International Journal of Engineering & Technology, 7 (3.6) (2018) 407-409

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

A Review on Palm Vein Biometrics

S. Kavitha[1*], P. Sripriya[2]

[1]*Research Scholar, Dept of Computer Applications, VISTAS, Chennai, India.*
[2]*Associate Professor, Dept of Computer Applications, VISTAS, Chennai, India.*

Abstract

The technology of biometrics is a growing arena and it still needs to be explored related to each and every physical and biological features of human. The recent trends in embedded technology and other areas has bloomed the biometric techniques to greater heights. Vein biometrics has its own advantages and disadvantages. The advantage is that the veins are present internally inside the body and cannot be forged easily. The paper presents the literature survey a review on palm vein biometrics.

Keywords: *Biometrics, palm vein, feature extraction.*

1. Introduction

Biometrics deals with the identification of a person based on physical and behavioral characteristics. The term bio represents "life" and metric means measurement. The physical characteristics include identification of a person based on the features present in face, finger, iris, vein and hand geometry and DNA. Each feature has its own advantages and disadvantages. Behavioral aspects of identification involve signature, gait and voice pattern. The biometrics techniques provide high level of accuracy compared to the conventional approach of identification that uses passwords, PIN(Personal Identification Number) and Smart Cards because the user tends to forget the passwords and the smart cards can be stolen or hacked. Apart from accuracy, the biometric technique offers various advantages such as security, Low cost, Time saving, Scalability and user friendliness.

The following are the important characteristics for a system or device to function as a biometric. They are Universality, uniqueness, permanence, collectability, acceptability, circumvention, performance.

Universality: Each and every individual using the biometrics should possess the particular feature.

Uniqueness: The biometric system should be unique for an individual user. (e.g. blood veins, palm veins etc.)

Permanence: It refers to the manner in which the feature does not vary or change with respect to time.

Performance: It indicates the speed, security, accuracy and ease of using the technology.

Collectability: The biometric feature should be collected without any difficulty to verify the identification

Acceptability: the biometric technique should be accepted by user. There are various parameters used in the biometrics like FAR, GAR etc.

The steps used behind the biometric authentication are:

input data->feature extraction->identification or verification->decision.

The data is input into the system using CMOS, CCD, thermal image sensors and the features are extracted and a template generated is stored into the database and verification process consists of matching the feature extracted with the existing template and thereby decision making process is done.

The following are the technical parameters used in biometric identification:

FAR, FRR, EER, GAR, GRR.

FAR: The biometric technique incorrectly accepting an authorized user is known as false acceptance ratio.

FRR: The biometric technique incorrectly rejecting an attempt made to access by an authorized user is False Rejection Rate

If the values of FAR and FRR are same and the point at which FAR and FRR overlap is called EER(Equal Error Rate).

GAR: It is defined as the number of authorized users in percentage accepted by the biometric system.

GRR: It is the percentage of authorized users rejected by the biometrics system.

2. Types of Biometrics

Broad view on the types of biometrics

Physiological	Behavioural
1.Face	1. Keystroke
2.Finger print	2. Voice
3. Iris	3. Signature
4. Hand geometry	

Behavioral biometrics uses software for analysis and it is simple and requires only less cost to implement.

Signature recognition uses analyses the signature style. Basically there are two types of digital signature identification they are static and dynamic. Signature may change due to ageing, and accidents the pressure points in the finger and hand may change.

In static method the digital signature is visually compared with the other. In dynamic method a template generated is created from which dynamic signatures are authenticated.

Keystroke/typing recognition done based on the how the user types a letter using keyboard the coordinates and positioning of finger are captured and recognized.

Voice/Speaker recognition: method of determining the speaker based on voice. Speaker recognition and speech recognition are contradictory terms. Speaker recognition refers to the identification of person speaking. Speech recognition is identifying the sounds or spoken language of the user and

converting them into text. It is also affected by factors like change in voice of person due to sickness, spoofing one's voice by mimicry, external noise etc.

Physiological biometrics: This uses physical characteristics of humans for identification.

Finger Print Recognition: It is the primary and accurate identification method. The finger print matching involves three major functions enrollment, selection, and verification. The basic finger print patterns are edges, furrows, whorls and arcs. It is the cheapest means of verification; the disadvantage is that the finger print recognition will be affected by sweat, cut and accidental damages.

