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Palm Authentication:A Review

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Abstract: A system which is basically used for pattern detection and identification on the bases of physical and behavioral traits is known as biometric system. Biometric recognition has been investigated over the past many years. Palm print recognition has been playing important role in biometric technology. The work done in past many years has discussed in this paper. Palm print recognition system consists of the following steps: palm print acquisition, preprocessing, feature extraction, enrollment (database) and matching. Because of tremendous information is present on human palm it act as an influential tool for person identification. The essential step in this recognition system extraction of feature vectors related to person input palm image and to perform matching based on parameters. Palm print recognition is a challenging problem mainly due to low quality of pattern, large nonlinear distortion between different impression of same palm and large image size, which makes feature extraction and matching computationally demanding.
Keywords: Biometric,Image Acquisition, Preprocessing, Feature Extraction, Matching

I.   INTRODUCTION

Many years ago the method of distinguishing a person which is illiterate (not able to write name) from another person, was palm impression and thumb impression comparison. In 1858, Sir William Herschel, working for the Civil Service of India for the payment of the salary and other identification purpose of employees, he took the handprints on the back of the contracts. A Hungarian company builds first palm print based recognitions system.
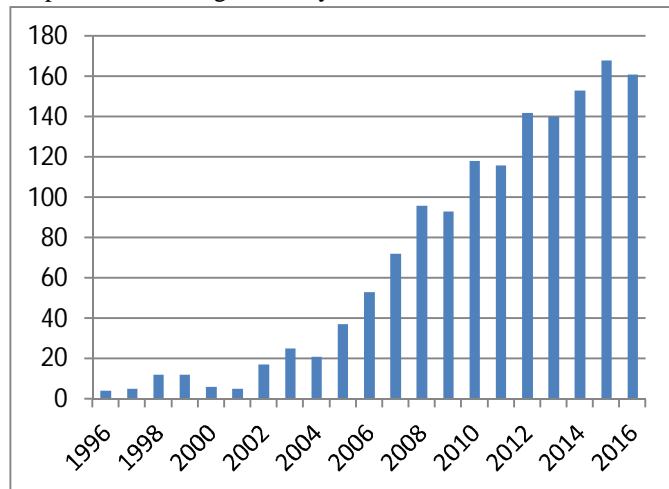

Figure1: Graph between numbers of publication vs. year

In later stage, 1994 the experts from the United States studies the purposes model of Hungarian company and invited the company for International Association for Identification (IAI) conference in 1995.In 1997, US build a palm system in which finger print and palm identification technologies are embedded. After 1997, the palm print system became more popular and became the area of interest of many researchers. As shown in the graph (Figure1) the research in this field is gradually increasing year by year, that is why I have selected this topic for my research. The data of last 20 years (1996-2016) is collected from well know index which is known as Scopus index. A lot of work has to be done.Biometrics refers to the technologies which is for an individual's identity establishment by measuring his/her physical characteristics or behavioural traits such as thumb impression, palm impression, retina, iris, hand geometry and face or some behavioral aspects such as , gesture and voice [1]. As the unlawful interventions are step up day by day we required more protective technique to enhance the reliability and security of the system. The application areas of biometrics are divided into three different group commercial (ATM, physical access control etc.), government (id card, passport

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control etc.), forensic (terrorist identification, corpse identification etc.).
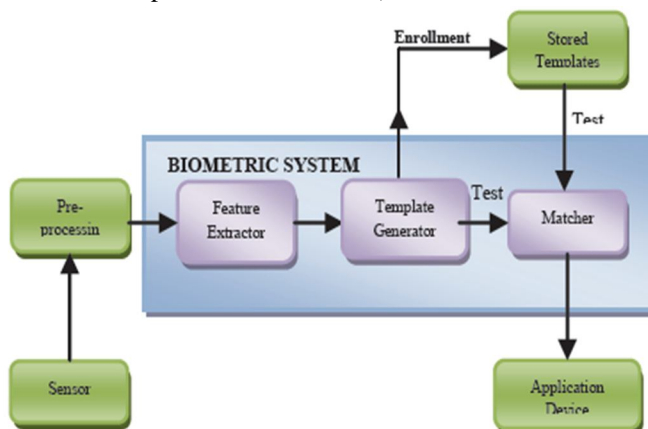

Figure 2: Biometric System

II. RECOGNITION OF PALMPRINT

There are two type of recognition for low resolution and high resolution images. Majority of the work is done on palm print recognition uses the low resolution images [2].
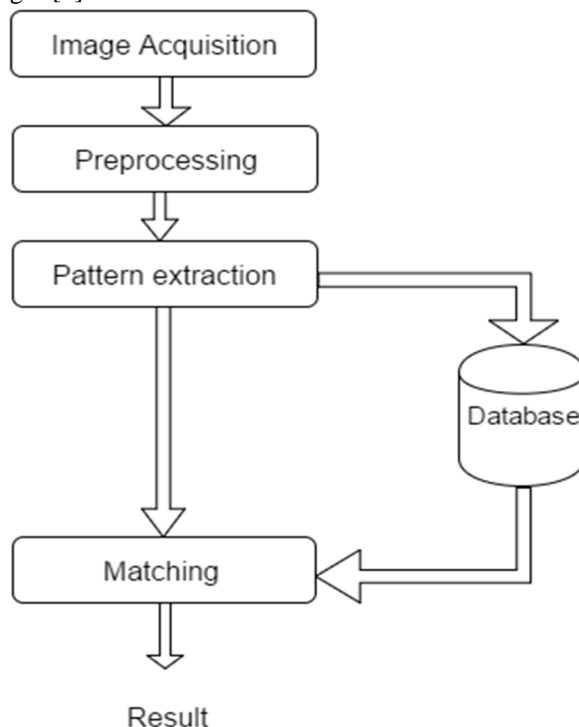

