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Palm Print Recognition and Authentication Using Hough Transform For Biometric Application

Ranjeet Singh Chauhan¹, Jagriti Kumari², Rajesh Mehra³, Shallu⁴

¹ME Scholar, ²Associate Professor, ³Research Scholar Department Of Electronics and Communication, NITTTR, Chandigarh, India

Abstract: Palm print is a unique physiological characteristic of human being which is used for individual identification purpose now days. Palm print consist so many lines such as heart line, life line, head line, group of these lines called principle lines. Features and edges of these lines can be extracted from Region Of Interest(ROI) and The aim of extracting the edges from ROI is to reduce redundant data in image and to get useful information low resolution devices are required which is low in cost and easy to use . The edges detection technique used are Sobel , Prewitt, Canny etc . The performance of these techniques is analyzed on the basis of PNR and MSE by applying this technique on PolyU data base. For further improvement in detection Hough Transform (HT) is used, which link all the edges and determine the peak point of these edges. Using these peak point (up to three point) efficiency of palm print recognition increased drastically and False rate detection decreases.

Keywords: Biometrics, palm image processing, Hough transformation, peak point detection, verification, authentication

I. INTRODUCTION

In digital image processing there are two main application areas which are improvement of image statics for human analysis and processing of pictorial information for storage, propagation and representation. An image is a function of $f(x,y)$ in spatial coordinates where it is two dimensional in nature and the magnitude of f is called intensity of image at that point. When x and y has finite discrete values then image is called as digital image. This digital image is processed by digital computer and the process is called Digital Image Processing. Digital Image Processing has various field of application such as medical field, video processing, micro scoping imaging , pattern recognition and Biometric system etc. Biometric system can identify a person by using his physiological and behavioral attributes .The physiological attributes are finger print, iris, palm print and DNA. The behavioral attributes are keystroke, signature and voice. Biometric recognition is the most convenient method because a person biological signatures and identification can't be lost or stolen. The security need has increased the use of biometric system. Biometric form of authentication is very safe because there is no need of remembering any passwords. In this paper palm print recognition technique is used for biometric identification and authentication of a person because this technique has many advantages over finger print and other recognition methods. Finger print recognition required high resolution imaging sensor while iris and DNA recognition devices are very costly. In Palm print recognition inner area between wrist and finger is known as Region of Interest (ROI). The area of palm print is more than the finger print that's why it is able to extract more features than finger print and Palm prints can be considered as one of the efficient biometric system. Palm prints are less prone to noise and provide more characteristics features and requires only a lower resolution imaging sensor when compared to other biometrics techniques . Palm print comprised of mainly principal lines datum point , delta point , ridges and wrinkles. Palm print comprises various amount of information and completes the identification procedure by analyzing the given palm print with image processing system by using techniques of pattern recognition .The very important part is locating and extracting the region of interest(ROI).CMOS and CCD are the traditional methods of extracting ROI, Both are palm print capture sensor device and they are connected to the computer. Edge detection is done by extracting the useful features from the edge of the image like corners curves and lines .After that these are used in algorithms of computer vision. In dip there are several methods are available to detect edges of images. These methods are Hough , canny , Sobel , Roberts cross and prewitt ,log and zero cross. The edge detection can be done by two ways that is first order derivatives and second order derivatives.

II. RELATED WORK

In present time There are many algorithms and operators are used for extraction of ridges , removal of holes , speckles from palm print .they connect ridges remove spikes and minutiae matching. The various methods of detecting edges in images are canny , Sobels , Prewitt and Roberts cross methods. In this paper we are using Hough transform for detection of lines and other

parametric curves of palm print. The main aim of Hough transform is to find the location of line in images. It gives very robust and effective detection under noise. different types of system which requires a reliable personal identification scheme for confirmation or identifying a person. By using the given method only valid persons can use these services. By using someone physiological and behavioral attributes the person can be automatically recognized and the system used is called biometric identification.

