

Survey: Human Identification Using Palm Vein Images

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Abstract – As far as security is concerned human identification is the most challenging and critical tasks, on the other side it is very important to recognized the person. Security is an important issue in many fields. Human identification is perform through one of the biometric authentication techniques such as palm, finger, iris, ID cards, pin number, passwords etc. Single human identification techniques sometime may unable to identify the person due to this the person belief in the identification techniques will be reduced. The ID may be tamper or hack so it may be unpredictable. It can be easily stolen. To overcome these problem one can use the multiple features in biometrics image processing techniques. These techniques can be used to make it full proof and to identify the correct person. Many researchers are working on this topic some of prominent results and its techniques are mentioned in this paper.

Index Terms – Human Identification, palm vein, Image Processing, Finger, Iris.

1. INTRODUCTION

Security is an important issue in many fields. In terms of security authentication is most challenging and critical task. Authentication or identification of a person has become a essential in today's environment. Biometrics is the one of the human characteristics used for identification and security purpose. It has several advantages. In non-biometrics application numbers of facilities are required for unique identification. Biometrics is always distinctive and retains its identity. Some examples of biometrics techniques are fingerprint, palm vein, iris, face recognition, DNA, retina and so on among all biometrics techniques of identification fails to palm vein. It is one of the effective systems for identification or verification. Vein pattern recognition is the modern biometric technology. Vein pattern lies underneath the skin and they are invisible directly by the eyes. It is difficult to make duplicate of the vein structure of individuals. The most useful benefit of palm vein is human vein characteristics stays constant throughout one's lifetime. It may be difficult to change. This type of biometric identification is used in various fields of medical sciences, laws enforcement, offices and in various applications where security and authenticity is critical reasons. Palm vein biometrics is used to verify the unique identity of individuals

in fact twins have also different vein pattern so, this authentication method is more secure than any other method. Vein pattern recognition is one of the well known biometric techniques.



Figure 1 Palm vein Technology

In this paper, one of the most important reliable and robust personal identification authentication approaches using palm vein patterns is presented. Han and lee [1] offered 2-D Gabor filter provides the optimized resolution in both the spatial and frequency domains, in terms of it is a basis for extracting local features in the palm vein recognition. for obtaining a effective pattern of palm vascular, and conversion of bit string representation of palm vein. Watanbe, Endoh and sakasi [2] proposed an innovative and robust directional coding technique is used to encode the palm vein features. The bit string representation, called Vein Code, offers speedy template matching and enables more effective template storage and retrieval. The similarity of two Vein Codes is measured by normalized hamming distance in palm vein recognition technology authentication uses vascular patterns of the palm as personal identification data. If there is match then access allowed, if not access denied, thus the system is fully protected [1]. A near infrared ray is component of

sunlight which is less effective than walking in sunlight. Palm vein technology is one of the upcoming technologies. This technology is one of the most contactless personal identification systems that use the vein patterns in human palms to confirm a person's identity. It is highly protective and reliable. The contact less feature gives it a hygienic advantage over other biometric authentication technologies. It uses the vascular patterns of an individual's palm as personal identification data.

This section should introduce the article. Authors should introduce the problem that is going to be discussed in the entire article. Introduction section should motivate the readers to read the article further.

