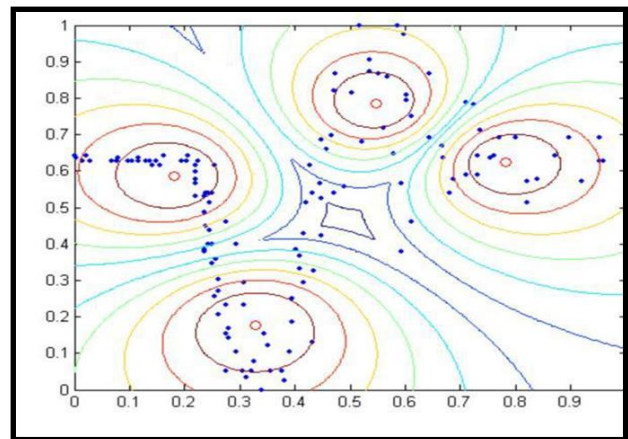


Figure 7: Fuzzy clustering method

J. Fuzzy c-means clustering

In fuzzy clustering, each point has a grade of fitting to clusters, as in fuzzy logic, rather than belonging completely to just one cluster. Thus, points on the edge of a bunch may be in the collection to a lesser degree than points in the center of cluster.

IV. CONCLUSION

Palm recognition can be used with segmented images in order to increase the performance and reliability. Palm recognition can use various characteristic like datum points, valley points, principal lines, ridges, curves, wrinkles etc. Palm Verification uses two approaches 1) Feature Based Approach is used for locating region of interest on palm image whereas 2) Appearance Based Approach takes into consideration the entire palm image. In this paper various techniques of palm verification are discussed. Each technique has its own advantages and disadvantages. It has been found after analysis that active shape model is one of the best palm recognition techniques.

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Images

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