A .k . Jain et.al; proposed different types of system which requires a reliable personal identification scheme for confirmation or identifying a person. By using the given method only valid persons can use these services. By using someone physiological and behavioral attributes the person can be automatically recognized and the system used is called biometric identification.

Laura liu et al; In his research he proposed a new approach for detecting simultaneous extracted structure and strength of palm images by reducing the local image area of approximating equal brightness of pixels.

C. Saravan et.al; used the technique of median filters for enhancement of palm print in biometric applications. The result showed that the enhanced palm print has brighter ridges than previous palm print.

IN biometric recognition the major difficulty is sample of single biometric recognition .this problem is overcome by Y.F.YAO in this procedure he takes two different features and combine it. one is image of palm print and the second one is face feature. this technique improves the recognition by use of large face and database of palm print as test data.

A.W.K. Kong et.al; Describes capture devices and preprocess ,fusion algorithm for user privacy and protection of palm print system. This is presently used in palm print recognition research.

III. PALM PRINT

Palm print became one type of physical biometric in 1998 when Wei and David found that no two persons have identical palm print. The area of palm print is greater than finger print so palm print has more useful information. The lower resolution devices can detect the principal lines, and wrinkles etc.

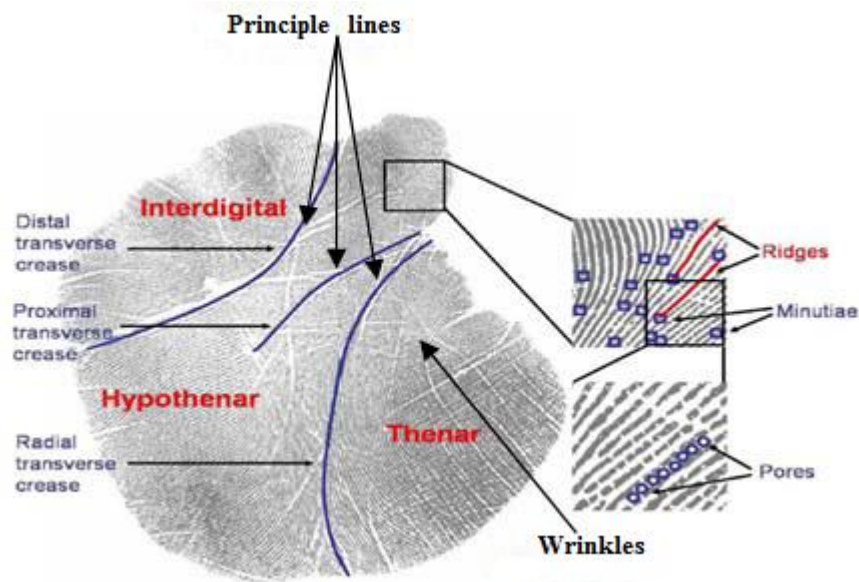


Fig.1 Image of Sample Palm print

TABLE I PALM PRINT FEATURES

S.No.	FEATURES	DESCRIPTION
1	Geometry	Width, length area is like palm
2	Principle lines	It consist of head line, heart line and life line
3	wrinkles	It contain coarse wrinkles and fine wrinkles
4	Datum points	It is the two point obtained by principle lines
5	Delta points	It is defined as center of delta like region
6	Minutiae	It pattern of ridges and valley

Palm print recognition and authentication have several steps. First is palm print acquisition which can be done by using CCD based palm print scanner, Digital scanner, Digital camera and Video camera. In pre-processing stage where binarization, edges detection, key point extraction and extraction of ROI has been done after that features are extracted and stored in data base and same work performed during the identification.

