ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 1, pp: (208-213), Month: January - March 2015, Available at: www.researchpublish.com

Palm Vein Authentication

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Abstract: **Palm vein authentication is one of the most reliable authentication. Which contain physiological body characteristics that can be used to distinguish between users. In this paper we represent in new approach for the personal identification in the palm vein image.This paper represent the contactless palm vein authentication device that takes blood vessel pattern as a personal identification. It is one of the most critical and challenging task to meet upcoming demand for stringent security. Vein are internal in the body and have wealth of differentiating feature assuming false identity through forgery is externally difficult, thereby enabling and externally high level of security. The palm secure works by capturing a person's vein pattern image while radiating it with near infrared rays. The palm secure detects the structure of the pattern of veins on palm of the human hand with the at most precision .The sensor emits a near infrared beam towards the palm of the hand and the blood flowing through these back to the heart with reduced oxygen absorb as black pattern. This pattern is a recorded by the sensor and is stored in encrypted from in a database, on a token or an a smart card. It is consist of small palm vein scanner. That is easy and nature to use, fast and highly accurate.**

Keywords: **Biometric authentication, Palm-Vein Recognition, Vascular Patterns, ROI extraction, feature extraction, Pattern matching.**

1. INTRODUCTION

Due to latest improvement in palm vein authentication technology some scanning devices are capable of handling finger vein authentication, handwriting, retinal, finger print authentication, voice palm vein authentication, Iris authentication within single scanning unit. The key point about an identification that is nontransferable means it can't be given or lent to another individual so nobody can get around the system they personally have to go through the control point. A key advantage of biometric authentication is that biometric data is based on physical characteristic that stay constant throughout one's lifetime are difficult to fake or change . Biometric identification can provide externally accurate, secured access to information, fingerprints, palm vein & iris scan produce absolutely unique data set's automated biometric identification can be done rapidly & uniformly, without and reading does the "best" job of ensuring secure authentication each of the different method has inherent advantages and disadvantages. Palm vein authentication has a high level of authentication accuracy due to the uniqueness and complexity of vein pattern vein of the palm .Because the palm vein pattern are internal to the body, this is a difficult method to forge. Also the system is contactless and hygienic for use in public areas, it is more powerful than other biometric authentication such as face, iris & retinal, palm vein authentication use an infrared beam to penetrate the uses hand as it is held over the sensor, the veins within palm of the user are returned as block lines. Palm vein authentication has a high level of accuracy due to the uniqueness and complexity of vein pattern of the palm. Because the palm vein pattern are internal to the body , this is difficult method to forge. Also, the system is contactless & hygienic for use in public areas.

1.1 Literature Survey:

The paper published by Mona A. Ahmed, Hala M. Ebied, El-Sayed M. El-Horbaty , Abdel-Badeeh M. Salem 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. The outside lights can affect the inside infrared light source so that some images have very poor quality due that the capture device should improve to increase the system performance .Resolution of image captured depends on ambient light intensity and temperature[2].

This paper published by Yingbo Zhou and Ajay Kumar, a novel approach for human identification using palm-vein images. We propose a novel feature extraction and matching approach that can effectively accommodate the potential image deformations, translational, and rotational variations by matching to the neighborhood of the corresponding regions and generating more reliable matching scores. This approach performs very well even with the minimum number of enrollment images[1].

This paper published by Saravanan.A and Dr. M. Ramkumar Prabhu investigated a novel approach for human identification using palm-vein images. We propose a novel preprocessing, enhancement and feature extraction techniques that can effectively accommodate the potential image deformations , translational, and rotational variations. This approach performs very well even with the minimum number of enrollment images. The palm vein identification method shows its robustness and superiority. The junction point approach extracts palm-vein features by analyzing the junction point of the palm image also achieves reasonably superior performance, and at the same time provides a smaller template size as compared to other methods [5].

This paper published by Gitanjali Sikka and Er.vikas Wasson After studying the research papers I came to know about the overall description of Palm Vein Authentication and its corresponding method. Further in literature, each technique is summarized with the advantages and shortcomings. Besides a number of palm vein recognition techniques are already been developed, there is still a scope of further improvements. So I have chosen this topic for my research.

