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Personal Identification Using Left and Right Palmprint Images: A Survey

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Abstract: ***The survey on palmprint has been investigated over many years. In this paper we have surveyed different feature extraction and matching algorithm for personal identification. Various researches based on the multibiometrics those combining left and right palmprint images, which will provide higher identification accuracy comparing to single biometrics. The methodologies that has been adopted by the researches are 2DPCA, nonlinear rank-level fusion, novel fusion, canny edge detection algorithm, novel framework, SIFT and OLOF algorithm. These papers has been reviewed and presented in the subsequent section below. This paper provides an overview of current palmprint research, image capture device, preprocessing technique, and varieties of feature extraction algorithm and matching algorithm. Finally some suggestions are also provided based on the theoretical study.***

Keywords: ***Biometrics, Multibiometrics, Palmprint, Person Identification, Feature Extraction, Charge Coupled Device***

I. INTRODUCTION

Biometrics is usually associate with the use of physiological and behavioural characteristic of people such as fingerprint, face, iris gait and voice, for personal identification, which provides better result compare to non-biometric method such as password, PIN, and ID cards [1]. It is a powerful technology for applications, such as e-commerce, banking and homeland security etc. biometrics system can be either 'person identification' and 'person verification (authentication)'. Identification is a process to determining the individuality of a person from a scene including different background where as authentication means recognizing a person from a group of person [2]. The survey of Fingerprint-based personal identification method has been exploration over many years. Recently, voice, face, and palm print-based verification has been studied extensively [2].

Palmprint identification is the process of matching the unknown palmprint against a database of known prints to establish a person identity. Palmprint is the inner surface pattern of human hand, including a number of discriminating features, such as principle lines, wrinkles, ridges, minutiae point, singular points, texture, etc. Compared with fingerprint, palm area is much larger; hence more distinctive features can be captured [1], [3]. There are two methods for capture the palmprint images: offline and online. An offline palmprint identification system palm images are collected by ink on to the paper. In the past few years, some researchers have worked on offline palmprint images, which are obtained useful result. Recently work on online palmprint that are captured by scanner, digital camera or CCD (charge-couple device) cameras that is typically connected directly to the identification system [1], [4]. In past decades various palmprint identification method are proposed, such as coding based method, principle curve method and subspace based method. In recent years, 2D appearance based method such as 2D Principal Component Analysis (2DPCA), 2D Linear Discriminant Analysis (2DLDA), 2D Locality Preserving Projection (2DLPP) and Scale Invariant Feature Transform (SIFT) have been used for palmprint identification [10] .

Biometrics system based on a single biometric characteristic are called unimodal biometric system. Unimodal biometric system uses a single biometric trait of person and it cannot gives as perfect identification and has various problems

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such as noisy data, spoof attack, non universality and unacceptable error rate. To overcome this disadvantage by using two or more unimodal biometrics as multimodal biometrics system it increases the performance of the biometric system and accuracy more than unimodal biometrics. Multi-biometrics system uses five different methods for solving single biometric disadvantages: multi-sensor, multi-presentation, multi-instance, multi-algorithm and multi-modal. Multi-biometrics system gives higher identification accuracy than unimodal biometrics, so it is more suitable for some real world personal identification applications that need high standard security. Combining the left and right palm print image perform multi-biometric and can obtain better result than the single biometrics and increase robustness to fraudulent technologies [5], [10].

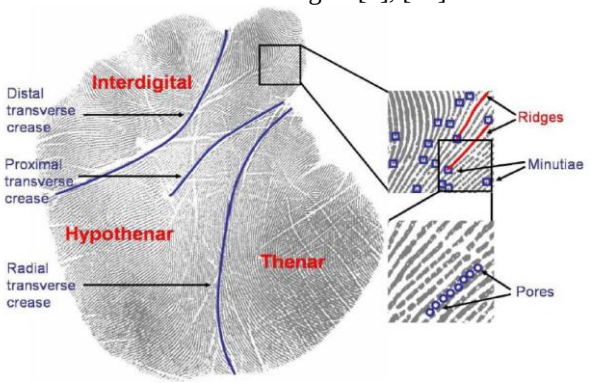

Figure 1: Palmprint Image with Principal Lines, Wrinkles, Minutiae point and Ridges

