PALM VEIN AUTHENTICATION USING DCT

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Abstract : Palm Vein Authentication (PVA) is a new promising technology based on biometric that has been applied successfully implemented to access control by many organizations that has even further potential in the field of forensics. The palm vein pattern has highly unique features that are difficult to forge because of its subcutaneous position in the palm. The palm-vein-based approach attempts to be more effectively accommodating the potential deformations, revolving and translational changes by encoding the orientation preserving features. Here the ROI of the palmvein image of size 128x128 is divided into four non overlapping sub-images. The DCT transform is applied on first subimage directly without any preprocessing. Transformed sub image divided into nine blocks, standard deviation is calculated for each block and such in total 36 (9x4=36) standard deviations will form the feature vector. This feature vector is used in matching stage. Total 4 images per person are taken from standard database available. Training set is prepared with the help of 2 images. Results are checked against remaining images in identification mode. This results are given in terms of genuine acceptance.

I. INTRODUCTION

Recently personal identification system based on biometric feature is being increasingly used in applications such as public security, access control, banks,etc. Palm vein based systems are being used for recognition in a number of applications.

Use of palm vein helps in increasing the robustness of the system. Biometric human recognition systems based on palm vein patterns are becoming popular as they possess properties like universality, uniqueness, stability, permanence and strong immunity to the forgery. Since the veins lie underneath of the skin and are, in most cases, not visible to the naked eye, they provide a strong resistance against forgery. The complex vascular pattern present inside the hand allows the computation of a good set of features that can be used for personal identification. This system applies various preprocessing technique to enhance palm vein images. Low pass filter is used to remove noise from image and by applying algorithm region of interest (ROI) is extracted, which helps to avoid rotational and scaling changes.

System is design to work using transform method. In this system various transform methods are used to extract features from ROI. The normalized and enhanced palm-vein images depict curved vascular network/patterns, and these vessels can be approximated by small line segments which are rather curved. In order to ascertain the effectiveness and robustness of the proposed approach for the palm-vein identification, transform method called Discrete Cosine Transform(DCT) is used[1][2]. Transform coefficients are used for feature extraction which will form template in database. All this methods are applied on PUT database [3] which contains palm vein images of 50 persons.

A. PROPOSED SYSTEM

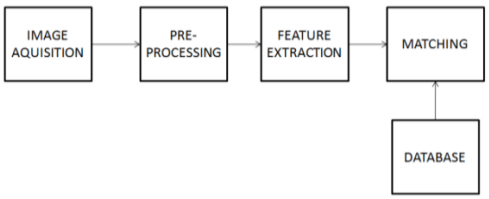


Figure 1-Block diagram of palm vein authentication system

Image acquisition -In this project, standard database of PUT database is used [3]. It contains 50 persons palm vein images, 24 image of each person with 12 of right hand and 12 of left hand.

II. PREPROCESSING &ROI EXTRACTION

The image available in database is first converted to gray scale. Then this image is filtered using Gaussian filter in order to remove any noise which may cause problems while thresholding the image. This filtered image is converted to binary image using a global threshold T. Centroid is calculated of a binary image and ROI is extracted. Centroid value is used to find x-y coordinates of ROI image and ROI is extracted.

Algorithm:

Step1- palm vein image resized in 256*256 format
Step2- Apply Gaussian filter as low pass filter to remove noise.

Step3- Convert image into binary image format.

Step4- Calculate the centroid of image

Step5-Take abs value of centroid and calculate x and y coordinate of image.

Step6-Crop the image to extract ROI of given dimensions (128*128).

Step7- Divide the image into four non overlapping parts around center point.

Step8- Apply DCT on each part and calculate standard deviation.

Step9- Create standard database containing value of standard deviation with help of training image.

Step10- Compare result of testing image with standard database for identification and verification.

