



A Review on Palm vein biometric identification technique

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Abstract: *This paper presents an overview of various biometric traits used for human identification. This paper mainly focus, on the palm veins based recognition techniques. The information provided by veins is hard to forge as veins are internal to the human body, also palms do not have hairs as the other parts of the body. Moreover, the palm veins does not get effected by the dryness or roughness of the skin. Furthermore, the vascular pattern is unique to every individual and even among twins. Due to these reasons, the palm vein based recognition methods offers a high level of accuracy. In palm vein identification the vascular patterns of an individual's palm are used as the personal identification data. Compared with the other biometric traits such as fingers or the back of a hand, a palm has a broader, and more complicated vascular pattern and thus contain numerous differentiating features for human identification.*



Keywords: palm vein, biometric traits, identification

I. Introduction:

In this digital age, where one can easily access their information anytime and anywhere, people are also faced with the risk that others can easily access the same information without their knowledge. Fearing of this situation, various personal identification techniques are developed, which can distinguish between registered legitimate users and imposters. These days, mostly passwords, and Personal Identification cards are used for recognition and authentication. However, there are risks associated with them such as, cards can be stolen, and passwords and numbers can be guessed or forgotten. To deal with these problems, biometric based authentication technology, which identifies people by their unique biological traits, is gaining popularity among researchers. Biometrics features of each individual are unique feature. Biometric identification refers to an automatic recognition of individual based on feature vectors derived from their physiological and/or behavioral features [1]. Common physiological biometrics include face, eye (retina or iris), finger (fingertip, thumb, finger length or pattern), palm (print or topography), and geometry, back of the hand vein pattern or thermal images. Behavioral biometrics includes voiceprints, handwritten signatures, and keystroke/signature dynamics [9].



II. Palm vein recognition:

Palm vein based recognition was first developed by Joseph Rice [2]. In 1984 his identity gets stolen, which led to fraudulent use of his bank account. He decided to do something about it so that this will not happen again, which led to his first vein recognition prototype around 1985. Palms have a broad vascular pattern and it does not change during a lifetime.

Advantages of palm vein authentication system:

- It is a very safe and sound method of recognition as the blood vein pattern lies under the skin, it is almost impossible for others to read or copy. [10]
- Palm vein authentication has negligible susceptibility to such external factors such as abrasion or dryness.
- In addition to requiring no direct contact with the sensor surface, the non-invasive scanning process is carried out in a simple and natural manner that is not awkward to the user.
- As the palms pattern registration and the identification process are both done within the IC card, the client's financial transaction can be highly secured without leak of the personal data.

The following figure (figure 1) shows the palm vein pattern extracted after scanning a palm.

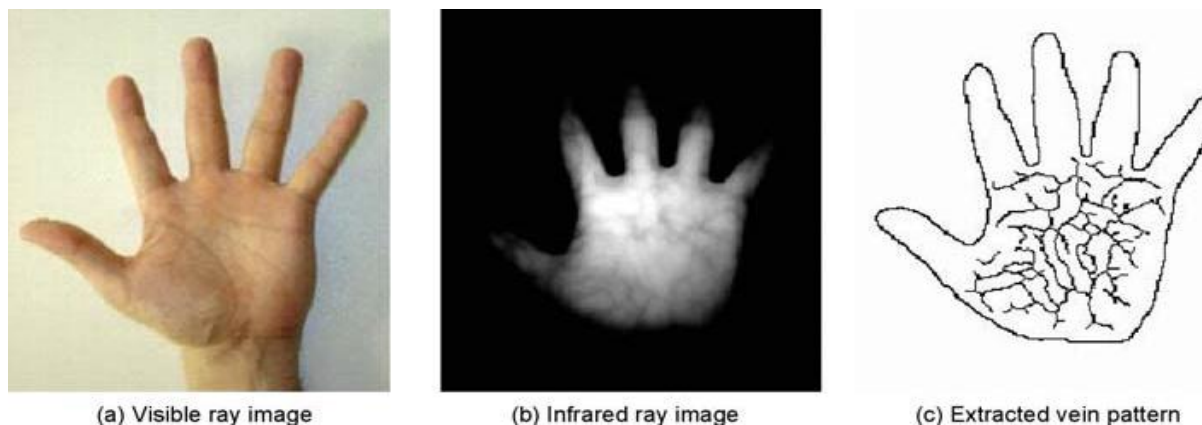


Figure 2. Palm Vein image by palm scanning [11].

