

Vein Pattern Extraction: A Review

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Abstract— Person identification and authentication using the biological features of the person are designed and are in use all around the world. There are different types of biometric authentication system one such medium which is very new technique of the systems are vein pattern recognition system. This vein pattern recognition system can be designed using different algorithms. In this paper, the surveys of different algorithms which are implemented for vein pattern extraction are done.

Keywords— Vein; image processing; review; identification

I. INTRODUCTION

Since the advent of 21st century, technology has been evolving in almost all fields known to mankind. Be it different types of user interfaces [1] or traffic assistance [2,3] or even security [4,5], many algorithms are being proposed using the concepts of image processing. One such area of interest is biometric system.

A biometric system is a technological system that uses information about a person or other biological organism to identify that person. A biometric system will involve running data through algorithms for a particular result, usually related to a positive identification of a user or other individual. Biometrics offers several advantages over the traditional security measures such as screening and security, accuracy. Biometrics are being used as one of the many alternatives in Recognition System. Biometric systems are divided on the basis of the authentication medium used. They are broadly divided as identifications of Hand Geometry, Voice Pattern, DNA, Signature Dynamics, Finger Prints, Iris Pattern, Face Detection and vein pattern detection etc.

II. COMPARITIVE STUDY OF BIOMETRIC SYSTEM

There are different biometric systems, each has its own advantages and disadvantages.

1) Iris recognition is one of the biometric recognition system which represents mathematical pattern of both iris patterns or only one iris pattern. Advantage with this system is very high accuracy and less verification time which is less than 5 seconds. Disadvantage associated with this system is that it requires very high data storage and also the total equipment is very expensive compared to other biometric system.

2) Fingerprint recognition:- This system scans and stores the fingerprints of the individuals and the scanned fingerprints are used to identify a person. Advantage with this system is that, it is very economical, easy to use and requires very less storage space. Disadvantage is that easy to get access with duplicate fingerprints.

3) Voice recognition:- This system uses recorded voice of a human to authenticate the system. Advantage with this system is it has high social acceptability, very less verification time. Disadvantage with this system is it is less accurate and a small change in voice of a human due to health issue will not authenticate the system.

4) Signature recognition:- This system recognizes the signature of the individual which are stored in the database. Advantage of the system is it has very less verification time and cheap technology but the disadvantage of the system is the signature can be duplicated very easily and it can be used for authenticating the system.

From above explained biometric systems each one has its own advantages and disadvantages. There is one biometric system which advantages than the above systems which is called as Vein pattern recognition biometric system.

Vein pattern recognition: This system first extracts the vein pattern using different algorithms and the extracted vein pattern is stored in the database which is later used for matching the vein pattern of the input image or scanned vein pattern. The advantages of this system are that it is difficult to forge because veins patterns are not same as it differs from person to person. Another advantage is that it has high accuracy rate when compared to other biometric systems.

So, with the found advantages of vein pattern recognition system here in this paper the survey of different algorithms used for the vein pattern extraction are done and described.

III. SURVEY ON VEIN PATTERN RECOGNITION

In [6] the design for biometric recognition system is done using two schemes, such as modeling and testing. Modeling is an enrollment process and testing is the combination of identification and verification process to recognize the palm vein feature stored in the database after modeling.

In [6], Palm vein images are obtained from CASIA database that contains 7200 human vein images which are of 100 different people. The obtained hand images are then split for finding out the ROI which is implemented by Competitive Hand Valley Detection (CHVD). CHVD is a method used to search the required valley point coordinate before gaining the ROI of the image. The ROI are obtained using the CHVD process. After the ROI, the next process done in paper 1 is pre-processing. The pre-processing is done using the adaptive histogram equalization (AHE) technique. AHE technique is image contrast reparation process which increases the contrast in the local area. AHE also could increase the contrast of grayscale image by converting the value using Contrast-limited Adaptive Histogram Equalization. After implementing AHE process the image is resized to 256 x 256.

After pre-processing the step is done in paper 1 is feature extraction by using Local Binary Pattern Recognition Invariant (LBPROT) method. After obtaining the LBPROT score from all the pixel of the image, the feature that is used in the matching process is the histogram value of the image. The next process in paper 1 is matching process, which is done by counting the distance by using cosine distance. The next is the decision making process is done based on the threshold defined in the system. The testing scenario in the paper 1 is based on two kind of errors, which are False Acceptance Rate (FAR) and False Rejection Rate (FRR), where FAR reached 0.11698 and the FRR reached to 0.1175 along with recognition accuracy rate as 96%.

In [7], they have developed hand vein-based multi-modal biometric technique for recognition. Multi-modal biometric recognition is a process of recognizing a person using two biometric modalities as input. Here in this paper palm vein and hand vein modalities are used for multi modal biometric recognition. Firstly, in pre-processing step the input vein images are given to intensity adjustment step such the pixel range will be within defined range such as 0 to 255. Then, binarization procedure is carried out to convert gray scale image into binary image. After conversion, morphological dilation operation is carried out to remove thinned objects in the image. Average filtering is carried out to get smooth input images. The next step after pre-processing is vein extraction. Vein extraction for the input images are performed by first filtering the image and then optimal threshold is identified to separate the vein part from the background of the input images using threshold based segmentation. The features such as location and width are extracted from veins and those features are fused with vector concatenation. In recognition step features are extracted from the test images and it is matched with the features stored in the database using distance measure done using Euclidean distance measure. By employing multi-modal biometric technique high False Match Rate (FMR) is achieved compared with single modality.

In [8], the personal identification is done using geometrical patterns of veins in a finger. The proposed system in this paper has three main stages apart from capturing the finger vein image pattern they are pre-processing, feature extraction stage and pattern matching.

In pre-processing stage allocation of region of interest (ROI) by applying Sobel edge detection operator are performed and then the next step is image enhancement using histogram equalization are done. After enhancement of image, image segmentation are done were brightness compensation is done using local contrast stretching. Along with brightness compensation binarization process are performed too. In image segmentation along with image compensation, noise elimination is done by employing dilation, erosion and applying median filter to erosion image. Thinning of the image after noise elimination are performed using Zhang-Suen (ZS) algorithm.

In second stage i.e, feature extraction stage, a feature set based on the local binary projection in four directions: - vertical, horizontal, main diagonal and second diagonal are adopted. The geometrical moments are calculated for four direction projections which represent the discriminating local

finger vein features. In the third stage pattern matching are carried out using K-nearest neighbour rule(KNN). In this developed system the equal error rate was found to be 99.2%.

In [9], the palm vein recognition are designed based on wavelet transform. The palm vein images are taken from PolyU hyper spectral palmprint database. The images in the database are cropped where the region of interest are present, the cropped size of the image is 128x128. The palm vein feature are extracted using 2D - Wavelet decomposition. Feature reduction are achieved using Linear Discriminative Analysis(LDA), where this LDA is a popular feature reduction method. The matching procedure is carried out using cosine distance nearest neighbour. In this proposed system, it is found that identification rate obtained was 99.74%, 100% of verification rate and 0.0% of Equal Error Rate(EER) was obtained.

IV. CONCLUSION

The paper has explained about several methods to detect and identify the vein pattern. These methods are accurate but when it comes to hardware implementation, they fail, as the area and time complexity of these methods are huge. As future scope, a hardware favorable algorithm has to be developed so that it can be implemented anywhere and everywhere.

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