IDENTIFICATION OF HUMAN THROUGH PALMPRINT: A REVIEW

Shalini Agarwal , Dr. P.C Gupta

ABSTRACT: Palm Print is one of the relatively new physiological biometrics, attracted the researchers due to its stable and unique characteristics. The rich feature information of palm print offers one of the powerful means in personal recognition. Palm print has been the efficient way to identify the identity of a person. In this paper an in depth analysis has been made to find out the work which is done related to this field.

Keywords: Biometrics, palm print, authentication

1.INTRODUCTION

A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database. Depending on the application context, a biometric system may operate either in verification mode or in identification mode. In the verification mode, the system validates a person's identity by comparing the captured biometric data with its own biometric template(s) stored in the system database. In such a system, an individual who desires to be recognized claims an identity, usually via a personal identification number (PIN), a user name, or a smart card, and the system conducts a one-to-one comparison to determine whether the claim is true or not (e.g., "Does this biometric data belong to Bob?"). Identity verification is typically used for positive recognition, where the aim is to prevent multiple people from using the same identity[1]. In the identification mode, the system recognizes an individual by searching the templates of all the users in the database for a match. Therefore, the system conducts a one-to-many comparison to establish an individual's identity (or fails if the subject is not enrolled in the system database) without the subject having to claim an identity (e.g., "Whose biometric data is this?").

Shalini Agarwal, Department of Computer Science, Banasthali University, Rajasthan, India

Dr. P.C Gupta, Department of computer science and informatics, University of Kota., Rajasthan, India

2. BIOMETRIC MODALITIES

Modalities are divided into physiological traits, including fingerprint, face, hand geometry, palm print, and iris biometrics, and behavioral ones, including voice, handwriting, and off- and online signature etc..

2.1 Physiological Biometrics

These are the biometrics which is based on the physical characteristics of the person. Some of the physiological biometrics are explained as follows:

2.1.1 Fingerprint Biometrics:

The finger prints of a person have been used as person identification from long time. A finger print is the pattern of rids and valley on the surface of a finger tip as shown in fig 1(a). The finger prints of the identical twins are different. It is affordable to scan the finger prints of a person and can be used in computer for number of applications. This method is traditional and it gives accuracy for currently available Fingerprint Recognition Systems for authentication.[7][8][9] This fingerprint recognition system is becoming affordable in a large number of applications like banking, Passport etc.
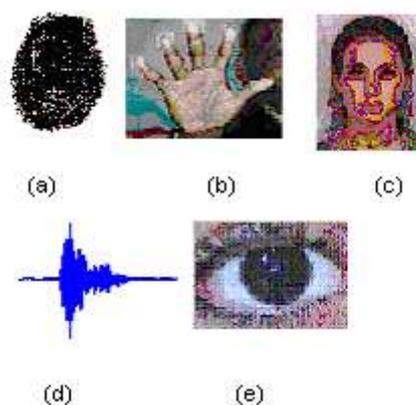

Fig **1. (a) fingerprint (b) hand geometry**

(c) face (d) voice (e) iris

2.1.2 Face Biometrics:

Facial recognition technology is a widely used biometric system. Usually these systems extract certain features from face images and then perform face matching using these features. Specific features of a face include the distance

between the eyes, width of the nose, position of cheekbones, jaw line, chin and so forth as shown in fig 1(c). A face does not have as many uniquely measurable features as fingerprint and eye irises. So facial recognition reliability is slightly lower than these other biometric recognition methods.[10][11][12][13] However, it is still suitable for many applications, especially when taking into account its convenience for user. Facial recognition can also be used together with fingerprint for developing more security-critical applications.

2.1.3 Iris Biometrics:

Iris is biological feature of a human. It is a unique structure of human which remains stable over a person lifetime. The iris is the annular region of the eye. The left and right irises of an individual can be treated as separate unique identifier. The iris information can be collected by iris image as shown in fig 1(e). The accuracy of iris based recognition system is promising. Each iris is believed to be distinctive and even the irises of identical twins are also different. The iris recognition system has become more user friendly and cost effective.[14][15] The iris have a very low false accept rate as compared to other biometrics like finger print, face, hand geometry and voice.

