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A Survey: IRIS Recognition With Different Techniques

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ABSTRACT
Biometric recognition refers to an automatic recognition of individuals based on a feature vector derived from their physiological and/or behavioral characteristic. Iris recognition, a relatively new biometric technology Iris recognition is proving to be one of the most reliable biometric traits for personal identification. In fact, iris patterns have stable, invariant and distinctive features for personal identification. Application of such system includes computer system security, secure electronic banking, mobile phones and credit cards. In this paper, we give a brief overview of different Techniques for iris recognition system.

Keywords
Iris Recognition, Localization, Normalization.

1. INTRODUCTION
The use of biometric systems has been increasingly encouraged by both government and private entities in order to replace or improve traditional security systems. Iris recognition biometric systems have proved to be efficient at personal recognition with highest recognition accuracy.

The word biometrics derived from "bio" that means life and "metric" that means measurement, in other words is the study of methods to uniquely recognize human behavior of each person. The study of automated identification, by use of physical or behavioral traits is called biometrics. The application of biometric is security. In today's world, security has become very important. Iris Recognition Security System is one of the most reliable leading technologies for user identification. The human iris has random texture and it is stable throughout the life, it can serve as a living passport or a living password that one need not remember but is always present.

Biometrics is automated methods of recognizing a person based on a physiological or behavioral characteristic. Compared with other biometric technologies, such as face speech and finger recognition, iris recognition can easily be considered as the most reliable form of biometric technology. Iris is believed to allow very high accuracy Iris has some advantages over other biometrics. The iris is an externally visible and protected organ whose unique pattern remains stable throughout adult life. Iris data is non-identical for left, right eyes and for twins also. It can't be borrowed, stolen, or forgotten.

The iris is highly protected and ideal for handling applications requiring management of large user groups, like voter ID management. The iris recognition techniques potentially prevent unauthorized access to ATMs, cellular phones, desktop PCs, workstations, buildings and computer networks. The accuracy of iris recognition systems is proven to be much higher compared to other types of biometric systems like fingerprint, handprint and voiceprint.

We can classify the biometric techniques into two classes:

1. Physiological based techniques include facial analysis, fingerprint, hand geometry, retinal analysis, DNA and measure the physiological characteristics of a person.

2. Behavior based techniques include signature, key stroke, voice and measure behavioral characteristics.

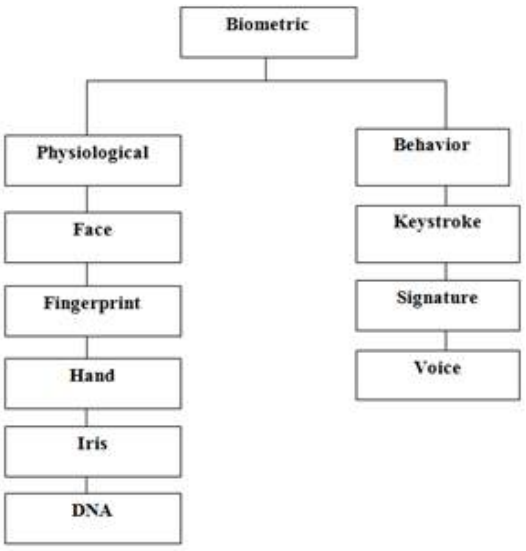

Fig.1 Categories of Biometric

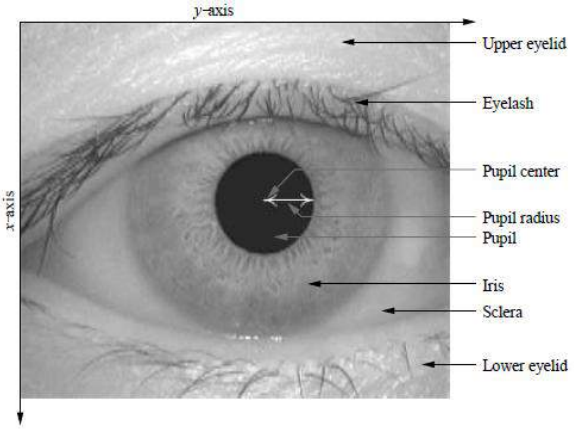

Fig.2 Human eye

Stages Involved in Iris Recognition:

1) Preprocessing includes image Acquisition, image iris localization, iris normalization, iris de-noising and enhancement
2) Iris feature extraction
3) Iris feature classification

2. Literature Review

The major investigation on iris recognition has been started in the last decade. Iris recognition is becoming an active area of research in biometrics due to its high reliability for personal identification. A variety of techniques have been developed for iris localization.

