

Palm Vein Extraction and Matching For Personal Identification

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Abstract : The most common method used for authentication is Textual passwords. But Textual passwords are in risk to eves dropping, dictionary attacks, social engineering and shoulder surfing. Biometric passwords are introduced as alternative techniques to textual passwords. Biometrics is used for human recognition which consists of authentication, verification and recognition. A CCD camera will capture the image and this image will process through various algorithms. In future this image will be compared for personal authentication. In this paper, three algorithms are proposed to extract the images taken by CCD camera.

Keywords: Biometric, palm vein pattern, ROI extraction, feature extraction, matching, Vascular Pattern, Near-Infrared Image, Grayscale, Thresholding, Thinning.

I. Introduction

The most common method used for authentication is textual password. The vulnerabilities of this method like eves dropping, dictionary attack, social engineering and shoulder surfing are well known. Arbitrary and lengthy passwords can make the system secure. But the main problem is the difficulty of remembering those passwords. Studies have shown that users tend to pick short passwords or passwords that are easy to remember. Unfortunately, these passwords can be easily guessed or broken. The alternative techniques are biometrics and graphical passwords. But these two techniques have their own disadvantages. There are many graphical passwords schemes that are proposed in the last decade. But most of them suffer from shoulder surfing which is becoming quite a big problem. There are graphical passwords schemes that have been proposed which are resistant to shoulder-surfing but they have their own drawbacks like usability issues or taking more time for user to login. Palm vein recognition system consists of four key steps: Infrared palm images capture Detection of Region of Interest (ROI) and pre-processing and Palm vein pattern extraction, feature extraction and feature matching.

II. Related Works

Debnath Bhattacharyya and his colleagues proposed that an Image Analysis technique for Vascular Pattern of Hand Palm, which in turn leads towards Palm Vein Authentication of an individual. Near-Infrared Image of Palm Vein pattern is taken and passed through three different processes or algorithms to process the Infrared Image in such a way that the future authentication can be done accurately or almost exactly. These three different processes are: a. Vascular Pattern Marker Algorithm (VPMA); b. Vascular Pattern Extractor Algorithm (VPEA); and c. Vascular Pattern Thinning Algorithm (VPTA). The resultant Images will be stored in a Database, as the vascular patterns are unique to each individual, so future authentication can be done by comparing the pattern of veins in the palm of a person being authenticated with a pattern stored in a database.[1] Yingbo Zhou and Ajay Kumar proposed two new approaches to improve the performance of palm vein based identification systems. They systematically compare previously proposed palm vein identification approaches with their proposed ones on two different databases that are acquired with the contactless and touch based imaging setup. They evaluate the performance, improvement both the verification and recognition scenarios and analyze the influence of enrollment size on performance. The rigorously experimental results presented in this paper on the database of 100 and 250 subjects, consistently conforms the superiority of the proposed approach in both the verification and recognition scenarios.[2]

Mona A. Ahmed and Hala M. Ebiied present the Analysis of palm vein pattern recognition algorithms, techniques, methodologies and systems. They discussed some technical aspects of recent approaches for the following processes detection of ROI (Region of Interest), segment o palm vein pattern, feature extraction and matching. Their result shows that, there is no benchmark database exists for palm vein recognition. For all processes, there are many machine learning techniques with very high accuracy.[3].

TABLE1: Various analyses by different authors

Authors	Pattern Extraction	Feature Extraction	Matching
Hassan et al[4]		SITF	Linear Vector Quantization
Zhou and Kumar[5]	Histogram equalization	Hessian Phase	Neighborhood matching Random Transform
Ladoux et al[6]	Gaussian low-pass 51x51	SITF	Euclidean distance between SITF descriptors
Mirmohama dsadeghi and Drygajlo [7]	Local Binary Patterns and Local Derivative Pattern	LBP and high order LDPs	Histogram intersection

III. Project Work

The project illustrated in this paper is entirely based on the idea of palm vein authentication. Here, the main objective of this project is to provide security to the confidential areas such as access room or locker rooms through biometric passwords. It includes 3 phases: registration, primary level authentication, secondary level authentication (draw-a-secret). The process of figuring out the validate person is accomplished in the following manner:

3.1 Registration

Here we register the new user by accepting the details of new user like user id, user name and palm vein image.