2.1.4 Hand Biometrics

Hand geometry recognition[4] is based on the extraction of a hand pattern that incorporates parameters like finger length, width, thickness, curvatures, or relative location. To obtain these features, an image of the silhouetted hand is needed. The process of capturing this information is normally accomplished through CCD cameras and infrared illumination; the user puts his/her hand on a highly reflective surface, such as a platen, performing an orthographic scanning, consisting of top and side views of the hand shape as shown in fig 1(b). Surface details like texture and fingerprints are ignored for this purpose. Specific hand positioning is forced by using inter-finger pegs or locator pins. Hand geometry requires high collaboration from the users as the hand must be kept flat while scanning.

2.2 Behavioral Biometrics

These kinds of biometrics are explained in the following sections

2.2.1 Voice Biometrics

The voice recognition systems have been currently used in various applications. Voice is a combination of physical and behavioral biometrics. The features of person voice are based on the vocal tracts, mouth, nasal activities and lips movement that are used synthesis of sound as shown in fig 1 (d). These physical characteristics of human speech are invariant for individuals. The behavioral part of the speech of person changes over time due to age, medical conditions, and emotional state. The speaker dependent voice recognition systems are text dependent; and the speaker independent systems are what he or she speaks .The speaker dependent voice recognition system is more difficult to design but provides more protection[5][6].

2.2.2 Handwritten Biometrics

The convenience for paper and pen in the electronic era is the reason why people still use handwriting as a mean to convey, retain, and facilitate communication. Together with this kind of information, handwriting is also a skill that individualizes people [3]. From this point of view, the process of automatically determining who the specific author of a given handwritten text is called writer recognition. Handwritten recognition can be accomplished from two different points of view, depending on whether there is electronic access to the handwriting process or not. If there is, one can digitize the pen's instantaneous information trajectories, and information like pressure, speed, or pen-up movements can be captured; if not, just shape-based image recognition is feasible. The former is also known as online or dynamic handwriting recognition, whereas the latter is often called offline or static recognition.[16][17][18]

3. PALMPRINT RECOGNITION:

Palm prints are stable and shows high accuracy in representing each individual's identity.[2] They have been commonly used in law enforcement and forensic environments. Since the surface of the palm print is larger than the fingerprint, a higher quantity of identifying features can be extracted from the palm print. Moreover, users consider hand biometrics as being user friendly, easy to use, and convenient. Palm print acquisition is based on standard charge-coupled device (CCD)-based optical scanning. During the last years there has been an increasing use of automatic personal recognition systems. Palm print based biometric approaches have been intensively developed over the last 12 years because they possess several advantages over other systems. Palm print images can be acquired with low resolution cameras and scanners and still have enough information to achieve good recognition rates. If high resolution images are captured, ridges and wrinkles can be detected.[19] [20]Forensic applications typically require high resolution imaging, with at least 500 dpi.

Palm prints are one of the biometric modalities possessing all of the following properties:

• **universality**, which means the characteristic should be present in all individuals;

• **uniqueness**, as the characteristic has to be unique to each individual;

• **Permanence**: its resistance to aging;

• **Measurability**: how easy it is to acquire image or signal from the individual;

• **Performance:** how good it is at recognizing and identifying individuals;

• **Acceptability**: the population must be willing to provide the characteristic;

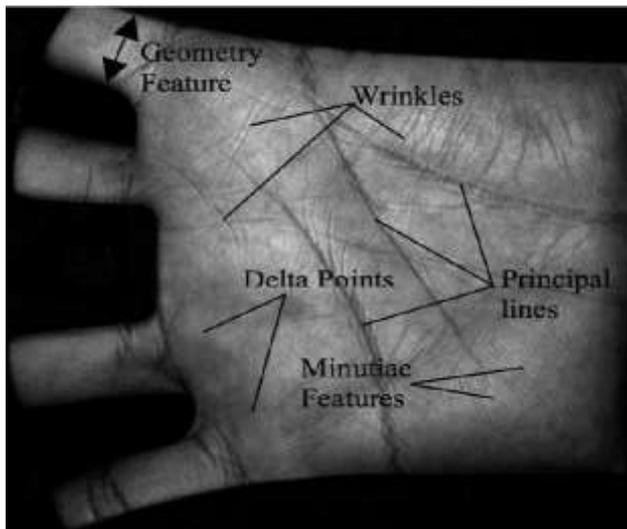• **Circumvention**: how easily can it be forged.

