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PRINCIPAL LINES BASED FEATURE EXTRACTION COMPLEMENTARY METHODOLOGIES FOR PALMPRINT

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Abstract: Biometric system uses technology of pattern recognition which makes identification by determining the authenticity of specific behavioral or physiological characteristics possessed by an individual. Human palm is used as biometric measure to identify an individual because of its unique, stable, distinct and multiple features such as principal lines, wrinkles, ridges, minutiae. Principal lines are the most stable lines of human palm and it is used in many recognition and identification techniques. In this paper we have an overview of different extraction methodologies used for principal line extraction. Also the complementary natures of different algorithms were discussed.

Keywords: PCA, Butterworth, APEX, DWT and PFI

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INTRODUCTION

Palmprint based biometric system can be of two types: identification in which an individual is recognized, and verification in which an individual is verified or authenticated. In this paper we are going to take an overview of the biometric system based on palmprint. This survey is about techniques based on principal lines extraction methodologies.

The inner surface of the palm normally contains three flexion creases, minor creases and ridges. The flexion creases are also called principal lines and the secondary creases are called wrinkles. The flexion and the major secondary creases are formed between the third and fifth months of pregnancy [4]. The major crease or flexion crease are formed due to folding of hand, these are the permanent feature of palm and can be used for recognition or as identification methodologies. It consists of different stages such as input stage where palmprint image is given as input to the system. Region of Interest Extraction stage in which the area containing the major lines are get extracted from the image. Feature Extraction stage in which the principal lines are obtained and used as matching characteristic. In this paper we are concentrating on feature extraction of methodologies used for principal lines. structure of palmprint recognition system is shown in fig 1. The next stage is feature matching stage where the extracted line features were matched against the test image, and result is given.

Methodologies

Complementary algorithms for palmprint feature extraction are discussed in this section.

Hierarchical Palmprint Recognition

In this methodology [2] a probability distribution template of major line is generated. Texture feature were obtained by applying dual tree complex wavelet onto palmprint image. The two features accompaniment each other well and the method can improve recognition accuracy. A probability distribution template of major line is generated from the palmprint image on the first level, then dual tree complex wavelet is applied onto palmprint image to obtain texture feature on the second level. Dual tree DWT has the advantages of approximate shift invariance, good directional selectivity, computational efficiency and low redundancy, that why it can be used to analysis palm texture effectively. In this the dual tree complex transform has two parallel wavelet trees that are constructed with traditional orthogonal wavelet filters. One is odd length high-pass filter, the sample sequences is even-symmetric about its mid-point; the other is even length high-pass filter and is odd-symmetric about its mid-point. They turn out to be the real part and virtual part of complex wavelet after odd and even filtering alternatively.

The decomposed image results in six wavelet sub-bands on each level. The transform redundancy degree is 4:1. Compared to traditional wavelet, the dual tree complex wavelet can be easily reconstructed besides its approximate shift invariance and good directional selectivity properties [2].

Main Line And Folds Extraction

Butterworth high-pass filter and median filter are used in combination in this methodology [3]. The corrosion method is used to remove some noises and only main line pass filter is used to increase the high is used to eliminate noise and reserve detail and folds features remain. After completing the pre-processing the formula shown is used for convolution is done to the processed image with 9×9 template the middle value of template is 81 while others are kept -1. Compared with the median filter, the sum of the whole template is not 0 but 1. The template can be used to extract the edge information and enhance the high frequency components of image [3].

$$template = \begin{bmatrix} -1 & \cdots & -1 \\ \vdots & 81 & \vdots \\ -1 & \cdots & -1 \end{bmatrix}$$

Computed result will be transformed into binary data according to this formula

$$BW(i,j) = \begin{cases} 1 & templateim(i,j) > TBW \\ 0 & templateim(i,j) \leq TBW \end{cases}$$

This method has overcome the shortcomings caused by palm rotation.

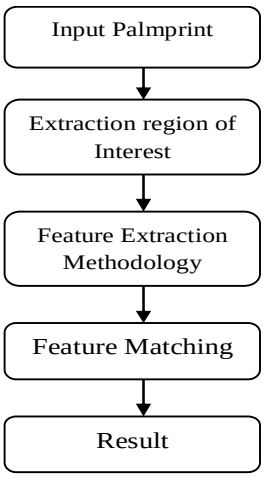

Fig1: Palmprint Recognition system.

Principal Component Analysis

In this methodology [1] different stages are used as follows

Data preparation: First training matrix (Pi) is formed by aggregating vectors for the training palmprints by appending palmprint image columns into single vector Mean subtraction: The average matrix Z has to be calculated then subtracted from the original palmprints (Pi) and the result is stored in the variable Fi

$$Z = \frac{1}{M}\sum_{n=1}^{M} P_n$$

$$F_i = P_i - Z$$

The covariance matrix calculation: the covariance matrix C is calculated as the given formula

$$C = \frac{1}{M}\sum_{n=1}^{M} F_n F_n^T$$

Calculation of the eigenvectors and eigenvalues of the covariance matrix is done. The eigenvectors and the corresponding eigenvalues should be calculated. The eigenvectors (eigenpalms) must be normalized so that they are of length 1.

Selecting the principal components: the decision is made on the basis of which has the highest eigenvalues. The higher the eigenvalue, the more characteristic features of a palm does the particular eigenvector describe[1]. Eigenpalms with low eigenvalues are neglected as they explain only a small part of characteristic features of the palms.

Apex Palmprint Recognition Algorithm

Here APEX algorithm [1] is used to extract palmprint feature. APEX algorithm is applied in feature extraction stage of system. This algorithm is used with PCA. PCA is based on the sample covariance which characterizes the scatter of the entire data set, irrespective of class membership. Then, PCA choose the projection axes which might not provide good discrimination power. Eigenpalms are strong in form constitution to slight translation, rotation and scale changes and can bear high blurring effects. But still they are affected by significant local variations such as that of directional lighting. APEX palmprint recognition is based on local eigenpalm analysis; consequently, it provides better results for local variations. The structure of

neural networks and enhance their performance. so it can be used as supporting methodology for PCA.

Probability Feature Image (PFI) Based Method

The proposed a methodology palmprint recognition algorithm based on principal lines. To reduce the noise rate irregular geometrical shape was employed to get valid region Probability Feature Image(PFI) was used in order to reduce random noises in feature image; in PFI features from different training samples were blended into one template, which guaranteed the integrity of feature. Canny edge detector and locally self-adaptive threshold binarization method are combined to extract the principal lines [6].

Recognition can be done only using the structure information of palmprint[5]. But the intension information is ignored. Considering both intension and structural information makes the extraction method more accomplished.

Conclusions

In this paper we review the existing techniques of pattern recognition. We discussed a variety of pattern recognition method techniques such as PCA, Hierarchical**,** Main Line And Folds Extraction. For each technique we have provided a detailed explanation of the techniques which are used for finding the feature of palm print principal lines. also this paper shows different algorithms for feature extraction and can be used in combination for improved result. Methodologies discussed here are complementary to each other and give a more effective extraction result.

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