Palm Vein Recognition using ANN

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Abstract: *Biometrics is one of the fastest growing areas because of need of high security. The basic recognition that is employed in biometrics is unique characteristics of human so that they can be differentiated easily [4]. Uniqueness in traits of humans has lead to hike in popularity of these biometric systems in all parts of the world. The features that are used in biometric systems are fingerprints, eye retina, voice or palm [4]. Palm recognition is one of reliable biometric system that captures and recognizes facial features of an individual. Palm recognition is said to be reliable biometric system because of differences in finger prints of human beings. Many techniques like PCA, Linear Discriminant Analysis, Support Vector Machine etc [2] have been used conventionally for palm recognition. The need is to improve the speed and the accuracy of the technique employed for recognizing palm [3]. In this paper, a new approach for palm recognition is proposed. In this approach the PCA and LDA is combined together for extracting the features of image. Then ANN is also applied for training and testing the datasets. The result section describes the efficiency of the proposed technique.*

Keywords-*Palm recognition, linear discriminant Analysis, Principal Component Analysis, ANN*

1. Introduction

Biometric authentication, Security and many other fields use the palm recognition technique for the purpose of privacy and security. Palm recognition technique is widely used now days. There are some factors that can the photo and can also lead to a problem in authentication. At the time of capturing the image there should be proper lighting, posture of the person should be accurate, image quality should be good enough and all other parameters should be satisfied. There must be some techniques to analyze all above features or patterns to generate a reliable or accurate result. To increase the possibility of correct matches the technique of preprocessing should be applied i.e. to pre-process the image before sending it to the database for comparing or matching.
A biometric system is a computer System which performs the Biometric recognition Algorithms for biometric Technique. Sensing, Feature Extraction and Matching Modules are the main components of a biometric System. Biometric sensors sense the biometric parameter such as fingerprints sensors and digital camera gives the output in the Digital form.

There are many aspects used for the purpose of biometric recognition or authenticating a person's identity. Biometric recognition of a person can be done by recognizing various biometric characteristics such as Face recognition, Iris Recognition, Finger Print recognition, Palm recognition etc.

Palm recognition or Palm print recognition is one of the promising technique for recognize a person by using biometric features. Palm recognition can be done on the basis of the characteristics of a palm such as lines of a palm, wrinkles and ridges on a hand etc. Wrinkles in a palm are thinner as compare to principal lines and ridges refers to characters same as that are found in the ridges of the fingers..In palm there are many lines but mainly there are only three lines which are important and useful. These three lines vary with a little difference over a period of time. Palm lines also known as principal lines are enough for recognizing a person uniquely. The principal lines or some wrinkles are easily locatable in a palm because these are very strong and wider than other lines on a palm. It defines that the lines on a palm poses various features and characteristics as compare to each other. Hence this feature is preferred mostly for the purpose of palm recognition.

A palm print is an image which consists of the palm or hand of a person. Palm print image can be of two types:

Online image: this is the image which is captured online by using scanners etc.

Offline image: This is the image which is captured without using scanners. This is captured by using ink and paper. The lines or wrinkles in a palm vary from the lines and wrinkles of the finger. The lines or wrinkles in a palm poses more features as compare to the fingers such as consistency, quality, indents etc. these features are combined in set and used in the future for comparing more than one palm. Palm print has many applications. It is used widely for the purpose of authenticating a person's identity. It is mainly used in the field of commerce, defense, forensic science, Industries etc.

1.1 Features of Palm Recognition

The principle features of a palm that are used for the process of palm recognition are line features, wrinkle features. The features of palm can be detected by applying various processing techniques such as datum point determination is a technique which is used for locating the end points of the fingers in a palm. Principal lines feature poses the following characteristics:

- Every principal line has a meeting point at the palm side. In some cases if the meeting point of principal line and palm side is at right angle then it goes out of the hand.
- The life line on a Palm poses a position at the center location of the hand.
- Mostly the life line and Head line gush out of the hand at the same spot.
- If the end points located near to the fingers as compare to the distance with wrist, then the concept of palm pattern is used.

2. Process and Techniques

For the purpose of palm recognition there are many steps to follow such as input the image, extracting the features, matching the features etc. Some of the steps are as follows:

- Snapshot of the biometric image such as palm image
- Feature Extraction
- Pre-processing
- Boundary Extraction

Snapshot of the Biometric Image: This is the first step to follow. In this step user have to enter the biometric image of his hand by placing the hand on the recognition device, which than clicks the snapshot of the scanned features of palm or hand. There are no hard and fast rules to follow in this step exceptional the position of the hand, taking image of particular hand such as either right or left only, proper hand should be covered by the scanned device for scanning and extracting the features of the hand efficiently for the purpose of recognition.

