A Review on Authentication Using Palmprint

Madhavi A.Gulhane, Dr.G.R.Bamnote

Abstract— Palmprint has proved to be an important biometrics for personal authentication. Palmprint can be recognized using five steps palm image acquisition, pre-processing, feature extraction, enrolment (database) and matching. Furthermost of the studies has been done in palmprint identification due to its substantiality, reliability and exclusivity. This paper elaborates about the number of research works introduced to capture the difficulties encountered in each stage of palm print verification. Our study on palm print identification highlights on verifying the palm print in different types of schemesconvolved.

Index Terms— Palmprint identification, biometric authentication system, person verification, Biometrics, security

1 Introduction

Over the past decade Biometric authentication has been been receiving much interest with rising demands in in automated personalrecognition. Within many of of biometric techniques, palm image recognition is one of the most trustworthy approaches.

Palmprints have various advantages compare to other hand-based biometric technologies, for instance fingerprints and hand geometry. Forging a palmprint is more difficult than forging a fingerprint since the palmprint texture is more complicated; and one rarely departs his/her complete palmprint somewhereaccidentally. Palm usually contains three flection creases (principal lines), secondary creases (wrinkles) and ridges. Palmprints are assumed to have the critical properties of universality, exclusiveness, permanence and accumulability for person authentication [1].

The three main flection are genetically hooked the many of other folds are not [2]. Even identical twins have dissimilar palmprints [2].These non-genetically finalized and composite design is effective in personal identification. Palm area contains huge number of features such as principal lines, datum point features, wrinkles, texture and minutiae [3]. Palmprint identification system utilizes high or low resolution images.

Figure 1 shows different features of palm. Palmprint contains three principal lines which divides palm into three regions: Interdigital, Hypothenar and Thenar.The Heart line is belowInterdigital region .The Thenar lies below the Life line. Hypothenar is among Heart and Life line.Principal lines, minutiae, ridges features can be evoked for identification from palmprint.

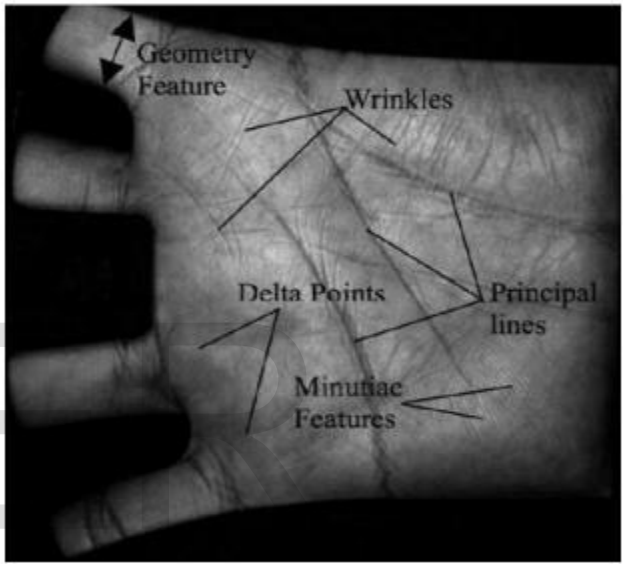

Figure 1. Features of Palm.

2 Literature Review

As Early researches on fast palmprint identification are based on following different approaches mainly ApproachesBased On Transformation,Approaches Based On Palm Strokes,Approaches Based On Appearance,Approaches Based on Numerical Statistics.

A large amount of research has been done in the palmprint recognition field, where researchers have proposed numerous methods for palmprint recognition. G. Lu, D. Zhang and K. Wang [5] has proposed palmprint recognition by means of Eigen palms features, where original image of palmprint is altered into the feature space i.e. Eigen palm with the aid of K-L transform. Euclidean distances classifier is used for harmonizing of recognition template and master template.

Cappelli, Ferrara, and Maio [6] proposed high resolution palmprint recognition scheme which is based on minutiae extraction.From its background pre-processing is done by segmenting an image. To improve the quality of image, local frequencies and local orientations are evaluated. Minutiae fea-

• *Madhavi A.Gulhane is currently pursuing masters degree program in CSE at PRMIT&R, Badnera, Amravati. E-mail: madhavigulhane@gmail.com*

• *Dr.G.R.Bamnote is Professor at Department. of CSE PRMIT&R Badnera, Amravati E-mail: grbamnote@rediffmail.com*

ture is taken out in feature extraction phase. To extract the minutiae attributes contextual filtering with Gabor filters approach is applied.For matching the minutiae features Minutiae cylinder code has been exercised.

