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Palm Print: A Biometric for Human Identification

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Abstract: ***As in today's life security is main concern. So, a lot of researches are going in the field of security like password, security question, pattern matching and a very important approach is biometric security. So my work is to study about the palm print recognition to identify human. Palm print recognition system has proved its efficiency with many machine learning techniques like LBP, Repeated line tracking, junctions point matching. This paper is a comparison of different techniques developed in the past.***

Keywords: ***biometrics, identification, palm print***

I. Introduction:

Biometrics plays a vital role nowadays, in human identification and authentication. Palm print and palm vein based human recognition is a topic in which much of effort is devoted these days. As most of the unimodal identification techniques do not work very well in recognition due to some problems such as noisy data, intra-class variations, restricted degrees of freedom, non-universality, spoofing attacks, and unacceptable error rates [1]. A number of research systems have now been developed which can concurrently acquire and combine hand shape, and palm print features and hence achieved a considerable improvement in their performance. In recent advancements in this field, the researchers concentrate on developing the systems that can acquire hand images in an unconstrained and contract-free manner [2]. A hand image contains a lot of information such as hand geometry, palm veins, palm texture, finger texture, fingerprint, and so on. The main point about a biometric based identification is that it is non transferable means it can't be given to another individual so they personally have to go through the identification and authentication point. Some special features of palm print recognition technique that makes it better than other are stable line features, rich texture features, low-resolution imaging, low-cost capturing devices [4]. Moreover, the palm is an ideal part of the body for identification and authentication as it normally does not have hair which can be an obstacle for photographing the blood vessel pattern as in other techniques, also it is less prone to a change in skin color, unlike fingers or the back of a hand. The palm-vein images in case of contactless imaging present a number of translational and rotational variations. Due to this, more stringent preprocessing steps are required to extract a stable and aligned ROI. The preprocessing steps must recover a fixed-size ROI from the captured images which have been normalized so as to minimize the rotational, translational variations in it [5].

Palm Vein identification is now getting higher and contentious development work in which self-determination groups are anxious in excess where confidentiality and uniqueness are the major concerns. Moreover, palm prints also have a great evidential value in forensic applications, because approximately 30 % of the latent lifted at crime scenes are those of palm prints [7]. Palm print matching can be classified into three categories based on the source and size of palm print images,

1) full-to-full palm print matching;

2) latent-to-full palm print matching; and

3) live-scan partial-to-full palm print matching.

So palm image can be taken with the help of the CCD based scanner, digital camera both but the images produced with the help of the camera are low quality images. Their quality suffers due to miss focus of camera, weather, lens adjustment but the images produced with the help of scanner are good images but scanners are very expensive and this results to a very expensive method for development. The given figure shows the image of the scanner that can be used to scan the palm of the user.

Figure 1 Show the scanner for palm image [11]

Figure 2 Image produces by the palm scanner.

The above figure 2 shows the scanned image produced by the scanner which is very clear. In this picture feature extraction is quite easy rather than digital camera image.

II. Previous work:

Jian-Gang Wang [1] proposed a novel representation for palm prints called "Junction Point"(JP) set. Junction point is formed at the point of intersection of line segments which are extracted from the images of palm print and palm vein respectively. Junction point approach is different from the other existing approaches as it contains the positioning and orientation information, which reduces its storage requirements considerably. A comparison is performed between junction point and the line based approaches on a large dataset. It is concluded by the results of analysis that junction point approach is better than others as it gives a better representation with a lower error rate.

Vivek Kanhangad [2] use 3D images of hands for human identification. He proposed a **technique** which first estimates the 3D space orientation of palm images. Which then normalize both the captured 2D and 3D images. A new feature representation approach called "Surface code" is implemented for matching between a pair of 3D palm print images. After that, weighted sum rule is used for consolidation of individual matching scores of palm print image pairs. The advantage of using 3D images for matching is that, the orientation of the hand can be robustly estimated using a single point detected on the palm.

Miguel A. Ferrer [3] proposed a multimodal biometric system which uses a combination of hand geometry, palm print, and finger prints for human identification. The right hand images are captured by a general commercial scanner having 150 dpi resolutions. The geometrical features were gathered using the binary images, which consists 15 measures. SVM is used for the verification purpose. For getting the palm print, and finger texture different 2 Dimensional Gabor phase encoding schemes are used. A Hamming distance and threshold are used for identification.