Feature Extraction: Feature extraction is the process of examining the structure of the human hand.
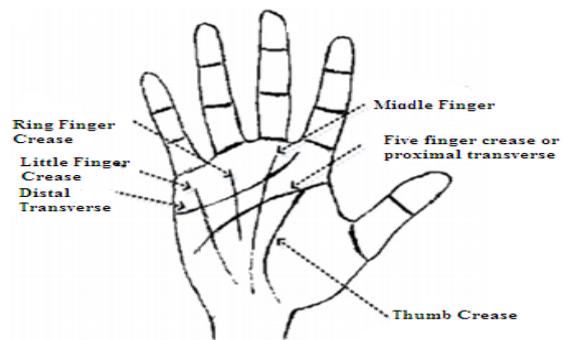

Figure 1. Definition of Palm Lines

Except from above mentioned palm regions in a palm there are some other parameters such as area of the palm indices of the figures etc. after extracting the features from a palm all the features are combined together to make a set.

Pre-Processing: Digital image processing is the part of the digital signal processing. In this field the digital images are processed with the help of digital computers. Digital image processing is used for improving the quality of the digital data by removing the unwanted and noisy contents form it. Digital image processing is done to increase the quality of the image by increasing the sharpness of the image pixels, increasing the vision clarity of the image. Digital image processing is also done for extracting the information or meaningful data from the image.

Boundary Extraction: After applying pre-processing techniques on image which aims to remove the noise from the image, the image is used for extracting the edges of the image i.e. geometric features. This is done by applying suitable or preferred edge detection algorithms.

Techniques for palm recognition

Three-dimensional recognition

3-D or 3 Dimensional Palm recognition technique is new introduced technology which improves the accuracy in results of image recognition. In this the image is captured by using 3-D sensors. This information is then used on different features of a Palm of a specific image.

Advantage of this technique is that it doesn't effected by the changes in the light like other techniques. It also recognizes a palm from a range of viewing angles, including a profile view. By using 3-Dimension data points it increases the quality of recognition. The sophisticated 3-D sensors have been developed that captures the better 3-D image. The sensor projects the light up to the palm. In single CMOS chips there are more than a dozen of sensors are implied and each of the sensor work on the different part of the spectrum. A company called Vision Access created a firm solution for 3D

recognition. Later the company was overcome by the biometric access company Bioscrypt Inc. And then they developed a version known as 3D FastPass.

ANN:

Artificial Neural Networks have been used in palm recognition because of their simplicity. This method of palm recognition is capable of matching patterns after obtaining training. These neural networks are intelligent systems that generate output on the basis of training provided to these at the beginning [2]. These are useful in classification problems
.

3. Methodology

The proposed work is divided into two parts. The Methodology and Block Diagram of proposed technique is as follow:
TRAINING DATSETS

Step 1: Initial step is to select the image of palm from the dataset of palm images that are stored in the data set.
Step 2: Train the dataset by using ANN (Artificial Neural Networks).
Step 3: Perform pre-processing and data extraction using PCA and LDA. PCA and LDA are both combined in the proposed work for extracting the features from the image of palm
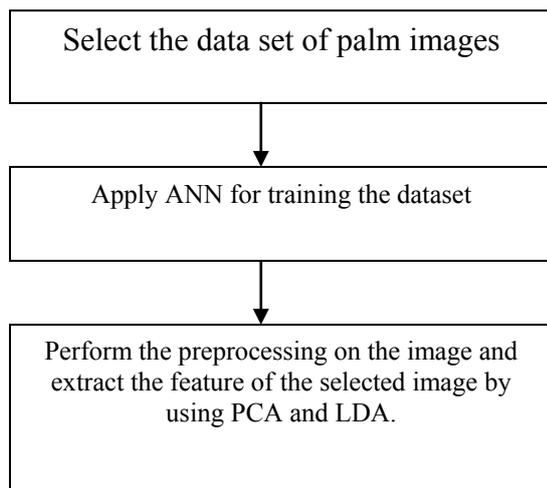