.
Fig. 2 Different Features of Palm

Palm print recognition has been introduced a decade ago. Palm is the inner surface of the hand between the wrist and the fingers. The Palm area contains a large number of features shown in Fig.2 that can be used as biometric features such as Principal lines, geometry, wrinkle, delta point, minutiae, datum point features and texture.. The principle lines are also called as flexion creases. The formation of these lines is related to the finger movements, tissue structures and the purpose of skin. Even the palm prints of identical twins are different[21].

4. STEPS OF IMPLEMENTATION

Palm print implementation is done through the following stages:

- Palm print image acquisition,
- Preprocessing,
- Feature extraction and matching

The palm print image is acquired using a palm print scanner .Preprocessing has two parts, image alignment and region of interest selection. Image alignment is done by referring to the key points. Region of Interest selection is the cropping of palm print image from the hand image .Feature extraction obtains discriminating features from the preprocessed palm prints .The matching compares the captured image features with the stored templates.

4.1 Palm Print Acquisition
Palm print can be captured by widely used CCD based palm print scanners, video cameras, Digital cameras and Digital Scanner. a CCD based palm print scanner attracts the most of the researchers for acquiring the image because the scanner have pegs for guiding the placement of hands [22], [23]. CCD camera consists of a set of optical components work together to obtain the data from the palm. However, the quality of the Palm print image depends highly on the camera technology used.
The digital scanner can acquire high resolution hand image but requires more time to scan which are not suitable for real

time application. Digital and video cameras can also be used to collect palm print images and these images might cause recognition problem as their quality is low, because they collect image in an uncontrolled environment [24] with illumination variations and distortions due to hand movement.

4.2 Preprocessing
Preprocessing is used to correct distortions, align different palm prints, and to crop the region of interest for feature extraction. Preprocessing is done in the steps shown below:
 1. Binarizing the palm images
 2. Boundary tracking
 3. Identification of key points
 4. Establishing a coordination system and
 5. Extracting the central part.

4.3 Feature Extractions and Matching

After preprocessing of palm print images features can be extracted for matching. There are two types of recognition algorithms, verification and identification.
In verification, the system validates a person's identity by comparing the captured biometric data with her own biometric templates stored in the system database. Verification is typically used for positive recognition, where the aim is to prevent multiple people from using the same identity. [25]
In identification, the system recognizes an individual by searching the templates of all the users in the database for a match. Verification algorithms must be accurate. Identification algorithms must be accurate and fast.

5. Conclusion

Palm print recognition has been investigated over past several years. Palm print based personal verification has quickly entered the biometric family due to its ease of acquisition, high user acceptance and reliability. Here we have presented brief review in palm print identification system. Biometric palm print recognizes a person based on the principal lines, wrinkles and ridges on the surface of the palm. These line structures are stable and remain unchanged throughout the life of an individual. More importantly, no two palm prints from different individuals are the same, and normally people do not feel uneasy to have their palm print images taken for testing. It offers promising future for medium-security access control system.

6. References

[1] .J. L. Wayman, "Fundamentals of biometric authentication technologies,"*Int. J. Image Graphics*, vol. 1, no. 1, pp. 93–113, 2001.

[2]. D.D. Zhang, Ed., *Biometrics Solutions for Authentication in an E-World*.Norwell, MA: Kluwer, July 2002

[3].R. Plamondon and S.N. Srihari, "On-line and off-line handwritting recognition:A comprehensive survey," *IEEE Trans. Pattern Anal. Machine Intell.*, vol. 22, no. 1,

ISSN: 2278 – 1323

International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 1, Issue 10, December 2012

pp. 63–84, Jan. 2000.

[4].A.K. Jain, R. Bolle, and S. Pankanti (Eds.), *Biometrics—PersonalIdentification in Networkwed Society*. Norwell, MA: Kluwer, 1999.

