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PALM PRINT RECOGNITION AND AUTHENTICATION USING DIGITAL IMAGE PROCESSSING TECHNIQUE

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Abstract— In ubiquitous network society, where individuals can easily access their information anytime and anywhere, people are also faced with the risk that others can easily access the same information anytime and anywhere. Now- a-days, passwords, personal identification numbers, etc are used as a means for security. But normally the PIN can be guessed and hence stolen. Passwords can also be hacked by software programs. Sometimes passwords containing special characters, capital letters etc are demanded which are bit complex to remember. Hence authentication using personal identification came to exist which is called Biometric. Biometric is something that we have and something we are. This paper presents biometric technique called palm print authentication which is more secure as compared to other techniques such as finger print, iris detection, face detection, voice detection, etc. As an important member of the biometric characteristics, palm print has merits such as robustness, user-friendliness, high accuracy and cost-effectiveness. Palm print has larger area as compared to finger print, it does not have hairs on it and palm print pattern is unique to every individual. The entire project goes with three basic steps like Pre-processing, feature extraction and feature matching.

Keywords — Binarisation, Biometrics, False acceptance rate (FAR), false rejection rate (FRR), Feature matching, median filtering, structure of human palm.

INTRODUCTION

Biometrics is nothing but identification of person on the basis of his/her physical behaviour or characteristics. As the features of every person are different from each other, it is very difficult to steal it. Hence the chances of forgery are eliminated and the integrity of data is maintained. Biometric authentication gives access to the right person at right time thereby avoiding unauthorized activities. In general, there are three approaches to authentication. They are given in order of least secure and least convenient to most secure and most convenient:

- Something we have - card, token, key.
- Something we know - PIN, password.
- Something we are - a biometric.

These approaches are used for the authentication. The first two approaches are least secure as the token, keys can be stolen and passwords and PIN can be forgotten. The biometric approach has thus proved to be the most efficient one.

The process mainly deals with two steps – authentication and verification. The authentication server contains database of user i.e. passwords, PIN or biometric image. At the verification stage, the input is taken from the user. The system then compares the taken input with the one stored in database and if the match is found then access is given otherwise denied. This is one to one matching process.

Among all the techniques that are available for authentication, palm print has proved to be the most secure and accurate with the FAR of 0.000008% and FRR of 0.0000001%. Hence they can be used in various applications. Use of palm print possesses properties like universality, uniqueness, stability, permanence and strong immunity to the forgery. Any biometric technique is worked on five parts - cost, user acceptance and environment constraints, accuracy, computation speed and security.

Structure of human palm –

Human palm normally consists of three flexion creases, secondary creases and ridges. The flexion creases are called principal creases and secondary creases are called wrinkles. The flexion and major secondary creases are formed in the fifth month of pregnancy and superficial lines are formed after our birth. Even identical twins have different palm patterns and hence these complex patterns are used for identification purpose. Even this palm pattern has been used by fortune tellers from a very long time. High resolution image of palm print is used for forensic applications such as criminal detection and low resolution image is used for civil and commercial application. Ridges and singular points are used extracted from high resolution images (400 dpi) and principle lines, wrinkles and textures are generally extracted from low resolution images (150 dpi).