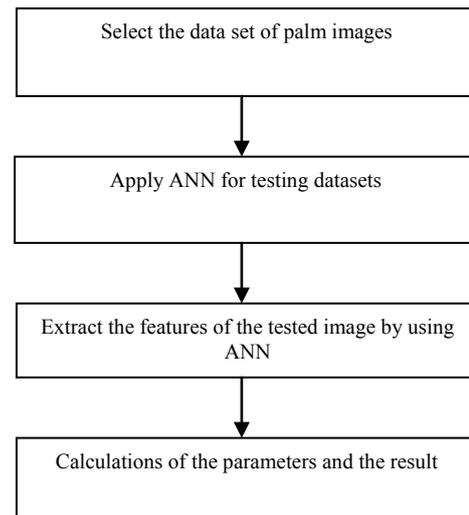Figure 3. Block diagram of training datasets in proposed work

Testing dataset:

Figure-4. Block diagram for testing dataset in proposed work

Step 1: Initial step is to select the image of palm from the   dataset for testing.
Step 2: Test the dataset by using ANN (Artificial Neural Networks).
Step 3: Perform pre-processing and data extraction using PCA and LDA. PCA and LDA are both combined in the proposed work for extracting the features from the image of palm.
Step 4: Calculate the performance parameters for proving the efficiency of the proposed technique.

4. Problem Formulation

Palm is our primary focus of attention in social intercourses. It plays an important role in providing human identity. Palm recognition is a section of pattern recognition in which human visual perception is saved in computer. This approach is much popular in many of the fields the main and the important one is recognition or can say as the security or authentication purpose. Many researchers are working on this field from many of the years, many algorithms and techniques are developed to update the traditional systems the common these days are PCA, LDA etc. But these approaches individually are not that much efficient in some of the cases, so the mixing of the algorithms are done as an example if PCA approach is used it will provide better results for small datasets. So to overcome these disadvantages the continuous research is processed to get better results. There is one issue too if the algorithms are getting advanced the fake parties are also able to make the algorithm crack able. So there is need to develop an algorithm which will work as advanced and modified approach to make classification that much complex that will not be easy to crack up to an

extent, so a study gives an proposed work for thesis in field of classification or security.

5. Proposed System

As problems are discussed in previous section an new approach is proposed for the thesis work In which the main approach will be to extract the features with the PCA and LDA techniques and the systems as this is much better approach to work with as per literature and more successful for large dataset. In our proposed work ANN is applied for the purpose of testing and training the data sets. Then a hybrid technique is developed which is a combination of PCA and LDA for extracting the feature from an image. The efficiency of the proposed technique is proved in next section.

6. Results and Discussion

In this section there is a brief introduction to the results that are obtained after applying proposed technique on the data sets of palm images.

Figure 5 Image shows the original image and ROI image of palm
Figure 5 shows the image of the palm that is scanned for the purpose of recognition. It also shows the ROI image of palm. ROI image is the image of region of interest. It depicts only that part of the image which is of interest and further used for operation and processing.
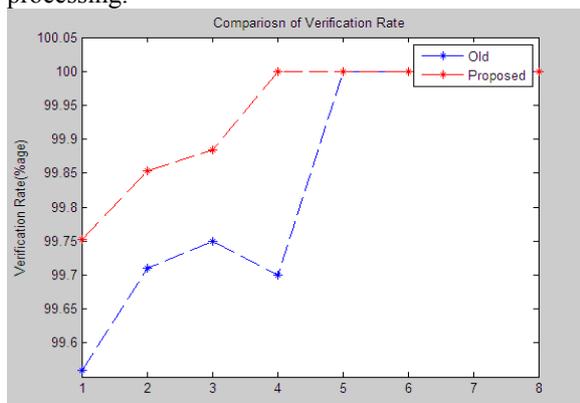

Figure 6 Graph shows the comparison of proposed and traditional technique on the basis of verification rate.

Figure 6 depicts a graph which shows the comparison of proposed work with traditional work on the basis of verification rate and it is observed that the verification rate of proposed is better than the old one
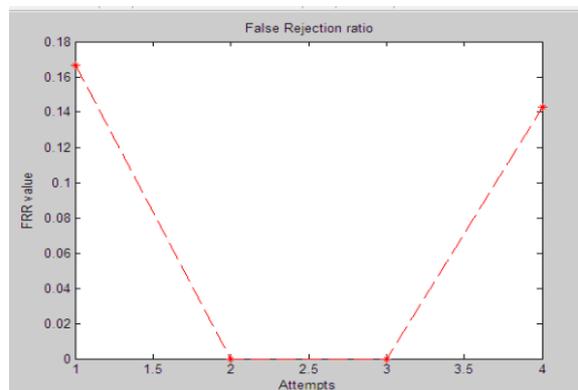

Figure 7 Graph shows the False Rejection Ratio of proposed Work.