Kong, Zhang and Li [7] have proposed palmprint verification by means of 2-DGabor filter for feature extraction from palmprint. Boundary tracking algorithmas well aslow pass filter is applied in the pre-processing of the image. Texture feature is extracted via the texture-based feature extraction technique which uses the 2-D Gabor Filter. Palmprint matching is based on the principle of normalized hamming distance.

Huanga, Jiaa and Zhang [8] have proposed the palmprint authentication system based on principal line extraction. Modified finite Radon transform has been employed for feature extraction. The feature which is considered is principal lines. For comparing of test image with a training image the line matching technique has been used which is based on the pixel-to-area algorithm.

Zhang, Kong, You and Wong [9] had proposed Online Palmprint Identification. The proposed scheme takes online palmprints, and utilizes low resolution images. Low pass filter in addition to boundary tracking algorithm is used in the preprocessing phase.

Konga, Zhanga, and Kamel [10] have introduced palmprint identification using feature level fusion. Multiple elliptical Gabor filters with diverse orientations are used to extract the phase information.

Jiaa, Huanga and Zhang [11] have projected palmprint verification based on the robust line orientation code. Modified finite Radon transform has been utilized for feature extraction, which extracts the orientation features. For matching of test image with the training image the line matching scheme has been used which is based on the pixel-to-area algorithm.

Dai and Zhou [4] has introduced high resolution approach for palmprint recognition by means of multiple features extraction. Features similar to minutiae, density, andorientation with principal lines are taken for feature extraction. For orientation assessment the DFT and Radon-Transform-Based Orientation Estimation are used. Forminutiae extraction Gabor filter is used for ridges improvement according to the local ridge direction and density.

Palm Strokes based approaches either develop edge detectors or use existing edge detection methods to extract palm lines [12, 13, and 14]. These lines are either matched directly or represented in other formats for matching. Wu et al. use Sobel masks to compute the magnitude of the palm lines [15].

The magnitude are projected along the x and y directions to form histograms. They designed two masks to compute the first order derivative and second order derivative of palm print images. The first order and second order derivatives can be obtained by rotating the two masks.

Also, Image alignment is an important step in various biometric authentication applications such as palmprint recognition. Most of the existing palmprint alignmentmethods make use of some key points between fingers or in palm boundary to establish the local coordinate system for region of interest (ROI) extraction. The ROI is consequentlyused for feature extraction and matching. To improve the palmprint verification accuracy, some researches mentioned present an efficient palmprint alignment refinement method.

Appearance based method is also called Sub-spacing based approach, generally involve principal component analysis (PCA), Linear discriminate analysis (LDA) and independent component analysis (ICA).The subspace coefficient are considered as features .In addition to applying PCA, LDA and ICA directly to palm print images, researchers also employ wavelets, Discrete cosine transform and kernel in their method [16], [17], [18], [19].

Dale et al. proposed discrete cosine transform (DCT) based feature vector for palmprint representation and matching compared with DFT and wavelet transform [20].

Such approaches contain two interesting componentFirstly, the directional representation for appearance based approaches. In it, the new representation is robust to drastic illumination changes and preserves important discriminative information for classification.3D palmprint authentications systems also developed using appearance based approaches, as a significant biometric technique.

Statistical approaches are categorized into local and global statistical approaches. Local Statistical approaches transforms images into another domain and divide the transform into several small regions. Local statistics such as means and variances of each small region are calculated and regarded as features [21], [22], and [23].

Yong et al. method for feature extraction divides the palm print image into a set of small regions and then calculates the mean and S.D of sub regions. Euclidian square norm is employed for matching [24]. Researchers compute global statistical features like moments, centre of gravity and density directly from the whole transformed images [25], [26]. Some recent researches prefer to combine these Statistical approaches with supervised learning environment as State-of-the-art algorithms of palmprint recognition describe appearances of palmprints efficiently through local texture analysis.
.