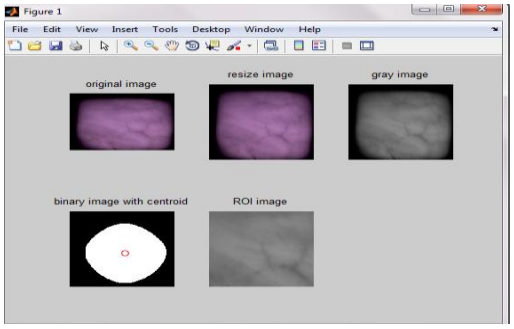
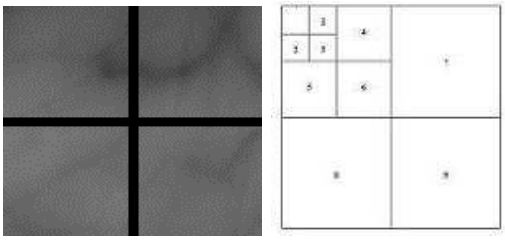


Figure 2-Result of ROI extraction

III. FEATURE EXTRACTION USING DCT

Feature extraction is to describe a palm vein in a concise feature set other than the original image. How to define the feature is the key point in any biometric identification. A feature with good discriminating ability should exhibit a large variance between individuals and small variance between samples from the same person. In this system, standard database of PUT database is used[3]. It contains 50 persons palm vein images, 24 image of each person with 12 of right hand and 12 of left hand.

ROI extracted is of size 128 by 128 pixels. Algorithm first divides the image into four non overlapping parts around center point as shown in figure 3.The 2-D transform is applied on first sub-image separately. The DCT transformed coefficients are now grouped into different frequency bands (blocks) as shown in figure 3.For each numbered block the standard deviation is calculated. Such features are calculated from four subimages and hence form a total of 36 features will form feature vector which is used for enrollment as well as matching phase.



(a) (b)

Figure 3-(a)ROI in four parts (b)Arrangement of sub-image DCT coefficients

Standard deviation of each part is calculated. In the matching phase standard deviation Training image compared with standard deviation of testing image and mean square error is determined. Threshold value of error is decided for each person. According to the error values individual person can be identified.

IV. RESULT

Database of feature vector is created; the value of respective standard deviation is taken as final feature vector. The algorithm is checked in identification and verification mode, by comparing remaining 2 images from the database against feature vector created for all. Thus total number of images used for training and testing are given in Table 1. Once standard deviation feature vector (36) for testing image is calculated it is compared with all database feature vector on one to one basis. Table 2 shows the result of verification and identification for all filtered testing images against the feature vector already created. The training set (TS) used is of 1 image per person. The testing set used is of 4 images per person.

Table 1. Number of Palmprint images for Training and Testing set

Training set	**Testing set**
1x10=10	4x10=40

Table 2.Recognition Rate with filtered image

Verification		Identification	
Th=0.3	62.50%	Th=0.3	72.50%
Th=0.4	75%	Th=0.4	72.50%
Th=0.5	80%	Th=0.5	57.50%

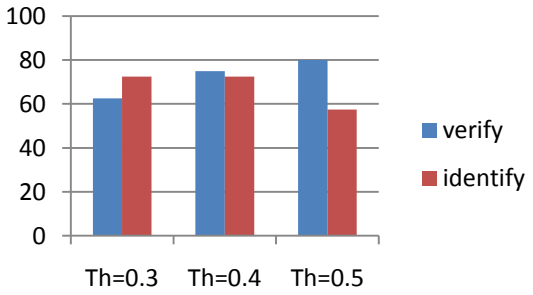


Figure 4- Recognition graph

V. CONCLUSION

In this paper "Palm vein authentication using DCT transform method" has been proposed that produce security system. Transform coefficients are used for feature extraction which will form template in database. In this project we use PUT database for image acquisition which contains 50 persons palm vein image[3].

Palm vein image is converted to gray scale. Image is filtered using Gaussian filter in order to remove any noise. This filtered image is converted to binary image.

Centroid is calculated of a binary image and ROI is extracted. The extracted palm vein features are compared with the available database of the palm vein features .If the extracted palm vein features is matched with the available database then the entry falls in genuine acceptance region else it is treated as false rejection.

REFERENCE

[1] Selma Elnasir, Siti Mariyam Shamsuddin, "Palm Vein Recognition based on 2D-Discrete Wavelet Transform and Linear Discrimination Analysis", Int. J. Advance Soft Compu. Appl, Vol. 6, No. 3, November 2014ISSN 2074-8523.

[2] Badrinath G. S. " An Efficient Palmprint based Recognition System using 1D-DCT Features", IDRBT Doctoral Colloquium ,August 25, 2011

[3] PUT palm vein database http:// biometrics.put.poznon.pl/assets/vp base1.zip