II. METHODOLOGY

W. Yu and Zhang et al. Proposed palmprint recognition based on 2DPCA. In this paper, Two-Dimensional Principal Component Analysis (2DPCA) is used for feature extraction. 2DPCA based on identification process includes collection, preprocessing, feature extraction and matching. In collection stage PolyU palmprint database contain 392 different palms with 10 samples for each palm have different degree of rotation and translation. In preprocessing step RGB image is converted into gray scale image and noise will be removed. After preprocessing, feature extraction done by using 2DPCA algorithm and used as a cosine distance from the palm prints to identify the classifier. The resulting performance of 2DPCA algorithm has more recognition accuracy than PCA. But the disadvantage of 2DPCA has no more storage efficiency [6].

Ajay Kumar et al. proposed a personal identification using multibiometrics rank-level fusion. In this paper exploration a new approaches for the personal identification using rank-level multiple biometrics representation. Rank-level combination system suitable for combining ranked identities for multiple palmprint representation and can achieve significant improvement performance as compared to the individual representation. The various rank-level combination schemes include such as Borda count, Logistic regression/Weighted Borda Count, and highest rank method, Bucklin majority voting and nonlinear approach. Borda count method is commonly used method for unsupervised rank–level fusion based on generalization of majority vote. The expected performance from the different palmprint is not the same, Therefore the Borda count method can be modified by assigning weights in the ranked output from the individual palmprint matcher using weighted borda count method. Bucklin method suggest the James Bucklin, this method is slightly modified and the procedure is repeated until all the candidate users get some rank. The nonlinear fusion approach is highly effective and gives better result than the other approaches [7].

Jifeng Dai and jie Zhou et al. proposed multifeature-based high resolution palmprint recognition. In this paper, A novel recognition algorithm used for high –resolution palmprint to achieve higher identification rate. By using composite algorithm, the orientation field can be extracted. There are three initial estimation methods commonly used such as gradient-based method, Discrete Fourier Transform (DFT), and Gabor-filter-based method. These three methods studied in depth it takes high processing time and not suitable for processing print with a large image size or online application. Multifeature introduces the extraction of minutiae, density map, and principal line map. There are three step can be perform to extract minutiae, first the ridges are enhanced by the Gabor filter then image is binarized than finally, minutiae are extracted as a ending and bifurcations points of ridge lines. The density map is extracted orientation field by using composite algorithm. Principal line map, discriminative power provides independent global information of the palmprint. In case of palmprint, matching of minutiae, orientation, and density map have much larger size compare to fingerprint than the accuracy of only using orientation field is much higher than that of principal line map, the discriminative power of their combinations with minutiae is almost the same in verification [8].

Sumangala Biradar et al. proposed a personal identification using palmprint biometrics based on principal line approach. In this paper, in preprocessing a Gaussian filter is used for smoothing the palmprint image and canny edge detection algorithm is used for extracting principal line feature for personal identification. Edge detection operation is very important in image processing programs because it allows object separation and shape detection. In this operation principal line are extracted and resulting image is obtained. After feature extraction matching is done between the stored templates and the test palmprint image. The performance parameters, False acceptance rate (FAR), Genuine acceptance rate (GAR), and False rejection rate (FRR) are calculated and compared with Modified Finite Radon Transform (MFRAT). The experimental result shows that the canny edge detection algorithm is faster than the MFRAT but accuracy is less than MFRAT [9].

Yong Xu et al. proposed a combining left and right palmprint images for more accurate personal identification. In this paper, multibiometrics is used for high-standard security. A novel framework to perform multibiometrics by combining the left and right palmprint images, moreover the proposed weighted fusion scheme allowed perfect identification performance to be obtained in comparison with different palmprint identification method. Line Based Method: each palm has three principal lines heartline, headline, and lifeline these can be extracted by using Gabor filter. Line based

methods use lines and edge detector to extract the palmprint lines and then to perform palmprint verification and identification. Subspace Based Method: These methods include principal component analysis (PCA), linear discriminant analysis (LDA) and independent component analysis (ICA). PCA algorithm is useful for identify pattern and reduce error rate of the system. Coding Based Method: In this approach Gabor filter is commonly used, phase and orientation feature have been encoded bitwise for high speed matching. In this paper, since the preprocessing of the left training palmprint, right training palmprint and reverse right training palmprint can be performed before palmprint identification then the computational cost is high compared to the individual palmprint identification method [10].