2. RELATED WORK

This survey paper discussed the different human identification techniques using image processing. The literature survey of Dere and Gurjer [3] suggested various phases of palm vein images based on human identification such as pre-processing, segmentation, feature extraction and selection, lapacian method [1] Gabor filter method and so on identification and recognition are also being discussed in this paper. The limitations or drawbacks of the various techniques are also mentioned in this paper. Yingbo Zhou and Ajay Kumar [4] proposed a method for Human Identification Using Palm-Vein Images. The author presents two new approaches to improve the performance of palm-vein-based identification systems and they are Holistic approaches using subspace learning and Line/curve matching using vessel extraction. This approach performs very well even with the minimum number of enrollment images (one sample for training). Xuekui Yan et al. [5] proposed a method for Palm vein recognition based provides the optimized resolution in both the on multi-sampling and feature-level fusion. To address the unsatisfactory recognition performance of a single-sample approach in single biometric systems, multi- algorithm approaches have been proposed to ensure that richer feature information can be extracted for better recognition performance. In this method we used a bidirectional matching algorithm instead of unidirectional matching is adopted for efficient mismatching removal. Jen-Chun Lee [6] proposed a novel biometric system based on palm vein image. To developed palm vein authentication techniques extraction he consider the palm vein as piece of texture and apply the texture based feature. A 2-D Gabor filter spatial and frequency domains, thus it is a basis for extracting local features in the palm vein recognition. The bit string representation, called Vein Code, offers speedy template matching and enables more effective template storage and retrieval. The similarity of two Vein Codes is measured normalized hamming distance. High accuracy has been obtained by the proposed by method and the speed of the method is rapid enough for real-time palm vein recognition.

Anil K. Jain, [7] introduced a biometric system for the automatic recognition based on their physiological and/or behavioral characteristics of any individual. In his paper he try to make the biometric fully reliable and secure by using multimode biometrics, which includes fusion of f1ace images and finger prints images. In this fusion they uses multiple matches (minutiae and non-minutiae based matches), multiple sensors (optical and capacitance sensors), multiple units (right, index and middle finger), multiple snapshots (two templates of right index finger) and multiple biometrics (face and finger prints). At last the author concludes with that the full personal identification proof doesn't exists and perhaps will not. The Gradient Feature detector Algorithm has been introduced by Prathiban K.[8] for the detection and extraction of finger vein images. This method tries to increase the feature information and obtains all the points on the Gradient of finger vein image. Also in his paper a new normalization method has been introduced that reduces disturbances that have been created by different finger pose. The algorithm proposed in this paper is used to extract vein images by identifying different parameters such as finger vein length, intersection, width of veins, position, and pixels. This system proposed is convenient for low power consumption devices such as mobile devices and ATM. David Mulyono, [9] used source image that has been clicked by web camera whose image quality can't be as good as CCD camera or any other high quality camera. Several authors tried to enhance the image quality for unique identification. So, they achieve 0.275% of FRR, 0% FAR, and identification rate up-to 100% and response time is 0.5s which shows the biometric is very effective and meets the clients requirements. Shi et al [10] proposed a method that makes devices that have low cost by using vein pattern images with low contrast, and high-quality images. This method extracts the enhanced quality of vein patterns successfully. The principle of vein imaging is discussed to acquire the vein images which could enhance the contrast and the algorithm of extracting the vein pattern from low quality images. Desong et al [11] that uses biometric technique which has been fitted into clients hardware devices. This is a secure and reliable identification system has been introduced by method shows high security and reliability than other identification methods. Random transform is used for feature extraction and normalized distance measure is used for classification purpose.

Lin et al [12] proposed an algorithm for vein extraction and partitioning dorsal hand vein images after which noise is removed by using Gaussian low pass filter and by median filter. These vein patterns are then segmented by using Nib lack algorithm and then area thresholding algorithm is used to remove noise. Naoto et al [13] introduced a technique that extracts vein patterns from noisy images by using line tracking method. These researches consists of finger vein images that contain vein images as well as shading that is due

to the thickness of finger muscles and bones and are captured under infrared light.

2.1 Working of palm vein scanner 2

Fujisto [14] explained palm vein scanning systems, like those for finger vein ID, use a technology based on the use of near-infrared rays and the way hemoglobin in the veins reacts to them. The blood's hemoglobin is oxygenated in the lungs and the arteries then carry the oxygenated blood to deliver oxygen to tissues throughout the body. The veins carry deoxygenated blood back to the heart. [2] A palm scanner illuminates the palm with near-infrared light, which is absorbed by the deoxygenated hemoglobin flowing through the veins. Deoxygenated hemoglobin absorbs more light, reducing the ability of the veins to reflect the light back and causing them to appear as a black pattern that is captured as an image by the system's camera. The raw data for that image is then processed and compared to a stored record for the individual in question.

