

# Identification of Human using Palm-Vein Images: A new trend in biometrics

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**Abstract:** In the ubiquitous network society people faced with the risk that others can easily access their information anytime and anywhere. Because of this risk, personal identification technology, which can distinguish between registered legitimate users and imposters, is now generating interest. Traditional personal verification methods rely heavily on the use of passwords, personal identification numbers (PINs), magnetic cards, keys, smart cards, etc. No matter which method is employed, each of these offers only limited security. To solve these problems, biometric authentication technology, which identifies people by their unique biological information, is attracting attention.

**Keywords**– Biometrics, personal identification, Vein pattern.

## I. INTRODUCTION

Human authentication is most challenging and critical tasks for stringent security. Biometrics refers to authentication techniques that rely on measurable physical characteristics that can be automatically checked. There are several types of biometric identification techniques: Face, Fingerprint, Hand geometry, Retina, Iris, Signature, Vein.

Biometrics will play a critical role in future in electronic commerce. Biometric can be classified as of intrinsic physiological and/or extrinsic behavioural characteristics of humans. The advantages of extrinsic biometric is easy accessibility but it can generate some concerns on privacy and security. While intrinsic biometrics characteristics are more difficult to forge. It provides high agility and same time ensures the crucial identity information is unrevealed, so intrinsic biometrics provides a greater degree of security and privacy for the user.

Vein pattern as biometric is a new trend in biometrics providing higher security because vein patterns lie underneath the skin and they are invisible directly by the eyes and we can not duplicate the vein structure of individuals. The most useful benefit of palm vein is a human vein characteristic stays constant throughout one's lifetime and it is very difficult to fake or change.

The cross section of human skin has three key components of the skin. They are the outermost epidermis, dermis, and subcutaneous layer, as illustrated in Fig. 1. All three layers contain fat and blood with different proportions and it is the subcutaneous layer that contains subcutaneous veins and arteries. Different skin layers have different responses to the wavelength of the incident illumination.

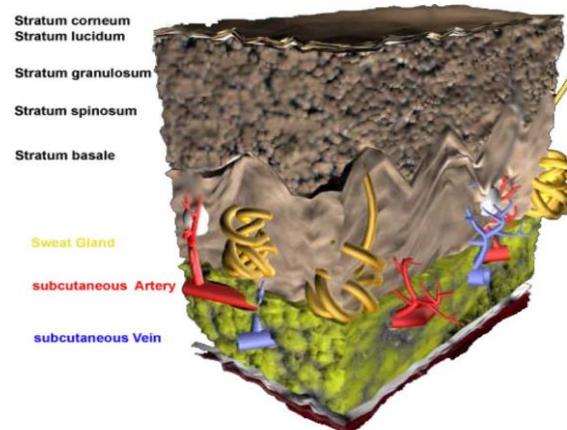


Fig.

1. Cross section anatomy of palmer skin.

### A. Motivation

Blood vessel patterns have already been used in a great number of commercial identification and authentication systems. As the ability to verify the identity of individuals has become increasingly important in many areas of modern life, the need for cheap biometric recognition systems becomes greater. Palm vein identification is one of the forefront methods in biometric technology in recent years. As a newly emerging biometrics technology, Palm vein identification has attracted considerable attention in the biometrics recognition field. Compared with other more traditional biometrics, Palm vein identification technology has the benefits of high anti-counterfeiting strength, small imaging devices, low cost, easy collection of images with

contactless operation universality and liveness. Furthermore, since the veins are located internally within the living body, the Palm vein identification system is less affected by the outer skin surroundings (skin disease, humidity, dirtiness, etc.). Hence Palm vein identification is considered as one of the most promising solution for personal identification in the future.

## II. LITERATURE REVIEW

[1] Yingbo Zhou and Ajay Kumar have proposed a method for Human Identification Using Palm-Vein Images. This paper 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).

[2] Xuekui Yan , Wenxiong Kang , Feiqi Deng , Qiuxia Wu have proposed a method for Palm vein recognition based 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.

[3] Jen-Chun Lee has proposed a novel biometric system based on palm vein image. He consider the palm vein as a piece of texture and apply texture-based feature extraction techniques to palm vein authentication in his work. A 2-D Gabor filter provides the optimized resolution in both the spatial and frequency domains, thus it is a basis for extracting local features in the palm vein recognition. He proposed an innovative and robust directional coding technique to encode the palm vein features in bit string representation. 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. High accuracy has been obtained by the proposed method and the speed of the method is rapid enough for real-time palm vein recognition.