V. Lavanya et al. proposed a personal authentication using the combination of left and right palmprint images. In this paper, multibiometrics performs combining the left and right palmprint images. Palmprint identification system consist four levels: palmprint scanner, preprocessing, feature extraction and matcher. Palmprint scanner collects the left and right palmprint images then by preprocessing color RGB image is converted into gray scale image. After preprocessing, Scale Invariant Feature Transform (SIFT) and Orthogonal Line Ordinal Features (OLOF) algorithm used for feature extraction. SIFT algorithm study about local information around several key points in palmprint images. The features extracted by SIFT based method is insensitive to the scaling, rotation, projective and illumination factors, which obtained significant better result for contactless palmprint images. OLOF approach is useful for global information of palmprint image. The comparison of OLOF method with several competing method, OLOF present significantly improved better result. The framework, contain three types of matching score, which are obtained by left palmprint matching, right palmprint matching and crossing matching between the left query and right training palmprint are fused to make the final decision [11].

III. WORKING PRINCIPAL

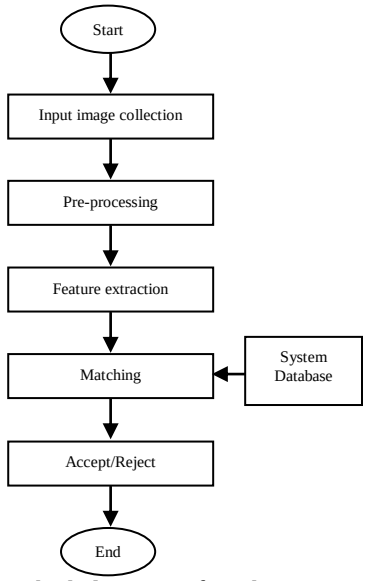

Figure 2: Block diagram of working principal

A. INPUT IMAGE COLLECTION

For personal identification Left and Right palmprint image are collected with the help of palmprint scanner. Palmprint image collected with two different sources touch-based and contactless. Digital cameras and video cameras are two ways to collect palmprint image without contact. CCD-based and digital scanner is touch-based scanner. CCD-based palmprint scanner developed by the Hong Kong Polytechnic University. It capture high quality palmprint image [1], [4].

Figure 3: CCD-based palmprint scanner

B. PREPROCESSING

Preprocessing is the process of converting an RGB image into Gray scale image. Blurring of image, distortion will be removed by filters such as low pass filter (LPF), median filter, and Gaussian filter etc. preprocessing is also used to crop the region of interest (ROI) for feature extraction. This is done in five steps:

- ✓ Binarizing the palm image
- ✓ Boundary tracking
- ✓ Key point's detection
- ✓ Establishing a coordination system
- ✓ Extracting the central part

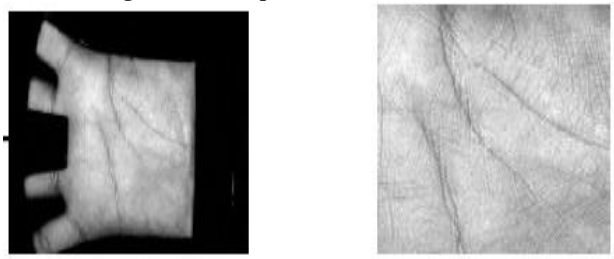

Figure 4: ROI extraction

C. FEATURE EXTRACTION

After preprocessing, feature extraction is most important step for palmprint identification. In this step, relevant features such as principal line, wrinkles, ridges, minutiae point and texture are extracted from the central palm area obtained. These features are extracted with different algorithm like coding based method, principal curve method, subspace based method, 2D Linear Discriminant Analysis (2DLDA), 2D Locality Preserving Projection (2DLPP) and Scale Invariant Feature Transform (SIFT).

D. MATCHING

Matching is a process to calculate degree of similarity between input test image and a training image from the database i.e., training and test image to obtained the most matched image that is stored in database (NIST BBSR1, PolyU, IITD) to find that whether authorized person's identification is available or not.

E. ACCEPT/REJECT

The users are authenticated by the palmprint identification system. These accept the users, who are authenticated, i.e. whose palmprint match with a palmprint present in the database. If the user is not authenticated, then the user is rejected. This accepting and rejecting process is done on the basis of matching algorithm and this matching is done on the basis of extracted features.