III. Literature review:

Mansi Manocha [3] has proposed an absolute and automated palm image recognition technique by simultaneously utilizing the palm surface and palm subsurface features, i.e., from palm-vein images. He has proposed a novel method for the palm-vein recognition, which can more reliably extract the palm-vein shape features and achieve much higher accuracy than previously proposed palm-vein identification approaches.



Jian-Gang Wang [4] has presented a novel palm representation, by using the “Junction Points” (JP) set, a junction point is formed by the intersection of two set of line segments extracted from the recorded palm print and palm vein images respectively. Unlike the other approaches, the Junction point set, is a more compact feature and contains positioning and orientation information about veins that significantly reduces the amount of storage needed. A comparison has been made between the proposed JP approach, and the line-based techniques on a large dataset. Experimental results depict that the Junction point approach provides a better representation of veins pattern, and also achieves lower error rate in palm recognition.

Vijayta Chowdhary [5] has given two new methods to enhance the performance of palm vein based authentication systems using the Gabor filter. The presented approach is an attempt to more efficiently accommodate the potential bends, rotational and translational changes by encoding the orientation preserving features and utilizing a novel region-based matching scheme. He has compared the existing proposed palm vein recognition methods with the proposed ones on two different databases that having contactless and touch-based imaging setup. An evaluation is done on the performance improvement in both verification and recognition scenarios and influence of enrollment size is analyzed on the performance of the system. In this context, the given methods are also compared for its superiority using single image enrollment on two different databases.

M.Deepamalar [6] has developed and presented an enhanced palm vein recognition system by making the use of multimodal features and neural network classifier. The effects of fusion of multiple features at various levels of recognition have also been expressed. The shape and texture features have been considered for recognition of registered users and validation is done by neural network classifier system. The recognition rate of the proposed system has been compared with the previously existing approaches. The results show that the recognition accuracy is 99.61% when the multimodal features fused at matching score level.

Yuhang Ding [7], has firstly discussed the various the challenges of the hand vein recognition approaches and its theoretical foundation. He then studied the threshold segmentation method and thinning method of hand vein image. After this a new threshold segmentation method, and an enhanced conditional thinning approach is proposed. The cross points and end points based method of hand vein image feature extraction is analyzed, and the matching method based on distances is used to match vein images.

Sara Zokaee [8] has presented a research to identify human using electrocardiogram (ECG) and palm print. The research showed the collaboration of both the biometrics together to make higher



recognition rate. The recognition rate of the proposed method was numerically calculated to be 97.4 %.

Mohamed Shahin [9], has presented a biometric authentication technique using hand vein patterns, a system is designed near IR cold source to provide back-of-hand illumination. The IR cold source is a solid-state array of 24 light emitting diodes. The diodes are built up in a square shape, with 6 LEDs in each side, on a designed and assembled printed circuit board (PCB), and made housing and an attachment for fixing the LEDs around the CCD lens. The experimental results showed that the cold source provides improved contrast than the ordinary tungsten filament bulbs. A commercially available, low cost, monochrome CCD fitted with an IR filter is used to image the back of hand designed in [9], it gives the stages through which the image processed.

IV. Conclusion:

This study presents an analysis of palm vein recognition algorithms and systems for biometrics authentication and identification. Many research used palm vein system only to identify the person by extracting his palm vein. At present, the challenges faces the researchers are the capture device which is very sensitive to the outside lights. so still some improvements are required in the technology and some progress is going on. In near future these problems are expected to be solved and more enhanced, accurate and secure device will be manufactured.

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