[4] Kuang-Shyr Wua , Jen-Chun Leeb , Tsung-Ming Loc, Ko-Chin Changd , Chien-Ping Chang have proposed a secure palm vein recognition system. In this paper, a directional filter bank involving different orientations is designed to extract the vein pattern and the minimum directional code (MDC) is employed to encode the line-based vein features in binary code. A total of 5120 palm vein images from 256 persons are used to verify the validity of the proposed palm vein recognition approach. High

accuracies (>99%) and low equal error rate (0.54%) obtained by the proposed method show that proposed approach is feasible and effective for palm vein recognition.

[5] Mansi Manocha and Parminder Kaur have proposed a method for Palm Vein Recognition for Human Identification Using NN ie. Neural network. The proposed algorithm is an alternative to currently employed palm-vein identification approaches that do not take advantage from the cross-level image measurements. Further improvement in the performance from the proposed approaches using feature discretization and image quality measurements is expected and suggested for the further work on the large-scale palm image databases with the help of Neural Networks.

[6] Gitanjali Sikka , Er. Vikas Wasson have proposed a method for Palm Vein Recognition with Fuzzy-Neuro Technique. In this paper feature is extracted using Fuzzy-Neuro is used to enhance the response time and accuracy of system . The fuzzy-neuro technique is based on the combination of the fuzzy-logic (fuzzy sets) and pattern recognition based feed forward neural network. This algorithm has been made able to tackle the light variations, noise and other specific image characteristics in the palm-vein recognition systems.

[7] Jing-Wein Wang , Tzu-Hsiung Chen have proposed a Building Palm Vein Capturing System for Extraction . In this paper The performance of the accurate extraction ratio is 93.35% but the major drawback of this system is extractions due to bad quality of the palm vein pattern images system may lead to the fatal errors of the process.

## III. PROPOSED METHODOLOGY

### *Image acquisition*

Vein patterns, invisible to the naked eye, can be viewed through an image sensor sensitive to infrared light. Infrared light passes through the tissues of the human body and is blocked by pigments such as hemoglobin or melanin. As hemoglobin exists densely in blood vessels, infrared light shining through causes the veins to appear as dark shadow lines in the captured image. In image acquisition module there are two cameras used one is CCD camera and the other is web camera.

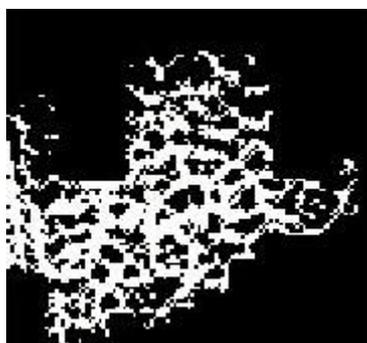
Following figure shows the captured palm vein image.



Sample palm vein image

*Image segmentation*

Image segmentation is the authorized process of dividing an image into multiple parts. This is typically used to identify objects or other relevant information in digital images. Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image or a set of contours extracted from the image (see edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. The original image is captured with the black unwanted background. Including the background reduced the accuracy of the original image, because the position of palm usually varies across different palm vein images, it is necessary to image segmentation in region of interest (ROI) before feature extraction and matching with database. When a palm is irradiating by the uniform light source, the image joint is brighter than the other part and is shown in Figure.



Segmented palm

*Image enhancement*

The segmented palm -vein image is then enhanced to improve its contrast as shown in Figure. The image is

resized to 1/4 of the original size, and enlarged back to its original size. Next, the image is resized to into the original size for recognition as shown in fig. Bicubic interpolation is used in this resizing procedure. Finally, histogram equalization is used for enhancing the gray level contrast of the image.



Enhanced palm vein image

*Feature extraction*

Feature extraction is most important step in palm vein recognition algorithm. It is a special form of dimensionality reduction. It is a transformation of input data into the set of features. In the feature extraction process the canny edge detection method is used for feature extraction process. Extraction of features such as edges and curves from an image is useful for final authentication. Edges are important features in an image, they represents significant local intensity changes as shown in the following fig.