IV. APPLICATIONS

- ✓ It is used for personal identification in security for banking, lockers etc.
- ✓ Used as keyless entry system in automobiles' such as Car, Bus

V. RESULT ANALYSIS

As, a result analyze comparing to different personal identification methods with their parameter. Table below gives the comparison study of different methods in previous researches.

VI. CONCLUSION

Palm print image contains much information regarding the identification of a person. Several existing methods have been reviewed for palmprint identification, which provides the review on unimodal and multimodal system. Zhang Proposed a 2DPCA method, these provide high recognition rate than PCA method but no more storage efficiency. Yong Xu, V. Lavanya and Many researches provide multimodal system by combining left and right palmprint images, which gives better overall performance compared to unimodal system and high-Standard security. Single palm print images have already been utilized for the purpose of person identification, while for the same multi biometrics method can also be utilized. In this case images of both the palm can be utilized for the purpose of personal identification. Fuzzy logic approach can be another method for the accurate and enhanced method.

Author	Method	Database	Parameters	Values
W. Yu, H. He, and Zhang et al. [6]	2DPCA, Cosine Distance	PolyU	Recognition rate	99.14%
Ajay Kumar et al. [7]	Nonlinear rank-level fusion	NIST BSSR1	Recognition rate	99.76%
Jifeng Dai and Jie Zhou et al. [8]	Novel fusion, Composite algorithm	THUPALMLAM	Recognition rate	91.7%
Sumangala Biradar et al. [9]	Canny edge detection algorithm	PolyU	Accuracy	85%
Yong Xu et al. [10]	Novel framework, Palmcode	PolyU, IITD	Error rate	2.90%
V. Lavanya[1], S. Sumathi[2] et al. [11]	SIFT and OLOF	PolyU, IITD	Error rate	0.58%

Table 1: Comparison of Previous Results

REFERENCES

[1] D. Zhang, W.-K. Kong, J. You, and M. Wong, "Online palmprint identification," IEEE Trans. Pattern Anal. Mach. Intell., vol. 25, no. 9, pp. 1041–1050, Sep. 2003.
[2] A. K. Jain, A. Ross, and S. Prabhakar, "An introduction to biometric recognition," IEEE Trans. Circuits Syst. Video Technol., vol. 14, no. 1, pp. 4–20, Jan. 2004.
[3] Z. Sun, T. Tan, Y. Wang, and S. Z. Li, "Ordinal palmprint represention for personal identification [represention read representation]," in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., vol. 1. Jun. 2005, pp. 279–284.
[4] D. Zhang, Z. Guo, G. Lu, D. Zhang, and W. Zuo, "An online system of multispectral palmprint verification," IEEE Trans. Instrum. Meas., vol. 59, no. 2, pp. 480–490, Feb. 2010.
[5] J. Rama, and P. Malathi, "A study on unimodal and multimodal Biometrics for a person identification," Image processing and pattern recognition, pp. 36-40, 2015.
[6] H. Sang, W. Yuan, and Z. Zhang, "Research of palmprint recognition based on 2DPCA," in Advances in Neural Networks ISNN (Lecture Notes in Computer Science). Berlin, Germany: Springer-Verlag, 2009, pp. 831–838.
[7] A. Kumar, and S. Shekhar, "Personal identification using muitibiometrics rank-level fusion," IEEE Trans. On systems, man, and cybernetics, pp. 1-11, Feb. 2010.
[8] J. Dai and J. Zhou, "Multifeature-based high-resolution palmprint recognition," IEEE Trans. Pattern Anal. Mach. Intell., vol. 33, no. 5, pp. 945–957, May 2011.
[9] Sumangala Biradar, "personal identification using palmprint biometrics based on principal line approach," International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), vol. 2, pp. 2262-2267, July 2013.
[10] Y. Xu, D. Zhang, and L. Fei, "Combining left and right palmprint images for more accurate personal identification," IEEE transactions on Image processing, vol. 24, no. 2, pp. 549–559, Feb. 2015.
[11] V. Lavanya1, S. Sumathi2, "personal authentication using the combination of left and right palmprint images," International journal of innovative research in science, engineering and technology, vol. 5, march 2016.