According to John Daugman [9], scientist in Cambridge University, developed very efficient method for iris recognition in 1992. In Daugman's system, Integro-differential operator was used for detecting the iris boundaries and 2D Gabor filter was used for feature extraction.

Canny filter were applied for the iris localization.Haar Wavelet transform used for feature extraction. Neural network is used to classify the extracted vectors.we use Learning vector quantization (LVQ) model due to low complixity & high learning capacity[10].

T. Rakesh, M G Khogare[11] Hough transformation, integrodifferential operator, gradient based edge detection are used to localize the portions of iris and the pupil from the eye image. In the feature extraction process Gabor wavelet transform and wavelet transform which are widely used for extracting features. Haar wavelet transform was used for optimizing the dimension of feature vectors in order to reduce processing time and space.

R.Meenakshi Sundaram , Bibhas Chandra Dhara[12] Iris localization using Circular Hough transform (CHT). Then normalized image is decomposed by 2-D Haar wavelet and textural features are extracted. The matching purposes probabilistic neural network (PNN) is used. we have used Gray Level Co-occurrence Matrix (GLCM) based features to describe an iris pattern. GLCM based features are widely used for texture analysis.And for the matching purpose probability neural network (PNN) is used.

Anjana Peter, Revathi N, Ms. Merlin Mercy[13] iris localization using Circular Hough Transform (CHT). normalized image is decomposed by 2-D Haar wavelet and textural features are extracted. for matching pur poses ArtificialNeural Network (ANN) with back propagation is used.Daugman's rubber sheet model is used to normalize the iris model.Gray Level Co-occurrence Matrix (GLCM) based features to describe an iris pattern. GLCM based features are widely used for texture analysis.

3. Preprocessing

3.1 Image acquisition:

The first phase of our method is to collect a large database consisting of several iris images from various individuals. Images in the database are stored in bitmap format on the hard drive of the computer that will be used to analyze them. The database needs to be dynamic. The images can be captured using a CCD camera, which should have a resolution of at least 512 dpi to create a meaningful detailed image. However, to capture the rich details of the iris patterns, a camera at a minimum image resolution of 70 pixels should be used. Special cameras with an illumination of 70mm to 90mm wavelengths are required for imaging.

It deals with capturing a high quality image of the iris. Images with sufficient resolution and sharpness are obtained. Good contrast in the iris pattern is obtained with proper illumination. distance up to 3 meter. Near-infrared camera or LED.

3.2 Iris localization:

Iris localization is the detection of the iris area between pupil and sclera. So we need to detect the upper and lower boundaries of the iris and determine its inner and outer circles. A number of algorithms has been developed for iris localization.

Iris Localization consists of localizing both inner and outer boundaries of the iris and those two circles are detected using polar coordinate system separately because they are not co-centric.

The first stage of iris recognition is to isolate the actual iris region in a digital eye image. The iris region is approximated by two circles, one by the iris-sclera boundary and another, interior to the first, by the iris-pupil boundary. In Iris Localization step we calculate the centre coordinates and radius of the pupil and the iris. Accordind to Libor Masek Circular Hough transform is applied to it to detect the radius and centre of iris.[1] According to Rafael G Gonzalez Canny Filter use to detect the radius & center of iris[2]. According to Wildes The Hough transform is a standard computer vision algorithm that can be used to determine the parameters of simple geometric objects such as lines and circles present in an image. The circular Hough transform is used to deduce the radius and centre coordinates of the pupil and iris regions[3].

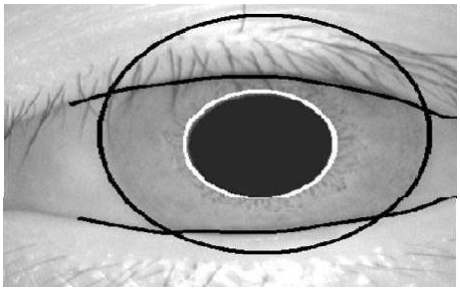

Fig.3 Iris Localization

3.3 Iris Normalization:

The irises captured from the different people have different sizes. The size of the irises from the same eye may change due to illumination variations, distance from the camera, or other factors. At the same time, the iris and the pupil are non concentric. These factors may affect the result of iris matching. In order to avoid these factors and achieve more accurate recognition, the normalization of iris images is implemented. In normalization, the iris circular region is transformed to a rectangular region with a fixed size. With the boundaries detected, the iris region is normalized from Cartesian coordinates to polar representation.