4 THE PROPOSED SYSTEM

Palmprint Recognition System Architecture

Normally a palmprint recognition system can be grouped as below: palmprint scanner, pre-processing, feature extraction and matcher. Palmprint images can be col-

lected using scanner.
Pre-processing is an placement of co-ordinate systemto adjustthe palmprint images, and to separate a fraction of the palmprint image for feature extraction. Feature extraction is to adoptefficient features from the pre-processed palmprints. Finally, a matcher evaluates the two palmprint features.

Palmprint identification refers to one-to-many match, means one input palmprint of an individual is checked with all samples present in database. It conform the identity of an individual. Palmprint based identification can operate in either recognition or validation mode. Palmprint recognitionsystem stages shown in Figure 2 can be grouped into stages which are image acquisition followed by pre-processing followed by feature extraction and finally matching.5

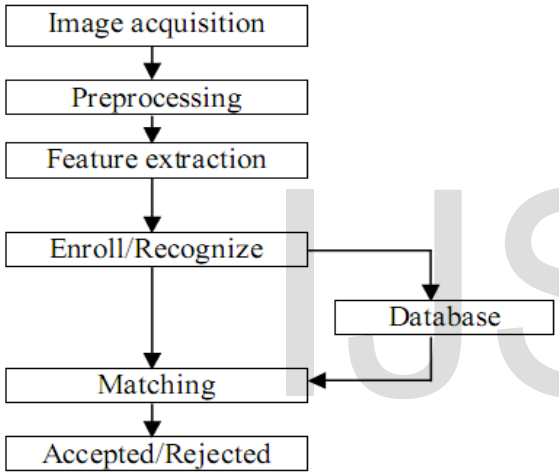

Figure 2. Stages in palmprint recognition

Palmprint identification system Architecture can be representedinto following terms:

a) **Image Acquisition:**
In this phase, using digital cameras image of palmprint is capture. Acquired image may be blurred or it may havedisturbance, which affect the quality of an imageandmay affects the performance rate of palmprint recognition system directly [4]
b) **Pre-processing:**
After capturing the data or image of the palmprint, preprocessing is formed on image. Sometime dissonance is present in the captured image, which can be remove with help of filters in processing phase.
c) **Feature Extraction:**
After proper pre-processing,Feature extraction is carried out. In feature extraction phase features of palm are extracted like minutiae,principal lines,density map, orientation field, texture, singular points etc.

d) Matching:
Matching is the final stage. Feature matching determines the degree of similarity of recognition template with master template [4]. Different approaches are used for matching. Input provided by individual is matched with templates present in database.

5 Conclusion

Because IJSER staff Biometrics is best defined as quantifiable physiological and or behavioural attribute that can be utilized to verify the uniquenessof an individual. Many physiological characteristics of humans, i.e., biometrics, are classically invariant over time, easy to acquire, and unique to each individual. Therefore biometrics is highlyassumed for civilian use and not much restricted to forensic identification. The Palmprint is a important biometric as stable structure that is preserved since birth and is quite exclusive to person, constant to the fluctuation in expression and Immune from anxiety, privacy along with hygiene problems.

A stable and efficient way to highlight the texture in palmprint image is to provide high authentication.