Figure 3: Generalized block diagram of Palm print Recognition

The palm print recognition system is categorized into four sub-parts as

A. Image Acquisition

The first step in any biometric system is, it requires input in the form of image or any pattern, where the palm image is taken for person biometric authentication purpose. Various types of sensors or equipment like digital cameras, high and low resolution cameras, palm scanners, are used for image acquisition which depends on requirement. The captured image may be unclear or it may have distortion or noise, the quality of an image is degrade by such unwanted parameters.That implies the performance rate of palm print recognition system directly also degrade.

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Figure 4: Palm print scanner

B. Pre-processing

Once the input data (palm image) is with us then pre-processing can be done on the image. Often noise is present in the captured image. To improve the quality of captured image need to separate the palm region of interest from the background region and the then percentage of noise up to some extend automatically decrease.

Basically ROI is help in feature extraction stage. This is divided in four steps.

Binarize the palm image.

Trace the boundary of palm image to identify and fix key Point.

Formation a coordination system., Central part Extraction.

Multiple methods are used to extract region of interest. The main focus is basically to extract middle area of palm because it covers all the features. And another reason is, it has approximately particular texture for different person. The most popular approach for detection of ROI firstly spot the knuckle point which lies between our finger like little finger, ring finger, middle finger and then joining these co-ordinates (points) are considered as our area of interest and a middle part of input image is develop .It could be in a circular or a squared shape which depends on the requirements.

C. Feature Extraction

Next step is feature extraction which consists of two different steps. One for verification of palm image and the other for identification palm image. In identification it searches the data of individual from all stored data in the system. The different type of approaches are Line based, sub-space based and statistical based, which are used for verification of palm features from the stored data. The purpose of this section is to identify the correct individual and to block the unauthorized access.In feature extraction phase features of palm are extracted like principal lines, orientation field, minutiae, density map, texture, singular points etc. Extracted features are stored in database for further process of matching.

Line based approach This approach is used to detect edge and palm lines are distinguish on the bases of magnitude. This magnitude of the palm's different line is projected in x and y coordinates forming histograms. Next step is to locate the end points and direction for that first order derivative is calculated. After that to identify the magnitude of lines second order derivative is calculated. Then the Euclidian distance is used for matching.

Subspace based approach Sub-space based approach is known as appearance based approach. This approach generally involves Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA) and Independent Component Analysis (IDA). The subspace coefficients are supposed as the features used for matching. To apply above mention techniques directly to the palm print, researcher also used different filters.

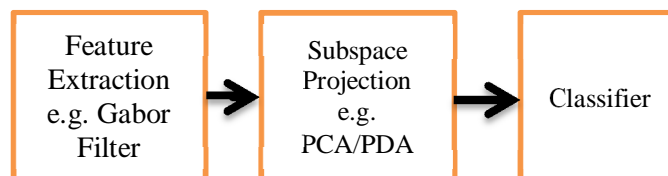Feature Extraction e.g. Gabor Filter → Subspace Projection e.g. PCA/PDA → Classifier

Figure 5: Architecture of subspace approach

Statistical approach The two different approaches are used one is local and another global approach. In the local approach input image is changes in another domain. This changed image is now divided into small sub-images and these sub-images are expressed

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in mean and variance form of each sub-image. On the other hand global approach is applied on complete palm print image. This approach involves density, center of gravity and moments. The main difference between the global and local approach is, global approach is applied complete palm on the other hand local approach divide the palm print in sub- regions.

Coding approaches This approach presents a new technique for extracting features from palm prints using the different Coding Scheme. The information about orientation is extracted from palm line by using multiple 2-D Gabor filter .This information is then stored in the form of feature vector and this is known as Competitive Code. The advantages of coding approach is the size of registered data is reduced and its also deal with non-linear distortion between palm print images.

D. Matching and decision making

Matching is next to the feature extraction phase.The templates of extracted feature are stored in the database. As we know each input template which is under consideration has salient features .This step basically compare the stored template with the input template which is under consideration and measure the degree of similarity between them.

E. Result

This stage gives the output.

Applications

Intelligent door handles, door locks.

Computer Logins.

POS (Point Of Sale) Authentication.

Time Attendance Applications.

Physical Access Control

III. CONCLUSION

In this paper we have discussed the different prevail approaches used for palm print recognition system and there is further possibility of advancement. The research in this field is increasing year by year, that is why I have selected this topic for my research. A lot of work has to be done. Still scope of development of new algorithm for matching as well as feature extraction. The aim of working on the palm print recognition system is to purpose a system with less cost, increased speed and accuracy.

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