Er. Ranpreet Kaur [4] use palm print biometric for human identification by using K-means Clustering and back propagation algorithm with global features on the same dataset. K-means clustering is a non hierarchical method that initially takes the number of components of the population equal to the required number of clusters. It then examines it each component of the population, and give it to one of the cluster in accordance to the minimum distance. Back-propagation on the other hand is a training algorithm for neural networks. It calculates the gradient of a loss function with respect to all weights in the network.

Vijayta Chowdhary[5] has used Gabor filter for human identification using palm print biometric. The given approach tries to more efficiently handle the significant deformations, rotational and translational variations, by encoding the orientation preserving features, and by using a new region-based matching approach. She has also compared the previously given palm vein recognition scheme with his new proposed ones on two different databases that are acquired with the contactless and touch-based imaging setup. She then calculates the performance improvement in both verification and recognition scenarios, and has analyzed the effect of enrolment size on the performance of the scheme.

Er.Ranpreet Kaur [6] uses the geometrical and texture features of palm print for human identification. She took her database from www.coep.org.in for processing. Image pre-processing is done before recognition, which includes removing noise, dust, etc from image. Secondly, the pre-processed image is used for extraction and finally, the dataset is prepared and used for further identification.

Eryun Liu [7] has presented a coarse to fine matching approach that is based on minutiae clustering and minutiae match propagation is designed specifically for palm print matching. a local feature-based minutiae clustering algorithm is designed to cluster minutiae into several groups such that minutiae belonging to the same group have similar local characteristics, in order to deal with a lot of minutiae. After that, coarse matching is done within each cluster to set up initial minutiae correspondences between two palm prints. Starting with each initial correspondence, a minutiae match propagation algorithm seeks for mated minutiae in the full palm print. The given scheme has been evaluated on a latent-to-full palm print database consisting of 446 latent and 12,489 background full prints. A rank-1 identification accuracy of 79.4 %, which is considerably higher than the 60.8 % identification accuracy of a state-of-the-art latent palm print matching algorithm is shown according to the paper.

Ajay Kumar [8] has proposed a novel bimodal biometric approach which uses both hand shape and palm texture for human recognition. Both images that are palm print and hand-shape images are proposed to be extracted from the single hand image captured via a digital camera. The proposed approach is demonstrated for palm print recognition using discrete cosine transform coefficients, which can be directly obtained from the camera. The obtained results depicts that

while majority of palm print or hand-shape features are useful in predicting the subjects identity, only a small subset of them are necessary in practice to establish an accurate model for recognition.

Sara Zokaee [9] used two biometrics methods that are electrocardiogram and palm print for human identification. MFCC (Mel- Frequency Cepstral Coefficients) approach is used for features extraction of Electrocardiogram biometric and PCA (Principal Component Analysis) to extract features of Palm print. Then the features undergo K-Means nearest Neighbour classification. The efficiency of the given scheme is measured against the standard MIT-BIH and POLYU databases. The results have demonstrated that the algorithm achieved 94.7% of the detection rate.

Slobodan Ribaric [10] demonstrated a multimodal biometric identification system based on Eigen palm and Eigen finger biometrics with combination applied at the matching-score level. The complete identification process is divided into the following phases: capturing the image; 1) pre-processing; 2) extracting and normalizing the palm and strip-like finger sub images; 3) extracting the Eigen palm and Eigen finger features based on the K-L transform; matching and fusion; and, finally, 4) a decision based on the (k, l)-NN classifier and thresholding.

III. Conclusion and Discussion:

As we discussed above in previous literatures, there are many approaches developed for the palm print recognition system. They claim at every step that their system accuracy is most. As I concluded from the above discussion that Sara Zokaee approach gave the maximum accuracy rate with 94.7 percent when she made a hybrid approach of ECG with palm print but individual palm can also be used for recognition. I want to develop an approach for palm print recognition using PCA too. I want to use this technique on palm only and consider its results as accuracy, mean square error, peak signal to noise ratio.

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