Filter image of vein

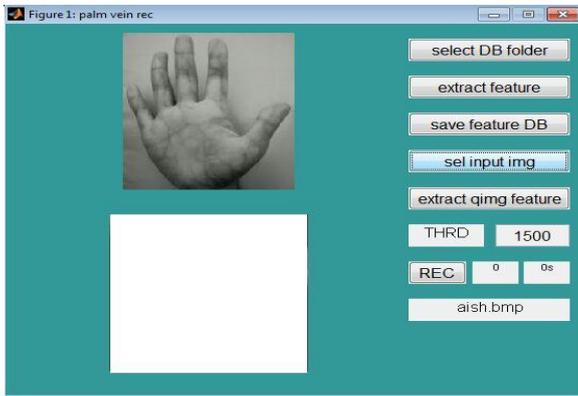
*Matching with database*

The palm vein matching module is use in MATLAB; the MATLAB is used to execute the finger vein recognition algorithm. In the working of real time proposed palm vein recognition algorithm contains two stages.

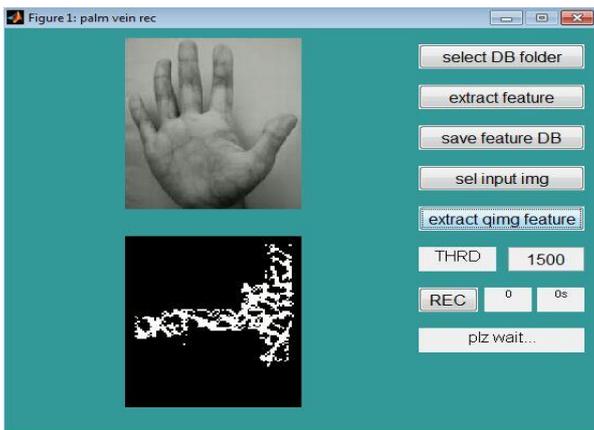
- The enrolment stage and
- The verification stage

#### IV. RESULTS

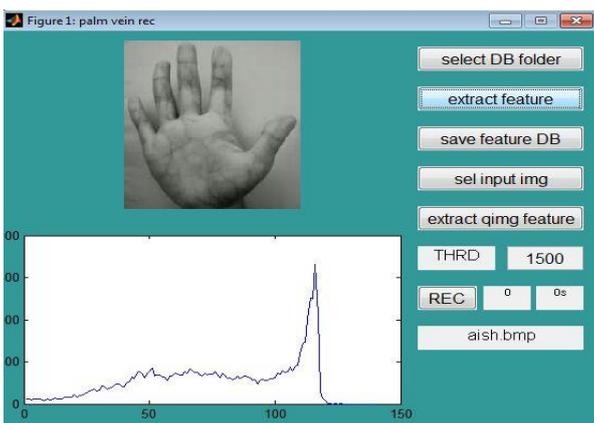
Following is the result that we get after applying proposed methodology to different images, and get the person name. we set an input image for the recognition of the disease and extract the feature as follows, then it matches with the database images and identify the person.



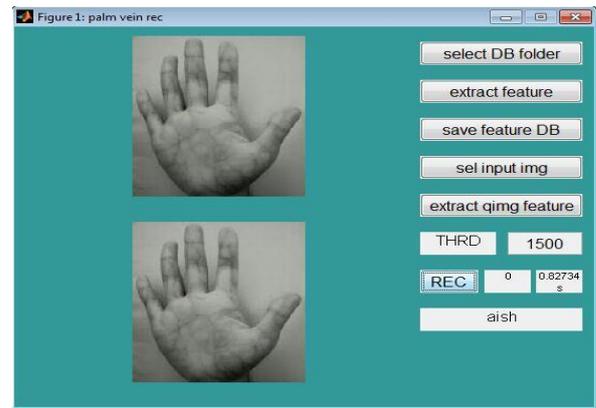
Input image for identification of person



segmentation of input image



Histogram of input image



identification of person

#### V. CONCLUSION

In the ubiquitous network society traditional authentication has been largely incapable of meeting the requirements of convenience, reliability, and security in a wide range of civilian applications so we go for intrinsic biometric authentication. This work has been implemented for improving the security and authentication based on biometric system. The developed system includes palm vein matching application. The experimental result shows that it takes minimal time that is only 0.5 seconds to verify one input palm vein sample image which is significantly lower than the existing system methods. This system consumes low power and has less computational complexity and hence it is suitable for security applications in vehicle, home, banks and industry etc.

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