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A Method for Palmprint Verification Using Array of Mean Values of the Pixels in the Grids of ROI

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ABSTRACT

An approach for extracting texture pattern as features for Palmprint verification is proposed in this paper. The features to classify the texture pattern of the Palmprints are calculated as an array of mean values of the pixels from the grided ROI . The Palm print image is processed through the various stages of the system to generate the feature vector which is useful to classify the texture for Palmprint verification.

Key words: Palmprint matching, Region of interest, Edge detection, Feature vector.

INTRODUCTION

Palmprint serves as a biometric to identify the persons based on the patterns available on the palms. The palm is the portion of the hand between the fingers and the wrist which contains large number of biometric features[7]. There two approaches to match the Palmprints, based on the palm patterns[1]. One is based on the statistical features extracted from the palm such as Eigen palm[2], fisher palm[3], Gabor filters[4], Fourier transform[5] and local texture[6]. And other approach is based on structural information includes principle lines and minutiae. Palmprint matching refers to the process of finding top five matched images for a given input Palmprint image.

Overview of the system

There are two phases in the system [1], namely

Enrollment phase

In the enrollment stage, Palmprint images from different palms are collected as training samples. These samples are processed by pre-processing and feature extraction to generate the feature vector templates. Store these vectors in the database in the registration module.

Matching phase

In matching stage, a query palm print image is given as input image, and is processed by the pre-processing and feature extraction modules to generate feature vector and then matched against stored feature vectors from the database to find the matched Palmprint images.

Fig.1 shows the various modules involved in Palmprint matching System.

Preprocessing module

- segmentation
- locating *ROI*

Feature extraction module

- features extraction process
- construction of feature vector

Registration module

Matching module

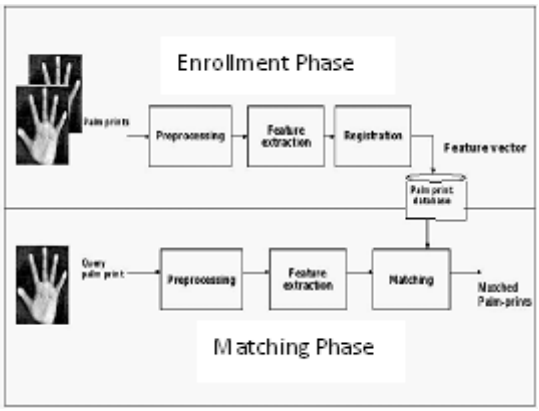
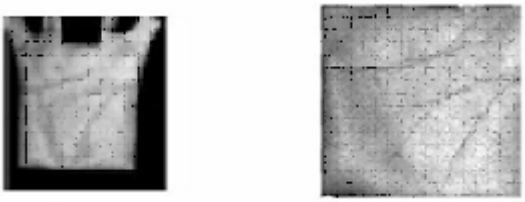


Fig. 1: Block diagram of Palmprint Matching System

Pre-processing

Pre-processing is necessary to align and orient the Palmprint image to minimize the variations in the hand images of the same person[8]. Pre-processing of a Palmprint image involves segmentation and localizing the *region of Interest ROI*. ROI is the central part of the palm, from which the feature vector is extracted [9],[7],[1]. Fig. 2 shows Input image and *Region of interest*.



(a) (b)

Fig. 2(a) Input image (b) Region of Interest

Proposed approach to extract the features

In the Pre-processing stage, ROI is localized for the given Palmprint image. Simple Sobel edge detection operations are employed on the segmented Region of Interest. Two direction Sobel operators S_0 and S_{90} are designed as shown in Fig. 3.

1	2	1
0	0	0
-1	-2	-1

S_o

1	0	-1
2	0	-2
1	0	-1

S_{90}

Fig. 3: Sobel Operators

This operation is operated according to the following expressions:

$$S = \sqrt{S_0^2 + S_{90}^2}$$

$$S = \begin{cases} 0 & \text{if } S > \text{threshold} \\ 255 & \text{also otherwise} \end{cases}$$

Binarized Region of Interest with Sobel features is obtained and is shown in Fig. 4. Region of Interest operated via Sobel operation is divided into 16 regions (4 X 4) .Each region is named (0, 0), (0, 1) … (3, 3). The grided region of Interest is shown in Fig. 5.