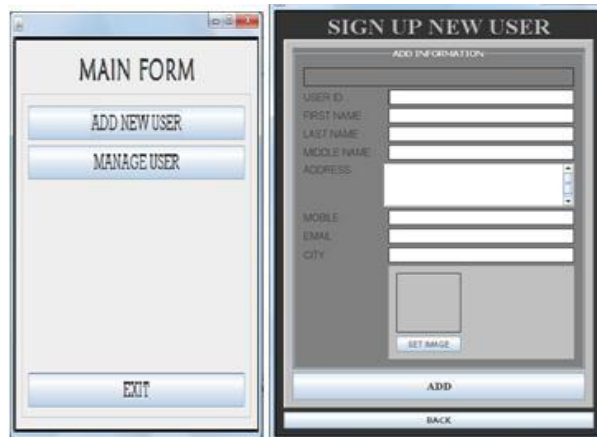


Fig 1: Registration Screen

3.2 Image Capture

Here we take image of palm vein of the person for authentication and identification purposes.



Fig 2: Image Capture

3.3 Image Processing Algorithm

In this process we capture the image taken for further processing using the three algorithms.

3.3.1 Pattern Marker Algorithm

In this algorithm the image we have got from near infrared is processed, this is the actual gray scaling of our images.

Algorithm

- a) Here traversal through the entire array of input image is done.
- b) Read color value of each bit which is 24 bit.
- c) Color value is to be split into three individual R, G and B which is 8-bit values each.
- d) Here conversion formula is used to calculate the grayscale component (8-bit) for given R, G and B pixels
- e) Further we compose a 24-bit pixel from 8 bit gray scale value.
- f) This 8 bit gray scale is stored at the same location in output image.



Fig.3: Grayscale Pattern

3.3.2 Pattern Extractor Algorithm

In Extractor Algorithm we perform Thresholding and Grayscale. This Thresholding is the simplest image segmentation technique. Afterwards to create binary images from a grayscale image, Thresholding is used. Only black and white image can be seen in the binary image. This is used for the further processing of the image to extract only the important features and make it black or white.

Algorithm:

- 1) Here again we traverse through entire array of input image.
- 2) Covert image into gray scale reading each pixel color.
- 3) Now the binary output value is calculated using the pixel value which we got from thresholding(vthreshold value).
- 4) Binary pixel value is stored at the same location as that of output image.



Fig.4: Threshold Pattern

3.3.3 Pattern Thinning Algorithm:

The image which is extracted undergoes thinning using the Thinning algorithm. Now this thinned image is used for the authentication and identification purposes. Basically to decrease the geometric value of the object image thinning is done. Stentiford Algorithm of thinning is used for thinning the algorithm. The resultant image is shown as below

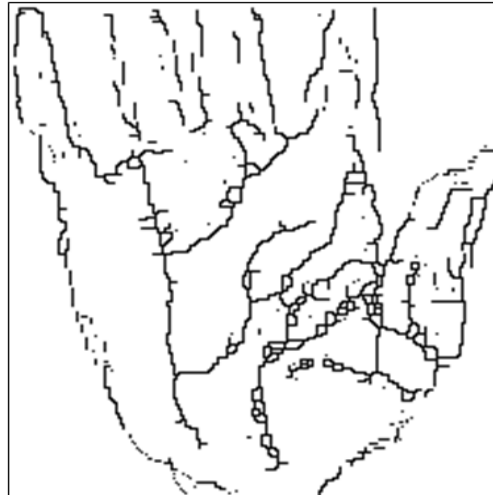
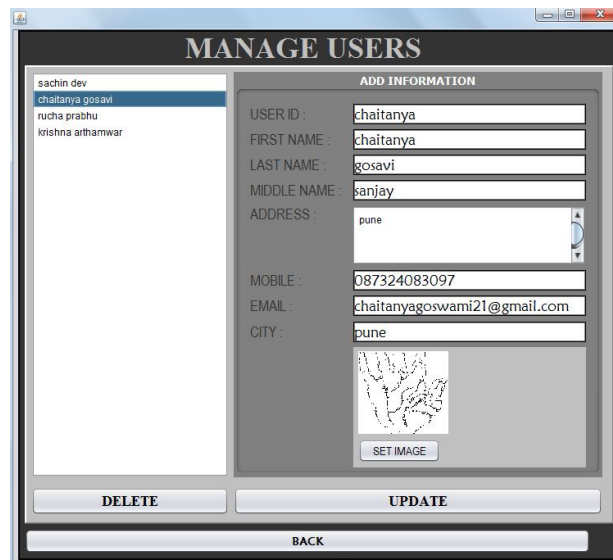


Fig.5: Thinned Pattern

3.4. Adding Thinned Image to the Database

In this step we add the thinned pattern to the database



3.5 Authentication

We are working on the authentication process

IV. Conclusion

We use three different algorithms for processing Palm Vein Pattern Image of an individual. This processed Image will be used for authentication of a person.

Acknowledgements

The authors would like to thank project guide Prof Mrs. S.B.MADANKAR PVPIT, Pune (India).for their guidelines and involving in research.

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