Face recognition works on matching of a person based on the template stored in the database. The template feature is stored in particular orientation change in the orientation, gradient and other parameters affect the accuracy of identification.

Face recognition can be done in many ways like face geometry, facial thermo grams The mechanism is accurate but affected by hair cut, wearing glasses, change in face appearance due to ageing and surgery

Iris recognition Features are extracted by identifying rings, furrows, wrinkles surrounding the pupil of the eye. Image acquisition done using LED based point source, and also using Wildes method by aligning the edges in different directions.

Hand geometry analyses the human hands and features like thickness, height, width are extracted for fingers and palm by positioning it on the appropriate device that read the attributes of the hand.

DNA recognition the term DNA stands for Deoxy Ribo Nucleic acid and it is made up of genetic information of an individual. The collection of DNA finger print and profiling is a tedious process.

The disadvantage is that it can be easily stolen and expensive

The upcoming biometric techniques are recognition based on odour and ear pattern matching.

Vein based identification is an emerging trend in the field of biometrics that has focused the attention of researchers. The main idea to concentrate in palm vein is that the study revealed that most of the vein patterns of the body end up in the palm and hence it is easy to study the features of vein either by structure based or texture based analysis.This biometric technology which provides high degree of accuracy with reasonable cost.

Palm vein recognition though reliable, many crime labs use finger print technique in the initial stage and palm vein identification is done as a part of conclusion work.

Vein recognition is also known as vascular recognition. It uses optical scanning technology to capture vein images in palm, iris, finger etc.

3. Palm Vein Approach

Palm vein technology has gained the researchers' attention because the vein patterns are internal to the human body and it cannot be stolen. It has high degree of accuracy. The vein patterns are non-vulnerable to spoofing attacks. Another advantage is that the palm vein patterns do not change with age, roughness or injury. Even for the identical twins the DNA patterns will be the same but their palm vein patterns are unique. It is less susceptible to change of skin color.

Palm vein recognition can be affected by factors like temperature, humidity and other factors.

CASIA multispectral Palm print image database it contains 7200 palm print databases and PolyU multi spectrum database can be used for palm dataset.

There are basically three approaches to palm print extraction: global feature approach, structure based and hybrid based.

In global feature entire veins of palm is considered as feature set and features are extracted using PCA, LDA, etc. To extract distinctive features of palm vein image histogram, Gabor transform are also applied.

When one biometric feature is combined with other biometric feature(multimodal biometrics) for identification it provides higher recognition rate, accuracy and more reliable performance in comparison with unimodal biometrics.

Structure based veins contains principally distinctive features such as principal lines, wrinkles, greases, minutiae features.

Palm vein technology has gained the researchers' attention because the vein patterns are internal to the human body and it cannot be stolen. It has high degree of accuracy. The vein patterns are non-vulnerable to spoofing attacks. Another advantage is that the palm vein patterns do not change with age, roughness or injury. Even for the identical twins the DNA patterns will be the same but their palm vein patterns are unique. It is less susceptible to change of skin color.

4. Palm Vein Review

Sayed M. used a Coset Decomposition method to extract palm vein feature vectors. the findings revealed high accuracy and ease to implement and further suggested the same can be applied to multimodal biometric authentication.

[1] Vijayalakshmi , SD pushpalatha(in Palm Vein Recognition using Independent component Analysis and Gabor Texture Patterns the Palm print was captured using normal web camera. Segmentation of hand from frames followed by ROI extraction of palm print and features are extracted using gabor kernel and then ICA features extracted and classified using NN and distance based classifier. The result was better with ICA rather than non dimension reduction technique

KanakaMahalakshmi and V. Siva Kumar, (ARPN Journal of Engineering and applied Sciences, 2016) has done vein pattern verification using palm dorasum Palm vein images are enhanced first and features are extracted with neural networks, feed forward and SVM algorithms cover high efficiency and accuracy

Poornima S., et al. found a versatile and Economical acquisition set up for dorsa palm vein authentication using correlation method small and cost effective set up is employed in small scale applications.