3. COMPARE AND CONTRAST FINGERPRINT RECOGNITION AND PALM VEIN TECHNOLOGY

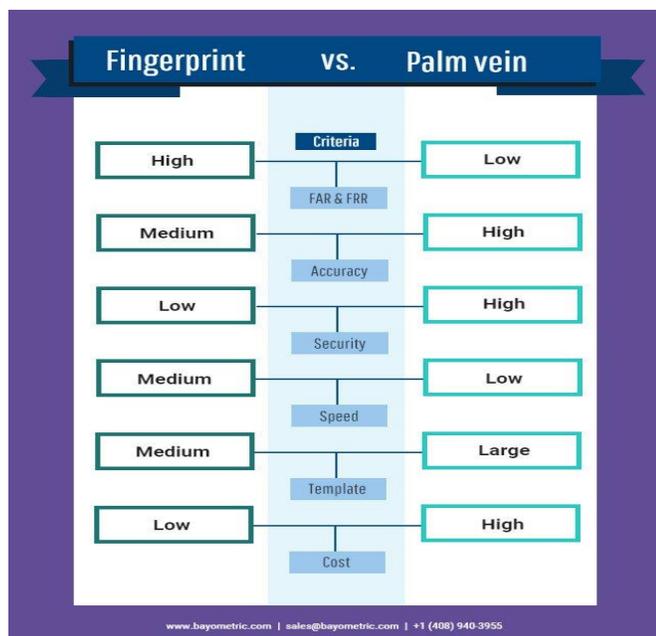


Figure 2 Info graphic- Fingerprint vs. Palm Vein

In terms of security system Personal identification technology became a greater in amount. Referred by Mancoa and Kaur [15], the important advantages of biometrics technology are non-repudiation, not guessable, not forgettable and availability. There are many distinguishable qualities or characteristics such as fingerprint, retina, iris, vein etc. it's mainly used as biometric identifiers to show individuals. However, On behalf of Bakshe [16] two of the most popular biometric experienced are fingerprint recognition and palm

vein recognition. Both fingerprint and palm vein recognition is physiological modalities which mean they are related to the shape of the body. One of this biometric identifier is fingerprint recognition and second one is palm vein. Fingerprint uses a highly detective camera to detect the thumb prints of individually. The second one kind of biometric trait, palm vein technology, uses an infrared sensor which is used to identify an individual's vein pattern.

There are some specified [15] comparisons of fingerprint recognition and palm vein technology with respect to the various performance metrics.

3.1 FAR(False acceptance rates) and false rejection rates (FRR) 1

False acceptance rates (FAR) and false rejection rates (FRR) are higher in fingerprint technology than palm vein technology [15].

3.2 Accuracy 2

Due to having higher FAR and FRR, palm vein biometrics is considered a more stickler biometric modality [15].

3.3 Size of template 3

In palm vein technology, the size of biometric templates is smaller as compared to fingerprint technology [15].

3.4 Cost 4

The cost of palm vein technology is expressively higher when compared to fingerprint recognition technology [15].

3.5 Security level 5

Veins are located inside the body so it is impossible to read or steal them. Since there is no risk of bastard or phony, palm vein technology provides higher security compared to fingerprint recognition [15].

3.6 Long term stability 6

As compared to individual's fingerprint biometric technology may be damaged due to factors such as environment, ethnicity, or age. Opposite to that the accuracy or readability of palm vein authentication is not affected by such factors [15].

3.7 Environment and weather adaptability 7

Palm vein biometrics has more adaptableness as compared to fingerprint biometrics palm vein is less likely to be affected by factors such as changes in the weather or physical condition like skin integrity of the individual [15].

3.8 Duplication risk 8

In terms of palm vein biometrics sample latent prints are not left behind on the hardware device during the authentication process and hence they cannot be duplicated or forged. But

such type of risk may exist in fingerprint biometrics recognition [15].