References

[1] K. Jain, P. Flynn, A. A Ross, "Handbook of Biometrics", Springer, USA, ISBN-13: 978-0-38771040- 2, pp.:1-23, 2007.
[2] Kong, D. Zhang and G. Lu, "A study of identical twins palmprint for personal verification", Pattern Recognition, vol. 39, no. 11, pp. 2149-2156, 2006.
[3] D. Zhang, "Palmprint authentication", nowell, mass kluwer academic publishers, 2004
[4] J. Dai and J. Zhou, "Multi feature-Based HighResolution Palmprint Recognition," IEEE Transaction on Pattern Analysis and Machine Intelligence, Vol.33, No. 5, pp. 0162-8828, May 2011.
[5] G. Lu, D. Zhang and K. Wang, "Palmprint recognition using eigenpalms features," Pattern Recognition, Science Direct, pp. 1987–1998, 2003.
[6] R. Cappelli, M. Ferrara, and D. Maio, "A Fast and Accurate Palmprint Recognition System Based on Minutiae," IEEE Transaction on System, Man and Cybernetics- Part B: Cybernetics, Vol. 42, No. 3, pp. 1083-4419, and June 2012.
[7] W. K. Kong, D. Zhang, W. Li, "Palmprint feature extraction using 2-D Gabor Filters," Pattern Recognition, Elesvier, pp. 2339 – 2347, 2003.
[8] Huang,W. Jia, D. Zhang, "Palmprint verification based on principal lines," Pattern Recognition, Science Direct, pp.1316 – 1328, 2008.
[9] D. Zhang, W. K. Kong, J. You, M. Wong, "Online Palmprint Identification," IEEE Transaction on Pattern Analysis and Machine Intelligence, Vol.25, No. 9, pp. 0162-8828, Sept 2003.
[10] Konga, D. Zhang, M. Kamel, "Palmprint identification using feature-level fusion," Pattern Recognition, Science Direct, pp. 478

– 487, 2006.
[11] Huang,W. Jia, D. Zhang, "Palmprint verification based on robust line orientation code," Pattern Recognition, Science Direct, pp. 1504 – 1513, 2008.
[12] F. Li, M.K.H. Leung and X. Yu, "Palmprint identification using Hausdorff distance", in Proceedings of International Workshop on Biomedical Circuits and Sy stems, pp. S3/3- S5-8, 2004.
[13] X. Wu, K. Wang and D. Zhang, "Line feature extraction and matching in palmprint", in Proceeding of the Second International Conference on Image and Graphics, pp. 583-590, 2002
[14] X. Wu, K. Wang and D. Zhang, "Fuzzy direction element energy feature (FDEEF) based palmprint identification", in Proceedings of International Conference on Pattern Recognition, vol. 1, pp. 95-98, 2002.
[15] X. Wu, K. Wang, D. Zhang, Line feature extraction and matching in palmprint, in: Proceeding of the Second International Conference on Image and Graphics, 2002, pp. 583–590.
[16] T. Connie, A.T.B. Jin, M.G.K. Ong, D.N.C. Ling, An automated palmprint recognition system, Image and Vision Computing 23 (5) (2005) 501–515.
[17] X. Wu, D. Zhang, K. Wang, Fisher palms based palmprint recognition, Pattern Recognition Letters 24 (15) (2003) 2829–2838.
[18] G. Lu, D. Zhang, K. Wang, Palm print recognition using Eigen palms features, Pattern Recognition Letters 24 (9) (2003) 1463–1467.
[19] L. Zhang, D. Zhang, Characterization of palm prints by wavelet signatures via directional context modeling, IEEE Transactions on Systems, Man and Cybernetics, Part B 34 (3) (2004) 1335–1347.
[20] D. Zhang, W.K. Kong, J. You, M. Wong, On-line palmprint identification, IEEE Transactions on Pattern Analysis and Machine Intelligence 25 (9) (2003) 1041– 1050.
[21] C.C. Han, H.L. Cheng, C.L. Lin, K.C. Fan, Personal authentication using palm-print features, Pattern Recognition 36 (2) (2003) 371–381.
[22] J. You, W.K. Kong, D. Zhang, K.H. Cheung, On hierarchical palmprint coding with multiple features for personal identification in large databases, IEEE Transactions on Circuits and Systems for Video Technology 14 (2) (2004) 234–243.
[23] G. Lu, K. Wang, D. Zhang, Wavelet based feature extraction for palmprint identification, in: Proceeding of Second International Conference on Image and Graphics, 2002, pp. 780–784
[24] G. Lu, D. Zhang, K. Wang, Palm print recognition using Eigen palms features, Pattern Recognition Letters 24 (9) (2003) 1463–1467.
[25] X. Wu, D. Zhang, K. Wang, Fisher palms based palmprint recognition, Pattern Recognition Letters 24(15) (2003) 2829–2838.
[26] J.S. Noh, K.H. Rhee, Palmprint identification algorithm using Hu invariant moments and Otsu Binarization, in: Proceeding of Fourth Annual ACIS International Conference on Computer and Information Science, 2005, pp. 94–99.