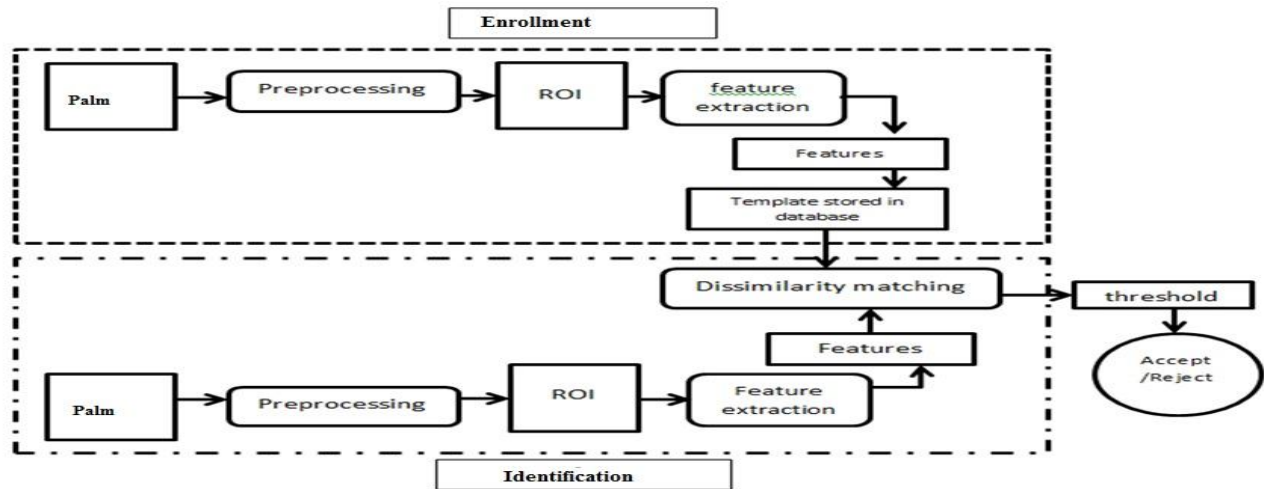


Fig.2 Palm print enrollment and identification block diagram

IV. EDGE DETECTION

The method by which boundary of an image detected is called edge detection. It is one of the fundamental step of extracting the features of the image, removing redundant information and getting useful information such as lines, curves which used by computer algorithm for recognition purpose. Four basic steps of edge detection is depicted in fig.3

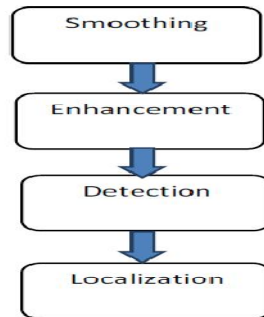


Fig.3

V. PROPOSED METHOD

Hough Transform is a technique by which linking of edges and peak point detection performed in image. It is one of most advanced and accurate technique of finding graphical information in an image. The component of pictures is measured by Hough procedure. Figure 3 demonstrates a basic case to consider the normal issue of fitting an arrangement of line fragments with an arrangement of discrete picture point.

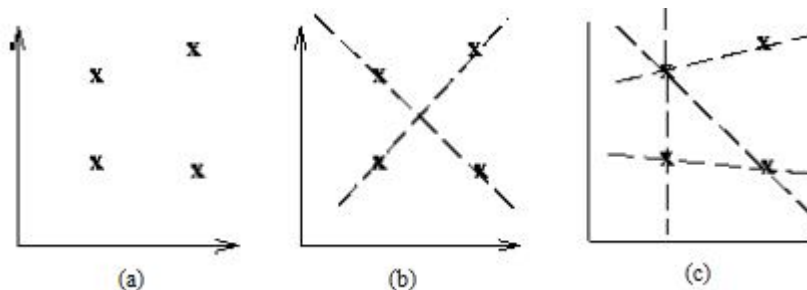


Fig.3(a) Points detected. (b) Points with lines (c) Possible straight line fittings

In this method peak point of an image is recognized which gives very efficient and accurate result. If three peak points are considered then the accuracy of palm print recognition is become almost hundred percentage. In Hough Transform a line in parametric domain is represented by a point in spatial domain and vice versa. So the boundary and edges are represented by the peak point and detection and matching of a point is easy and accurate as compared to line and edge. For representation of lines the equation are used given below

$$A \cos \theta + B \sin \theta = \rho \tag{1}$$

Where ρ is perpendicular length from the origin to the line and θ is the orientation of ρ with respect to a-axis and b-axis.