In the future the implementation of the system would be done by the authors of this paper. The future authors taking this paper as inspiration can proposed enhancements or improvements in the proposed mode [4].

1.2 Existing System:

Palm vein authentication uses the vascular patterns of an individual's palm as personal identification data. Compared with a finger or the back of a hand, a palm has a broader and more complicated vascular pattern and thus contains a wealth of differentiating features for personal identification. The palm is an ideal part of the body for this technology; it normally does not have hair which can be an obstacle for photographing the blood vessel pattern, and it is less susceptible to a change in skin color, unlike a finger or the back of a hand.

The deoxidized hemoglobin in the vein vessels absorbs light having a wavelength of about 7.6 x 10-4 mm within the near-infrared area. When the infrared ray image is captured, unlike the image seen in Fig.1, only the blood vessel pattern containing the deoxidized hemoglobin is visible as a series of dark lines. Based on this feature, the vein authentication device translates the black lines of the infrared ray image as the blood vessel pattern of the palm, and then matches it with the previously registered blood vessel pattern of the individual.

Fig1) Visible ray image

Fig 2) Infrared ray image

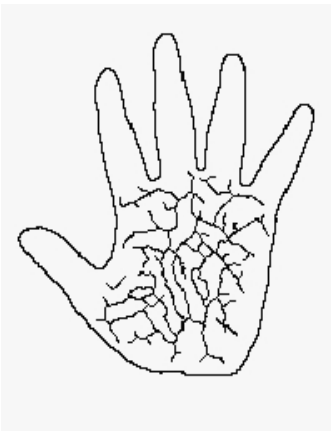

Fig 3) vein pattern.

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1.3 RELATED WORK:

Palm vein technology works by identifying the vein patterns in an individual's palm. When a user's hand is held over a scanner, a near-infrared light maps the location of the veins. The red blood cells present in the veins absorb the rays and show up on the map as black lines, whereas the remaining hand structure shows up as white. This vein pattern is then verified against a preregistered pattern to authenticate the individual. As veins are internal in the body and have a wealth of differentiating features, attempts to forge an identity are extremely difficult, thereby enabling a high level of security[1].After image capture, a small area of a palm image is located as the region of interest (ROI) to extract the features and to compare different palms. Using the features within ROI for recognition can improve the computation efficiency In the image-based biometric systems there is a number of processing tasks used to produce a better quality of image that will be used on the later stage as an input image and assuring that relevant information can be detected. Normally, the captured palm vein pattern is gray scale and subject to noise. Noise Reduction and Contrast Enhancement are crucial to ensure the quality of the subsequent steps of feature extraction [4]. Also, the vein pattern extracted from infrared-ray images is represented as dark lines.