3.9 Processing speed 9

Both biometrics such as fingerprint biometrics and palm vein biometrics technologies are quite different when it comes to authentication and processing speeds. Fingerprint technology is promoted for a 1: N environment whereas vein technology is promote for 1:1 searches [15]. Takashi Shinzaki [17] fingerprint is the oldest and the most popular biometric technology. It has a low cost and high user acceptance as compared to other biometric technologies. Historical accounts suggest that fingerprints were in business use dating to 500 B.C. in Babylon and also by Chinese officials in the 3rd century B.C. for sealing official documents.[2]Fingerprints identification works on the impressions made by a regular sample pattern show on the fingerprints and is composed with watershed mark and valleys. These watershed mark are authorized by Sarvanan and prabhu [18] they explained landmark points known as precise and the spatial distribution of these minutiae points is unique to each finger. And, it is the collection of these precise points that is primarily used for matching of two fingerprints. In contrast there are sweat pores and other information's, also known as extended features which can be obtain as high resolution fingerprint images. These images are mostly helpful to forensic experts those who utilize them especially for confidential and inoffensive quality fingerprint images. One of the worldliest utilized Automatic Fingerprint Identification Systems (AFIS) [3] is now being all forensics and law enforcement agencies. Also, due to the low cost and nearly packed fingerprint readers this experienced is preferred in various civil and commercial applications

Sample

4. ADVANTAGES OF PALM VEIN RECOGNITION SYSTEM

Each person has its own unique vascular patterns systems which are used to differ the person from one individual to another than the patterns of fingerprints and palm prints [3]. Because the veins are located under the skin's surface, in Addition the scans depend on blood flowing through living humans, palm vein scans are nearly impossible to counterfeit. In typical manner Deepti and Krishnanah [19] studied contactless systems, which manufacture them more hygienic than touch-based systems. This system is particularly important and beneficial for healthcare environments and high-traffic venues such as supermarkets. Palm scanners provide a most security individual privacy than some biometric technologies, such as [14] fingerprint recognition, iris, and voice and so on because a sample cannot usually be captured without the person's knowledge or consent. In this case one exception is here that is rule regardless is a

healthcare context, where a palm scan could enable identification of an unconscious individual.

Palm recognition [16] is developed a strong form of the original biometric authentication circumstances and is currently used for an increasing number of user identification and authentication applications, containing online and onsite authentication, automobile security, employee time and attendance tracking, computer and network authentication, healthcare identification, end point security and ATM machines. Like many other biometric, [2] technologies palm vein recognition systems, capture an image database of a target, obtain and process image data and compare it to a stored record for that individual person.

5. CONCLUSION

In this paper various method for human identification with the help of palm vein images are studied. The methods with their accuracy and observed the experimental results are shown in following table.

S. No	Author Name	Data Size		Method Name	Accuracy (in %)
		No. of Images	No of people		
1.	Navjot [25]	BOSPH ORUS	----- -	Neural Network	99.97 %
2.	Lin and Fan[26]	960	82	Palm dorsal image	99.8%
3.	J.Fuertes [21]	1440	144	Support Vector Machines[SVMs]	99.77 %
4.	Im et al [23]	5000	----- -	Palm vein dorsal image	99.45 %
5.	Kwang Shyer Wua [10]	5120	256	Directional filter	99%
6.	N.Saxena [16]	250	25	Thresholding algorithm	98.72 %
7.	Crisan et al[24]	612	306	Support Vector	97.8%

				Machine s[SVMs]	
8.	Rahul C. Bakshi	460	30	Shape context technique	96.43 %
9.	Aythami M [22]	2000	100	Features extractio n	94.22 %
10.	Jing wein wang[20]	-----	----- --	Palm vein complexi ty	93.35 %

Table 1 Properties of some typical vein recognition method.

From the above table the accuracy of neural network is 99.97%.

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