Villarina and Noel B, Linsangan using directional encoding and Back Propagation Neural Network worked with palm vein recognition In the study Region of Interest and gamma correction applied. Sobel directional encoding applied on feature vectors Mean absolute deviation applied to these sets and then given as input to back propagation neural networks Back propagation has the highest classification rate but slower the training time Stochastic propagation works faster than BPNN. The conclusion revealed focus needed in the following areas: 1. the use of distance sensor 2. Verification should be done in both hands 3. Improvement in hand tracking and ROI algorithm 4. The use of IR camera to provide high quality image

Pooja and Anudeep Goraya used Artificial Neural Networks technique for Palm vein Recognition. In their research work PCA and LDA are combined together to extract the features of the image and ANN applied for testing and training datasets It worked well than conventional techniques

R.Sasikala, et al.(IJIRCCE, 2016) have done a survey on human palm vein identification using Laplacian Filter. In this research work palm veins are enhanced using histogram equalisation and feature extraction done using Laplacian filter on convolved images. The study revealed that this can be applied to multimodal veins rather than unimodal and also can be employed in online biometric.

Weinjing Liu, Meini Lu, Liu Zhang published a paper in International Journal of Signal Processing(2016) in Palm vein using directional features derived from local binary patterns. The Palm vein enhanced using multi scale Gaussian filter to emphasize enhancement, then local binary patterns used for feature extraction palm vein features are represented as a binary series. The findings

showed that neural networks perform better than distance based classifier for palm print recognition.
Swapnali N.Dere, Dr.A.A. Gurjar(IJECS 2017) extensively studied on identification of human with palm vein images by extracting of edges and curves from image and feature extraction of palm vein images done using canny edge detection method resulting in low cost and low computational complexity and recognition time was only 0.5seconds.
Prajakta Patil,et al.(IJEEE june 2017) Found the relationship between centre of pixel and neighbors using local tetra pattern. Retrieval of images based on best matches done by LrTP.
Kamtanath Mishra, Kander deep Narayan Mishra,Anupam Agarwal done a comparison on Comparison of multi vein based techniques and concluded that The finger, iris, palatal and face veins give lowFAR and FRR.
S. Bharathi, Valentina E. Balas, R.Sudhakar published a paper in Acta poltechnica hungarica, 2015 Hand vein based multimodal biometric system Shearlet transform and scale invariant feature transform are used for feature extraction extracted features in the form of coefficients stored in the database fusion of finger hand and palm vein carried out using maximum likelihood fusion technique provides highest accuracy of 94%with FAR and FRR.

5. Conclusion

The literature survey of palm vein reveals that each methodology has its own advantages and disadvantages. The accuracy and timing spent on recognition can be improved by choosing the fuzzy logic and deep learning with embedded system approach. multimodal vein recognition also can be taken as a future research work .

References

[1] Vijayalakshmi & Pushpalatha SD, "|Palm Vein Recognition using Independent component Analysis and Gabor Texture Patterns", *IJARCET*, (2015).
[2] Sasikala R, Sandhya S, Ravichandran K & Bala Subramaniam, "A survey on human palm vein identification using Laplacian Filter", *IJIRCCE*, (2016).
[3] Liu W, Lu M & Zhang L, "Palm vein using directional features derived from local binary patterns", *International Journal of Signal Processing*, (2016).
[4] Villarina & Linsangan NB, "Palm vein recognition using directional encoding and Back Propagation Neural Network", *Proceedings of the world congress on Engineering and computer science*, (2016).
[5] Ranjith Kumar M, Deepika G, Krishnan M & Karthikeyan B, "An Open Source-Free Palm Vein Recognition system", *IJAAS*, (2017).
[6] Zhang L, Li L, Yang A, Shen Y & Yang M, "Towards contactless palmprint recognition: A novel device, a new benchmark, and a collaborative representation based identification approach", *Pattern Recognition*, Vol.69, (2017), pp.199-212.
[7] Soh SC, Ibrahim MZ, Yakno MB & Mulvaney DJ, "Palm Vein Recognition Using Scale Invariant Feature Transform with RANSAC Mismatching Removal", *Lecture Notes in Electrical Engineering*, (2018).
[8] Gopal & Srivastava S, "Accurate Human Recognition by Score Level and Feature Level Fusion using Palm Phalanges Print", *Arabian Journal for Science and Engineering*, Vol.43, No.2, (2018), pp.543-554.
[9] Subramaniam B & Radhakrishnan S, **"**Multiple features and classifiers for vein based biometric recognition", *BioMedical research*, (2018).
[10] Chiu CC, Liu TK, Liu WT, Chen WP & Chou JH, "A micro control capture images technology for the finger vein recognition based on adaptive image segmentation", *Micro systems technologies*, (2018), pp.1-44.