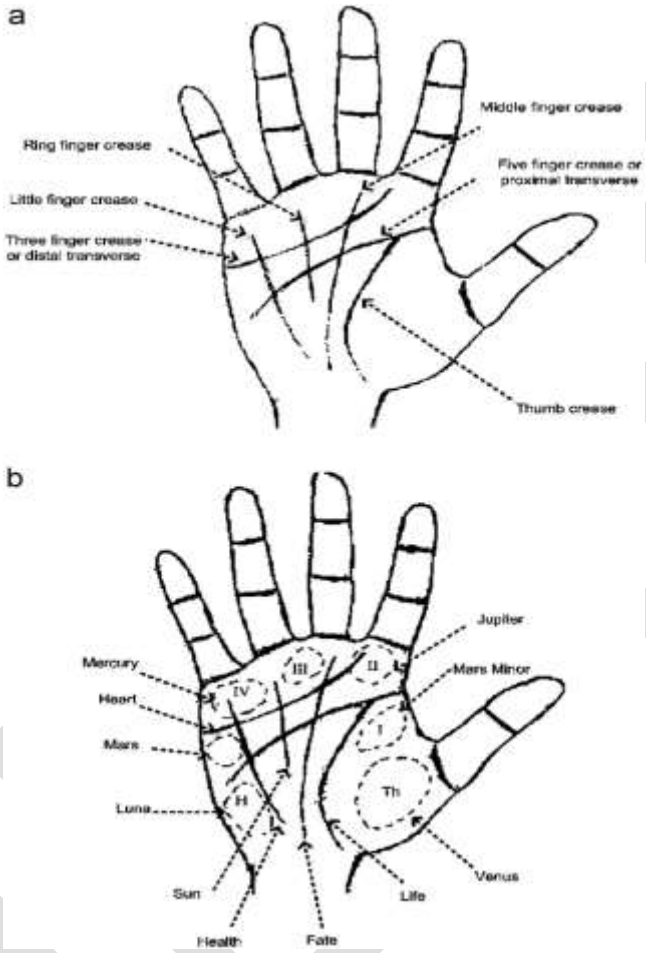

Fig. 1 Basic structure of human palm

LITERATURE REVIEW

In a paper presented by Tee Connie, Andrew Teoh Beng Jin, Michael Goh Kah Ong, David Ngo Chek Ling in March 2004 titled "An Automated Palm Print Recognition System" [5], proposed a technique of verification using palm structure and divided it into three parts pre-processing, feature extraction and registration. They have used several linear subspace projection techniques like principle component analysis (PCA), fisher discriminate analysis (FDA) and independent discriminate analysis. The experiment gave FAR and FRR of 1.356% and 1.492%.

In a paper presented by Zhenhua Guo, David Zhang, Lei Zhang and Wangmeng Zuo titled as "Palm print verification using binary orientation co-occurrence vector"[2], a superior feature extraction method, designated as binary orientation co-occurrence vector (BOCV), to represent multiple orientations for a local region was proposed. They found that using single dominant verification may lose some important information as the palm consists of many cross lines. The BOCV can better describe the local orientation features and it is more robust to image rotation. The method proposed for palm pattern extraction was 2-D Gabor filtering. This method worked well for palm vein feature extraction as the cross section of palm vein was Gaussian in nature.

Jiaa, Huanga and Zhang [3] have proposed palm print verification based on robust line orientation code. Modified finite Radon transform was used for feature extraction, which was used to derive orientation feature. For matching of test image with a training image the line matching technique was used based on pixel-to-area algorithm.

X. Wu, K. Wang and D. Zhang [4] proposed a novel algorithm for the automatic classification of low-resolution palm prints. Principle lines were defined and characterized by their position and thickness. A set of directional line detectors was used for extraction of principal lines of the palm. Using these detectors, the potential line initials of the principle lines are extracted and then using these extracted potential line initials, the principal lines were extracted with the help of recursive process. Using this information about the extracted part, the region of interest (ROI) was selected and then a suitable line detector was chosen to extract the next part of the principle line in this ROI. After extracting the principle lines, some rules are presented for palm print classification. The proposed algorithm classified these palm prints with 96.03% accuracy.

Later in a paper presented by Feng Yue, Wangmeng Zuo, David Zhang, Kuanquan Wang titled as "Orientation selection using modified FCM for competitive code-based palm print recognition" [1], fuzzy C-means cluster algorithm to determine the orientation of each Gabor filter was proposed. The statistical distribution was made on set of real palm print images, the method was found to be suitable. The computational accuracy and complexity was considered and competitive code with six orientations was selected.

PROPOSED CONTENT

Now-a-days, biometric is playing a vital role in authentication and palm print has proved the most secure as for every individual, the palm pattern is different. Again palm has no hairs and it is less susceptible to color change as compared to other body parts. Recent research on palm print authentication has proved that orientation of palm lines is one of the most promising features for personal identification.

Figure 2 shows block diagram of proposed system. First block contains an automated approach to extract the region of interest using completely contactless technology. Second block shows feature extraction and it is followed by feature matching i.e. the captured image is compared with the image in database using various matching algorithms.