Fig. 4: ROI operated via Sobel operation

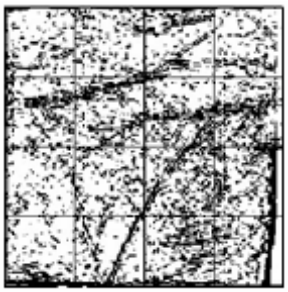


Fig. 5: 4 × 4 Gided Region of Interest

The Palmprint features are calculated directly from the grided ROI. The feature vector is an array of 16 values which are derived from 16 grids respectively. Each value is calculated as the mean values of the pixels from each grid.

The feature vector of the 16 mean valued array is shown in Fig. 6.

Fig. 6: Feature vector

EXPERIMENTAL

In this section, experimental details which are carried out in this approach are presented. 1000 Feature vectors are stored in the database (as shown in Fig. 7) which are obtained from 1000 Palmprint images of 100 different individuals (10 images of each person) from Hong Kong PolyU Palmprint database. Given input palm print image is preprocessed and extracted feature vector is compared against the feature vectors stored in the database to find top five matched feature vectors

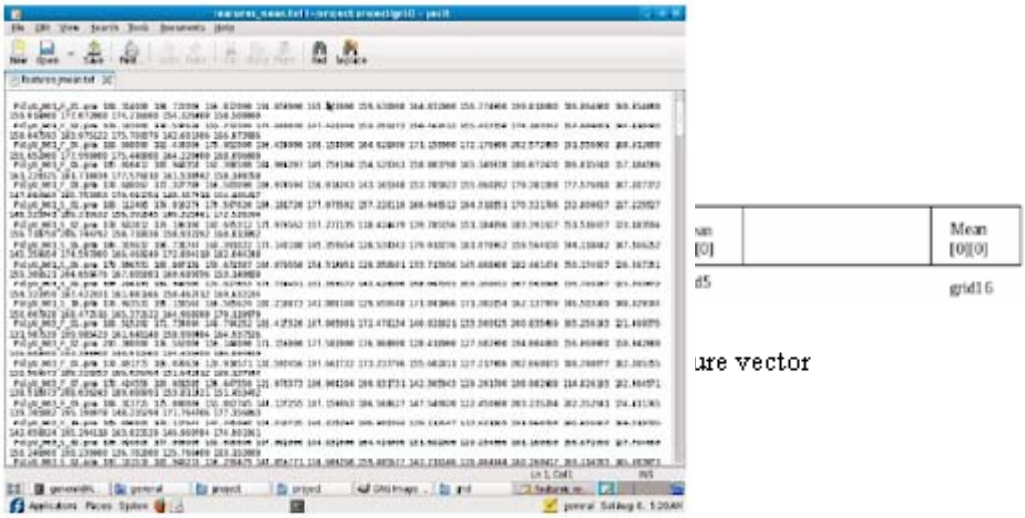


Fig. 7: Sample data base

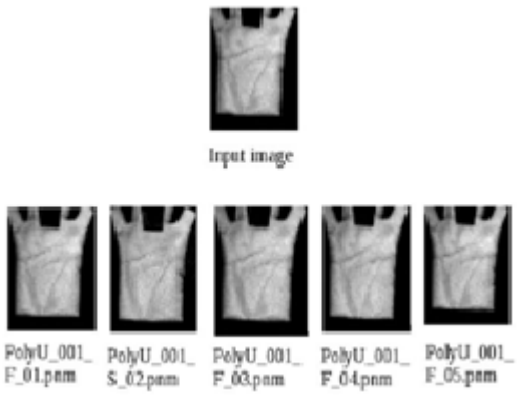


Fig. 8: Sample results

by finding the Euclidean distance between feature vector generated from the given input Palmprint image and every feature vector templates in the database. By arranging all the feature vector templates in the database in ascending order of Euclidean distance, top five vectors are chosen as matched templates (as shown in Fig.8).

CONCLUSION

Palmprint verification based on the array of Mean values of the pixels form the Grided ROI is fully automated system for verification. It is useful approach and makes the extraction of Texture based features easy.

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