A Survey : Iris Based Recognition Systems

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Abstract: The security is one of the important aspect of today's life. Iris recognization is one of the leading research of security which is used to identify the individual person. Usually iris based biometric is more better than other biometric in terms of accuracy, fast, stability, uniqueness. The iris recognition system works by capturing and storing biometric information and then compare scanned copy of iris biometric with the stored iris images in the database. There are several Iris Based Recognition Systems are developed so far. In this paper we presented several iris techniques and create a base for our future roadmap.

Keywords : iris recognition, Pattern Matching, Feature extraction, Biometrics

I. INTRODUCTION

In order to recognize a person an automated system of Biometrics helps to calculate its physical and behavioural uniqueness. Instead of recognizing a person with help of his identification cards, passwords or keys biometric can be preferred for easy and convenient verification . Biometric recognise a person with his face, fingerprints, face, signature, iris [1] or retinas . Iris recognition is also a type of biometric recognition. In iris recognition a person can be recognised through his/her iris print having its own uniqueness and characteristics. In modern age iris recognition have gained a great importance because of its reliability and accuracy. Iris recognition feature extracted scheme may be parted as phase base method, zero crossing, intensity variation procedure, texture analysis.
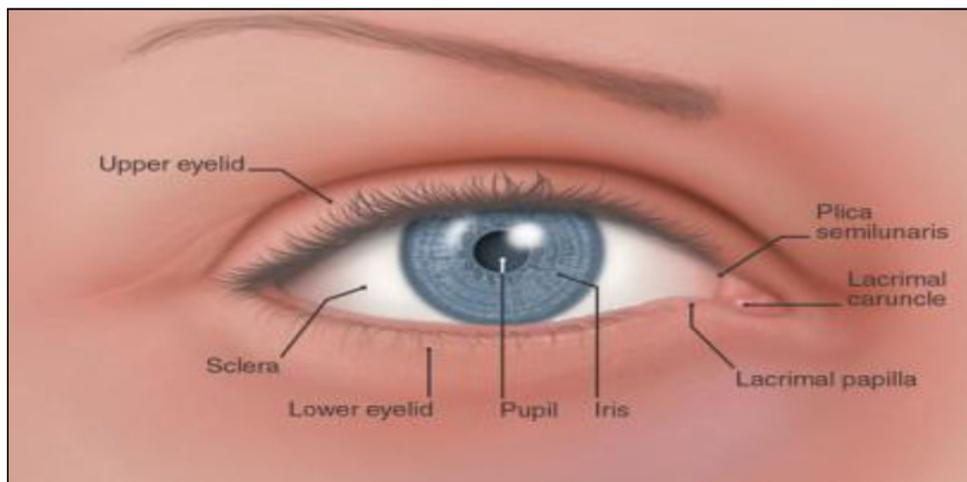

Figure 1 : Parts of Iris

II. CHALLENGES FACE BY IRIS RECOGNITION SYSTEM

Although technology has evolved but still Iris recognition systems faces the following challenges :

- Processing of noisy and blur image
- Recognizing the repeated string from the same iris
- Saving iris image facial attributes. Accuracy and Performance level of recognition system can be improved by considering facial attributes
- Maintaining and ensuring privacy and security
- Position of iris from distance is a challenge in iris recognition system. Iris at distance and Iris on move have been developed and designed. but still Iris position is a big challenge

III. STEPS USED FOR IRIS RECOGNITION SYSTEM

The steps of Iris recognition system : Image acquisition, Segmentation, Normalization, Feature extraction and Pattern Matching are described below :

[1] Image acquisition : At the first stage in order to extract iris pattern, images are processed and then extracted iris pattern is matched with the one which is already stored on the database.
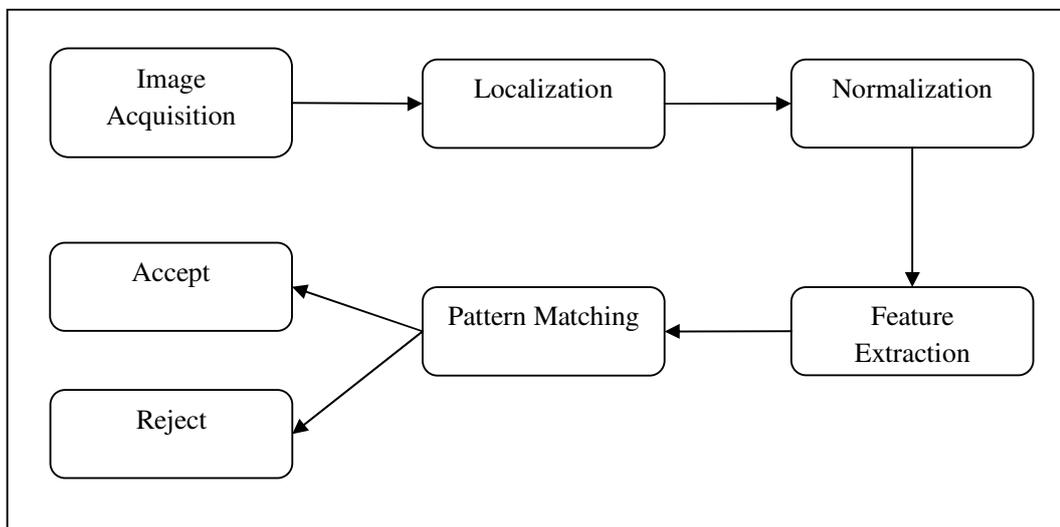

Figure 2 : IRIS recognition system

[2] Segmentation : A major attainment of recognition system is accurate segmentation of iris and pupil boundary. In non co-operative datasets iris region is usually near to corner of right and

left eye. Whereas in co-operative world iris is considered as central gaze. In iris recognition identification of single region out of multiple region into which iris is divided will identifies an individual. As per colour aspect of iris recognition only those dataset images having same colour of input image will be considered.