Pre-processing

Accurate personal identification using palm print patterns will require accurate segmentation of ROI (region of interest) images. In case if the guiding pegs are not provided, then the process of authentication becomes difficult and hence rotation invariant processing technique is designed. Pre-processing is the first step of image processing technique. It is done to extract the required portion of palm from the entire hand image. It is a five step process

Binarization

Boundary tracing

Key point detection

Establishing the co-ordinates

To extract ROI

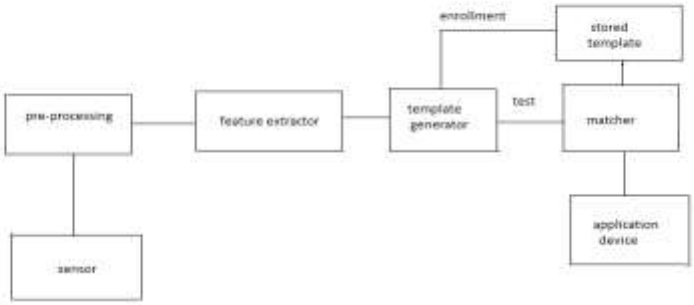

Fig 2. Block diagram of proposed system

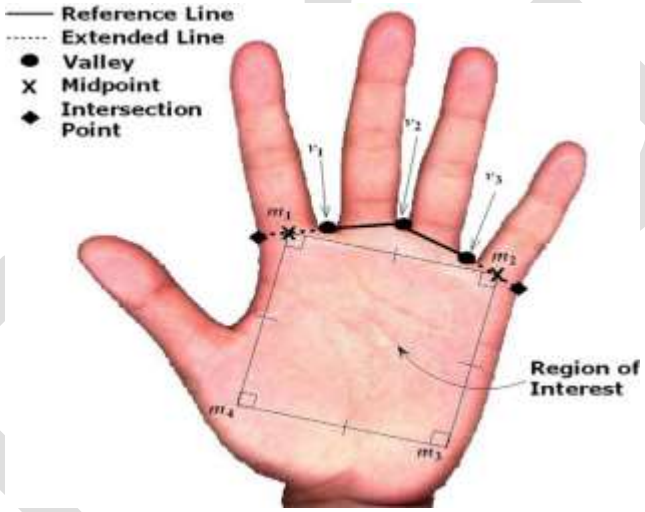

Fig. 3 Extraction of ROI

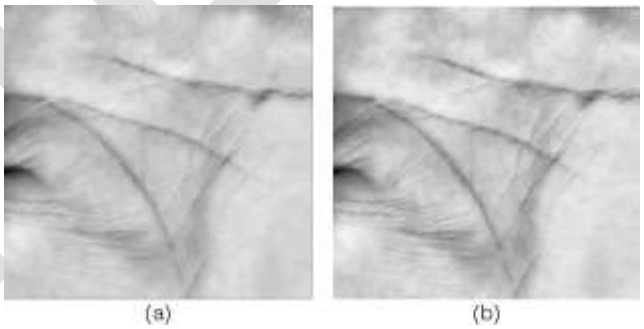

Fig. 4 (a) image before normalization (b) image after normalization

Feature Extraction and Matching -

After the input image is captured, pre-processing is done to extract region of interest. Noise is removed in pre-processing using median filter. The value of intensity is adjusted so that 1% of the data is saturated i.e. amount of white color present in entire image is enhanced to increase the brightness of the image at low and high intensities. Then thresholding is done by means of analyzing the histogram of an image, but the spreaded histogram of an image from 0 to 255(Gray Scale value) will make the analysis difficult and

results in poor thresholding. To overcome this, proposed method clustered the images into two categories i.e., having only two gray scale values. Finally thresholding is applied to each clustered image which results with a good threshold value.

LBP algorithm was used for face reorganization as a texture descriptor. Each pixel in the input image is labeled by thresholding 3x3 neighborhoods with the centre value and representing the fixed binary value. Its improved version has also been proposed and has versatility in image matching. The reason why LBP is receiving attention in biometrics is because it does not need any optimization. One of the disadvantages of LBP is that it cannot handle large deformation of images.

Gabor filtering is widely used for pattern matching in finger print and palm print authentication. However the Gabor filter proves inefficient for deformed images patterns as these methods assume that the images are completely aligned. Again unlike LBP, the Gabor filters need optimization depending on biometric threads.
We are using multi scale local binary pattern (MSLBP) in which the radius of LBP is varied. Considering H_1, H_2… H_i as vectors, the MSLBP histograms can be calculated by summing all the vectors over an interval 0 to n. The match between the captured image and stored image is obtained using Euclidian distance or Hamming distance.

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CONCLUSION

Palm print authentication proves to be very efficient, accurate and cost friendly technology for security purpose. The main application of palm print is in the field of security, forensic science and defense, etc. various algorithms have been discovered for feature extraction and matching. Proposed idea gives much accurate results as compared to other techniques.

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