Above graph in figure 7 shows the false rejection ratio of proposed technique. False Rejection Ratio is a term which is used to measure the ratio of the work in order to case where the samples which were correct but rejected by the technique as false samples. The FRR should be low always to improve the quality of the technique.

Figure 8 shows the comparison of accuracy of proposed and traditional technique. From graph below it is observed that the accuracy of the proposed work is higher than the accuracy of old work.
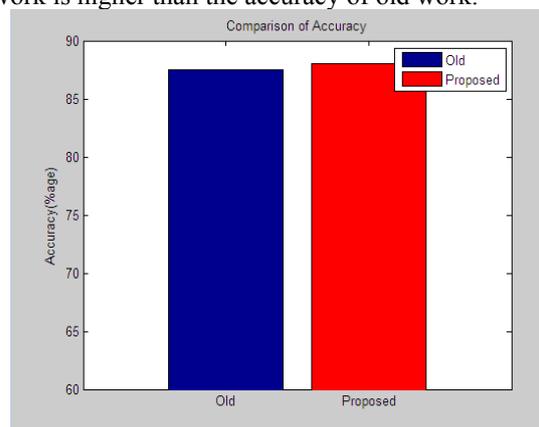

Figure 8 Graph shows the comparison of proposed and traditional technique on the basis of Accuracy.

Figure 9 depicts a graph which shows the comparison of proposed work with traditional work on the basis of Genuine Acceptance Ratio and it is observed that the genuine acceptance ratio of proposed is better than the old one. GAR is used to determine the acceptance ratio of the dataset by a technique
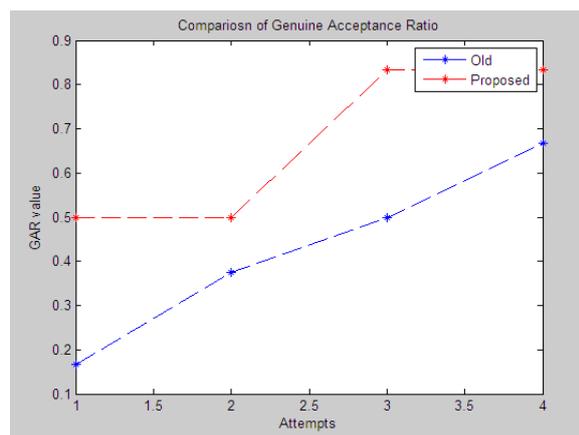
Figure 9 Graph shows the genuine Acceptance Ratio comparison of proposed and traditional technique.
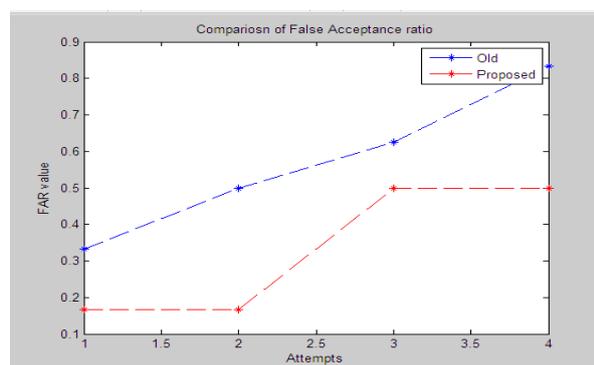

Figure 10 Graph shows the False Acceptance Ratio comparison of proposed and traditional technique.

Figure 10 depicts a graph which shows the comparison of proposed work with traditional work on the basis of False Acceptance Ratio and it is observed that the genuine acceptance ratio of proposed is better than the old one. It is the term used for measuring the amount of dataset which is rejected by the technique because data is not suitable or correct.

7. Conclusion and Future Scope

After simulating in Matlab it is concluded that the combination of PCA and LDA performs efficiently as compare to the individual performance.
The results clearly show that the accuracy of the proposed technique is more than the conventional technique. The comparison of the conventional and the proposed technique is made by obtaining accuracy of both techniques after application. The proposed technique is accurate and efficient enough for Palm recognition
In future we can introduce some classifiers for making the technique more efficient and effective.

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