[3] Normalization : It changes the range of pixel intensity values. It generated the iris region which have same constant dimensions. In the same iris two images under different conditions have the same features.

[4] Feature extraction : This steps is used for extracting unique attributes which helps to generate specific code.

[5] Pattern Matching : The feature generated in the feature extraction method is taken as the input value for matching the iris image with the iris codes. To authenticate via identification or verification, a template created by imaging the iris is compared to a stored value template in a database.

IV. RELATED METHODS OF IRIS RECOGNITION SYSTEM

Many research have been worked for Iris Recognition so far. Some of the methods used for Iris recognition system are described below in Table 1.

Table : Methods used for IRIS recognition system

Steps of Iris recognition system	Methods used for IRIS recognition system	Description
Segmentation or Localization	Hough Transform	Used to estimate the parameters of a shape from its boundary points and identify lines from image[2].
	Circular Hough Transform	Used to deduce the centre and radius coordinates of the iris and pupil regions[3].
	Daughman's Intergo-Differertial Operator	Used for locating the circular pupil and iris region. This method operator searches for circular path. It takes closeup image as input from that where there is maximum change in pixel values by varying the radius and centre(x & y) positions[4].
	Canny Edge Detection	Algorithm uses to detect a wide range of edges in images. Boundary coordinate are separated

		from the rest of image based on intensity values of strength and pixels.
Normalization	Analysis Band Based Normalization	Portion of the iris to be analyzed is mapped. and It is subdivided into eight analysis bands[5].
	Dimension Reduction Approach	Reduce the problem of dimensionality and It considers two portions of equal size to pupil size from the left and right side of the iris. After normalization operation These both portions are merged.
	Rubber sheet model of lower half of iris	Iris is partially covered with eyelids. This can lead to false recognition result. To avoid the prominent occlusion due to upper eyelid this technique was Implemented.
	Daughman's Rubber Sheet Model	Converts the Cartesian coordinates into polar coordinates
Feature Extraction	Wavelet Packet	Provides flexible time frequency resolution properties.
	Ridgelet	Combination of wavelet transform and random transform
	Daubechies Wavelets	Used to transform huge data in smaller representations. For this transformation use longer filters which produces smoother scaling functions.
Pattern Matching	Histogram Matching	Representation of the tonal distribution in a digital image.
	Hamming Distance	Calculates the bit difference by using the XOR operation on the iris patterns
	Euclidean Distance	Used to match the iris with the iris images already present in the data base

V. LITERATURE SURVEY

Ziauddin et. al. [6] invented hybrid technique for iris localization which uses many techniques at the same time, detection of Hough transform and detection of edges. Ziauddin et. al. conclude that difference between iris boundary and pupil boundary is high as compared to sclera and iris boundary but this technique requires several improvements to achieve performance and accuracy.

Sgroi et al. [7] evaluate the relative age of person from the iris pattern and gain 64% of accuracy. The author conclude that we can get the age group of person through iris image. Nine filters are used to get texture features.

Xu [8] proposed a new method instead of using previous one where normalization of image is performed then feature vector are extracted. The proposed method uses wavelet filter by extracting global features and then achieve local features of an iris by applying SIFT method. Different weights are applied to get the similarity distance between them.

Annapoorani et al. [9] proposed four major steps: elimination of specularities, pupil detection, iris localization, eyelid and eyelashes detection. This method proposed for fast and accurate segmentation of iris.

Gupta and Saini [10] evaluate the performance of existing system by using Image Processing Toolbox of Matlab. The proposed solution consist of several steps : (1) Image acquisition (2) Segmentation (3) Normalization (4) Image enhancement (5) Image matching

Proenca and Alexandre [11] proposed a method which does not requires cooperation from the subjects. It classify iris methodology. The proposed system authenticate the individuals without matching whole image of iris. Six regions of iris proposed system are : Inner part of iris, outer part of iris, first 4 quadrant starting at -45 degree. Iris images and regions are represented as superscript and subscript respectively. Classification of Iris is achieved by using a defined threshold set to combine dissimilarity values obtained from comparison between iris regions. If dissimilarity is higher than the defined thresholds, then no match is found (i.e., signatures are of dissimilar irises) otherwise a match is obtained (i.e., both the signatures relate to the same iris).

Shin [12] researched novel algorithm which has 3 main steps : (1) right and left eyes are discriminated with the help of specular reflection (SR) points and eye lashes. (2) Information of color is used to classify the iris image. (3) textual information of iris region is classified. Proposed system increased the performance of the system.

VI. CONCLUSION

This paper reviewed many techniques of segmentation in iris recognition. All these techniques has been analyzed based on segmentation accuracy. Higher the performance if higher the segmentation rate.

In this paper, we focused on various Iris Recognition methodologies And also we gave an outline for our proposed system. In the future work we aim to implement the proposed model for biometric recognition. And we also plan to extend our algorithm for a multimodal biometric system.

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