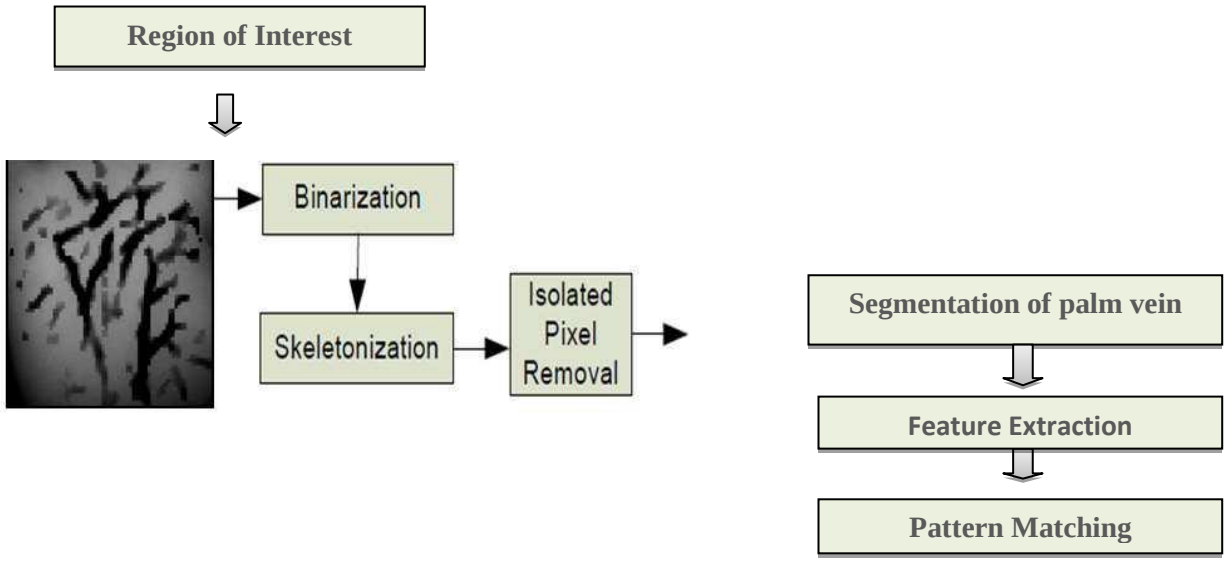

Fig.4: Block diagram of personal identification using palm vein images

PRE-PROCESSING:

Region of Interest Segmentation:

In pre-processing we first find region of interest that is ROI this is part of an image from where we get maximum number of vein this is part of image is taken for further pre-processing .in order to account for the potential in the acquired contactless palm vein images, the location as well as the size of ROI are selected based on instance between two webs (LW) and illustrated in the following equation:

$$LD = aLW$$
$$Lroi = bLW$$

Where Lroi denote the side length of ROI, LD denote the distance between the ROI and the reference line, and LW represent the distance between the two webs, a and b Are the factors that control respectively the location and size of the ROI.

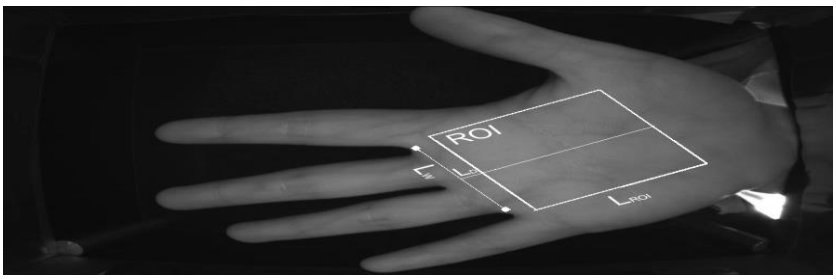

Fig. 5) Region of interest

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Image Enhancement:

Image enhancement techniques help in improving the visibility of any portion or feature of the image suppressing the information in other portions or features. Enhancement is the modification of an image to alter impact on the viewer. Generally enhancement distorts the original digital values; therefore enhancement is not done until the Restoration processes are completed.

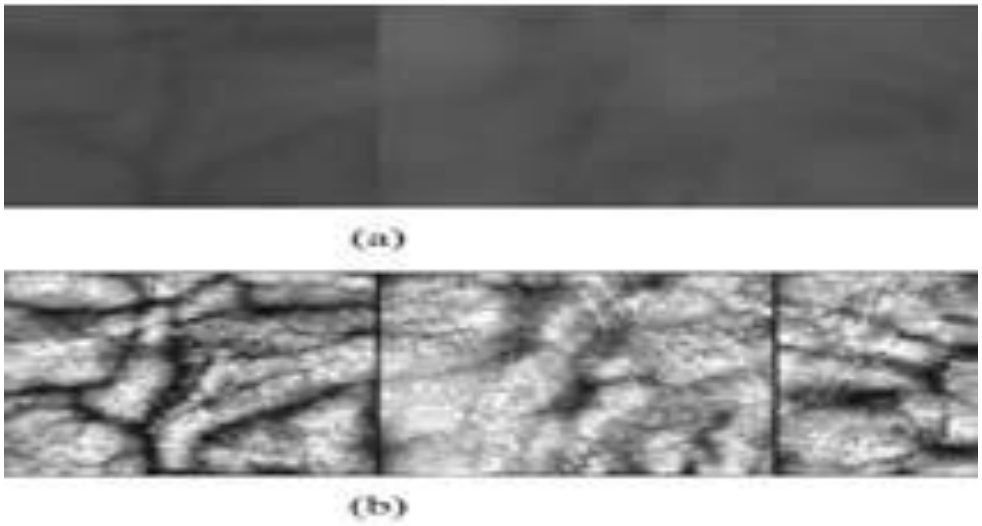

Fig.6) Image enhancement

Feature extraction:

One of the most interesting aspects of the world is that it can be consider to be made up of pattern. A pattern is essentially an arrangement. It is characterized by the order of the element of which it is made, rather than by the intrinsic nature of this element this definition summrized our purpose in this path is called as feature extraction this step is responsible of extracting the pattern of the veins taking into account the correlation between adjacent pixels.

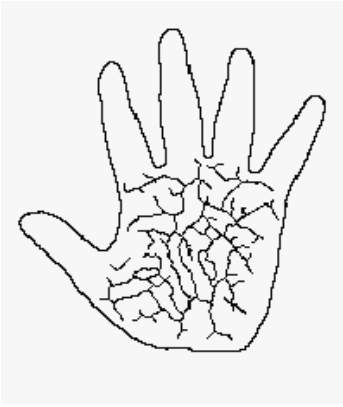

Fig.7: Infrared ray image

Fig.8: Infrared ray image

Pattern Matching:

To recognize an image means to check whether the image exist in the database. When a person wants to get access to the system, the picture of the vein, known as the test image is captured. The coordinates of the test image are obtained and represented as the training set. The weight of the new image is calculated and projected on the vein space. The vein space contains all the vein images. Thus, we have to check whether the input image exist in that space. The Euclidean distance between the projected image and those stored is being calculated. First of all, our system checks whether the test image is a vein by testing it with an arbitrary value. Then the Euclidean distance is computed to check whether the test image exist in the database. If it is vein image, then it is accepted.

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Q(P0)				
		Q(P1)		
				Q(P2)
	Q(P3)			
			Q(P4)	

Q(I0)				
		Q(I2)		
				Q(I3)
	Q(I4)			
			Q(I5)	

2. IMPLEMENTATION PROCEDURE

Design and implementation of palm vein authentication refers n-queen problem which defined no two columns and two rows get overlapped on to each other. Implementation procedure contains four modules.

1. Preprocessing module
2. Image segmentation and normalization module
3. Image enhancement module
4. Feature extraction module

	Q(I0)				
			Q(I4)		
					Q(E2)
Q(E0)					
		Q(E1)			
				Q(E3)	

Step 1:

Set P={p0,p1,p2,p3,p4}

P0=Take input image

P1=Extract stable and aligned ROI

P2=Recover fixed sized ROI

P3=Follow nonlinear Enhancement

P4=Provide the preprocessed image to the image segmentation module

Step 2:

Set I={i0,i1,i2,i3,i4}

I0=Take preprocessed image as a input.

I1=Estimate distance between center and body of palm

I2=Binarize the image

I3=Devide image into segment

I4=Normalize the image.

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Step 3:

Set E={e0,e1,e2,e3,e4}
E0=estimate the background intensity
E1=Compute average grey level pixel
E2=Take ROI as a input
E3=Substract normalized image from ROI

Step 4:

Set F={i4,f0,f1,f2} Feature extraction
F0=Take normalized image as input
F1=Check the curve size.
F2=Use neighbor matching scheme

	Q(I0)		
			Q(F0)
Q(F1)			
		Q(F2)	

3. CONCLUSION

Due to the unavailability of Palm Vein Image Database, we have considered images on which different people have already worked. Thus we have proposed an algorithm and a way of low cost vein pattern authentication using low quality images.

Palm vein authentication technology offers contactless authentication and provides a hygienic and noninvasive solution, thus promoting a high-level of user acceptance. It is very difficult to forge and therefore contributes to a high level of security, because the technology measures hemoglobin flow through veins internal to the body. The opportunities to implement palm vein technology span a wide range of applications. Thus we have concluded that, using this system a person is authenticated using his palm vain pattern.

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