[5].J. Campbell and J. Schroeder, Eds., Special issue on speaker recognition,*Digital Signal Proces.*, vol. 10, Jan.2000[Online].
Available:http://www.sciencedirect.com/science/journals

[6].D.A. Reynolds, T.F. Quatieri, and R.B. Dunn, "Speaker verification using adapted gaussian mixture models," *Dig. Signal Proc.*, vol. 10, pp. 181–202, Jan. 2000.

[7].A.K. Jain, R. Bolle, and S. Pankanti (Eds.), *Biometrics—PersonalIdentification in Networkwed Society*. Norwell, MA: Kluwer, 1999.

[8].A.K. Jain and S. Pankanti, "Automated fingerprint identification and imaging systems," in *Advances in Fingerprint Technology*, 2nd ed. New York: Elsevier Science, 2001.

[9].D. Maltoni, D. Maio, A.K. Jain, and S. Prabhakar, *Handbook of Fingerprint Recognition*. New York: Springer-Verlag, 2003.

[10].J. Bigun and G.H. Granlund, "Optimal orientation detection of linear symmetry," *First Int. Conf. Computer Vision, ICCV-87*, Washington, DC, June 8–11, 1987, pp. 433–438.

[11].R. Brunelli and T. Poggio, "Face recognition: features versus templates," *IEEE Trans. Pattern Anal. Machine Intell.*, vol. 15, pp. 1042–1043, Oct.1993

12.F. Hartung and F. Ramme, "Digital rights management and watermarking of multimedia content for m-commerce applications," *IEEE Commun. Mag.*, vol. 38, pp. 78–84, Nov. 2000.

[13].M. Lades, J.C. Vorbruggen, J. Buhmann, J. Lange, C. von der Malsburg, R.P. Wurtz, and W. Konen, "Distortion invariant object recognition in the dynamic link architecture," *IEEE Trans. Comput.*, vol. 42, pp. 300–311, Mar. 1993.

[14].J. Daugman, "Recognizing persons by their iris patterns," in *Biometrics— Personal Identification in Networkwed Society*, K. Jain, R. Bolle, and S. Pankanti, Eds. Norwell, MA: Kluwer, 1999, pp. 103–121.

[15] R.P. Wildes, "Iris recognition: An emerging biometrics technology," *Proc. IEEE* (Special Issue on Automated Biometrics), vol. 85, no. 9, pp. 1348–1363, 1997.

[16]. F. Leclerc and R. Plamondon, "Automatic signature verification: The state of the art, 1989–1993," *Intl. J. PatternRecMachine Intell.*, vol. 8, no. 3, pp. 643–660, 1994.

[17] .J. Ortega-Garcia, J. Fierrez-Aguilar, J. Martin-Rello, and J. Gonzalez- Rodriguez, "Complete signal modeling and score normalization for function- based dynamic signature verification," in *Proc. 4th Int. Conf Audioand Video-Based Person Authentication, AVBPA 20 03*, LNCS 2688, June 2003, pp. 658–667.

[18]. R. Plamondon and S.N. Srihari, "On-line and off-line handwriting recognition: A comprehensive survey," *IEEE Trans. Pattern Anal. Machine Intell.*, vol. 22, no. 1, pp. 63–84, Jan. 2000.

[19].D.Zhang, Palmprint Authentication, Norwell,mass.Kluwer Academic publishers, 2004.

[20]. Biometrics: personal identification in networked society, A.Jain, R.Bolle and S.Pankanti; eds.Boston: Kluwer Academic, 1999.

[21]. A. Kong, D. Zhang, G. Lu, A study of identical twins palmprint for personal verification, Pattern Recognition 39 (11) (2006) 2149–2156.

[22]. W.K. Kong, D. Zhang, Palmprint texture analysis based on low-resolution images for personal authentication,in: Proceedings of 16th International Conference on Pattern Recognition, vol. 3, 2002, pp. 807–810.

[23]. 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

[24]. J. Doublet, M. Revenu, O. Lepetit, Robust grayscale distribution estimation for contactless palmprint recognition, in: Proceedings of the First IEEE International Conference on Biometrics: Theory, Applications, and Systems, 2007, pp. 1–6.

[25]. 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.

I.