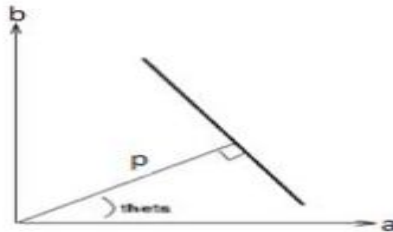


Fig.4 Parametric description of straight line



Fig.5 Edge Extraction

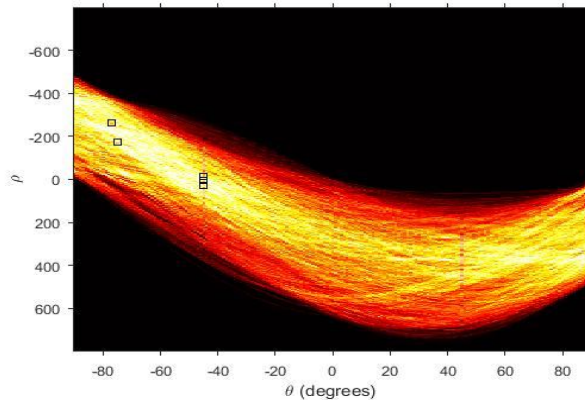


Fig.6 Peak point detection

VI. RESULT AND DISCUSSION

In palm print recognition the palm print and their ROI with their Histogram are discussed. ROI has better histogram equalization as compared to whole palm print because the whole ROI is taken with important lines and their histogram shows better results. The Hough Transform is implemented on these ROI after edge detection and peak points are obtained. These peak points are used for identification purpose. The proposed HT methods and previous methods results are given in the table below



Fig.7 (a) Palm print with their Histogram

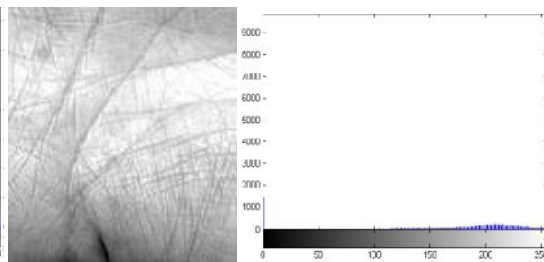


Fig.7(b) Generated ROI with their Histogram

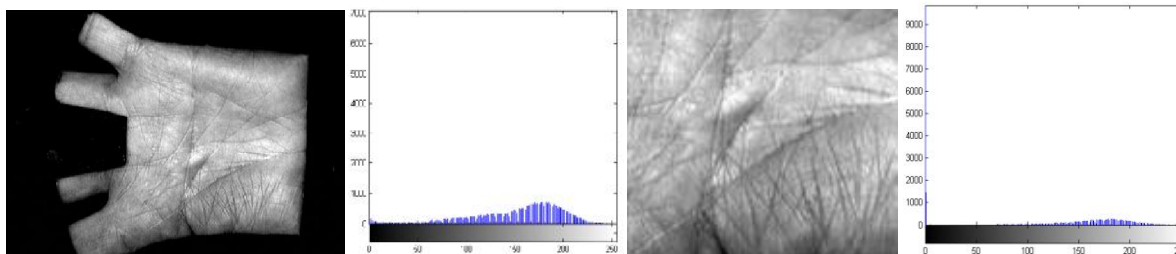


Fig.8 (a) Palm print with their Histogram

Fig.8(b) Generated ROI with their Histogram

TABLE II. COMPARISON PERFORMANCE BETWEEN PREVIOUS WORK AND PROPOSED WORK

Parameters	Previous Edge detection method	Proposed HT peak point detection method
Accuracy of detection	70%	100%
Vector Size	8	4
Image size	384x284	250x200

VII. CONCLUSION

In this paper several edged detection technique are used and compared on the performance basis on parameter PNR and MSE. To improve the result of these technique and achieve better accuracy Hough Transform used which gives almost 100% accuracy when at least three peak taken into consideration and for this result Hough transform required smaller image i.e. ROI only.

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