According to L. Masek Daugman's rubber sheet model used for normalization[4].

According to Lye Wil Liam, Ali Chekima, Liau Chung Fan and Jamal Ahmad Dargam Once the iris region is successfully segmented from an eye image, the next stage is to transform the iris region so that it has fixed dimensions in order to allow comparisons. The original image which is in Cartesian co-ordinates is transformed into polar [5]. The normalization process will produce iris regions, which have the same constant dimensions.

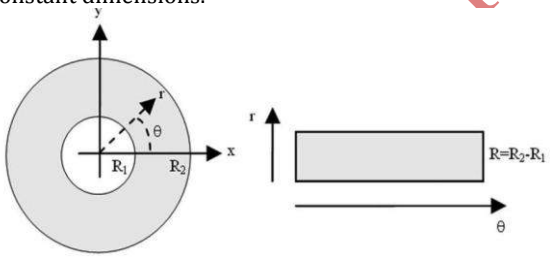

Fig.4 Iris Normalization

3.4 Iris de-noising and enhancement:

The noise results while normalization process and while capturing the image some light illusion results were removed during enhancement. To extract the iris pattern it is necessary one to enhance the image.

According to Rahib H. Abiyev, Koray Altunkaya To remove high frequency noises and also improve the contrast of projected iris ribbon, histogram equalization (HE) will be used for the iris zone. Also the effects of background illumination are removed [6].

Fig.5 Image Enhancement of the Normalized Iris

4. Iris feature extraction

Feature extraction is a special form of dimensionality reduction and contains more information about the original image. Features are extracted, using the normalized iris image. The most discriminating information in an iris pattern must be extracted. Only the significant features of the iris must be encoded so that comparisons between templates can be made conveniently and correctly.

The iris contains important unique features, such as stripes, coronas, freckles to mention but few. These features are collectively referred to as the texture of the iris. These features are extracted using a variety of algorithms. Any of these techniques can be employed: Wavelet encoding, Gabor filters, Log-Gabor filters, Haar Wavelet, Laplacian of Gaussian filters.

Boles [7] proposed an algorithm for iris feature extraction using zero-crossing representation of 1-D wavelet transform.

According to A. Azizi1 and H. R. Pourreza[8], Gray Level Co-occurrence Matrix (GLCM) based features to describe an iris pattern. GLCM based features are widely used for texture analysis.

Author	Year	Segmentation	Used feature extraction method	Used classification method
R.Meenakshi Sundaram	2011		Gray Level Co-occurrence Matrix (GLCM)	ANN
seongwon cho,jaemin kim	2002	Canny filter	Haar Wavelet transform	ANN(LVQ)
H. ERDINC KOCER	2008	Hough Transform and Cartesian to Polar Coordinate Transform	Histogram Equalization and Average Absolute Deviation	ANNs with Back-propagation

Upasana Tiwari	2008	Doughman's		SVM
Rahib H.Abiyev	2008	circular Hough transform		ANN
Amir Azizi	2009	circular Hough transform	contour let transform	SVM
Usham Dias	2010	circular Hough transform	Canny edge detection	EBPA ALGORITHM
Dr. T. Karthikeyan	2010	Harr wavelet algorithm	Fuzzy neural network algorithm	Hamming Distance operator
M. GOPIKRISHNAN	2011	Hough transform	1D log-Gabor filters	feed forward back propagation
R.Meenakshi Sundaram	2011	Circular Hough transform	2-D Haar wavelet, Gray Level Co-occurrence Matrix (GLCM)	probabilistic neural network
Upasana Tiwari	2012		Kernel based classifier, KPCA	SVM
Omaima N. Ahmad AL-Allaf	2012			All ANN
Shivani Godara	2012			ALL SOM,ANN

5. Iris feature classification:

The last module of an iris recognition system is used for matching two iris templates. Its purpose is to measure how similar or different templates are to decide whether or not they belong to the same individual or not. Most of the technique used in iris feature classification.

Neural network is classify the extracted vectors. we use learning vector quantization model due to its low complexity & high learning capability.

LDA, SOM technique are also used to classify the image.

6. Conclusion:

The purpose of Iris recognition, a biometrical based technology for personal identification and verification, is to recognize a person from his/her iris prints.

The other methods also used to extract the features of iris like wavelet packet analysis and Scale invariant feature transform. In this paper, an attempt has been made to present of different iris recognition methods. The study of different techniques provides a development of new technique in this area as future work.

7. Reference:

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