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A SURVEY ON THE IDENTIFICATION SYSTEM OF IRIS

Ms.Savitha R
Assistant Professor,Department of EEE, Faculty of Engineering and Technology,
Jain (Deemed-to-be University), Ramnagar District, Karnataka – 562112
Email id: savi.msrit@gmail.com

Abstract

Iris recognition is an imperative biometrics technique used for security purposes. It works on the principle of extracting the important features of iris and have been proved to be efficient at individual recognition level with high accuracy and nearly perfect matching. These are easy to guess and crack because users prefer passwords that are easy to remember. Cards can be lost and they can be used by anyone else to gain access to a restricted area or restricted computer. Biometrics on the other hand provide a certain and easy way of authenticating persons, biometrics can be combined with some other method like password in order to form very strong authentication method It is popular because of the unique nature of human iris. The process of iris recognition is real-time, highly accurate and reliable. Iris recognition has many practical uses, like it can be used to authenticate a person's identity or to identify a certain person from a large set of databasesThe iris recognition system consists of image acquisition, segmentation, normalization, encoding and comparison. The Iris feature of two eyes of same person are not similar making it more secured way of authentication compared to other Biometric recognition systems. This paper provides a review of various methods and algorithms used for Iris recognition system.

Keywords: *Iris Recognition, Biometrics Technique, Biometric Authentication, Security, Segmentation, Normalization, Encoding.*

I. INTRODUCTION

Iris detection is an aspect of methods of biometric authentication, including fingerprints and many other biological characteristics. These are the new methods for personal identification, authentication and security. In order to enter into safe areas or to log into a device, users actually have to bring identification tokens or some recognised pin codes. The drawback with these approaches is that certain passwords and pincodes must be recalled by users. These are easy to guess and crack, so people like easy-to-remember passwords [1]. Cards may be

misplaced and someone else can use them to obtain access to a restricted area or small device. On the other hand, biometrics offer a certain and quick way to authenticate individuals, biometrics can be combined to form a very powerful authentication mechanism with some other method such as password.

Biometric recognition uses much of an individual's psychological and physical attributes. Some common features are fingerprints, hand shapes, eyes retinas and many others, including eye's iris. Psychological and behavioural traits include speed of typing, way of walking, and signature, etc. It is assumed that iris patterns are one of the most accurate of all physiological properties [2]. It has epigenetic formation and from the human DNA it is produced. Two eyes, while very similar, contain unique patterns from the same human. Similarly, four separate iris shapes will represent identical twins. The iris detection method is real-time, extremely detailed and effective. Iris identification has many practical applications, like it can be used to authenticate an individual's identity or to distinguish a particular person from a wide collection of databases.

The Iris's Physchology:

The iris, situated behind the cornea but in front of the lens, is a covered internal organ of the eye. The iris has several properties that can be used to separate one iris from another [3]. Trabecular meshwork, a tissue that gives the impression of separating the iris in a circular manner that is permanently developed by the eighth month of gestation time, is one of the key visible characteristics. There is no genetic effect on it during the formation of the iris, a phenomenon known as disorderly morphogenesis that happens during the seventh month of puberty, which means that twins have distinct iris forms, even similar means of the infant. And people's own eyes are uncorrelated, in truth.

II. METHODOLOGY

In addition, the iris recognition system consists of a variety of sub-systems that correspond to each iris recognition level. Those processes are:

I. *Image*- capturing eye image retrieval.
II. *Segmentation*- locating the area of the iris in an image of the eye.
III. *Normalization*- to create a dimensionally cohesive image of the area of the iris.
IV. *Encoding*- the development of a blueprint containing only the most discriminating iris characteristics.
V. *Matching*- The matching module specifies how closely the encoded features stored in the database match the created code.

The Segmentation Procedures:

1. Hough transform:

The Hough transform is a structured computer-based algorithm that can be used to evaluate the parameters, such as lines and circles, of basic geometric objects. To deduce the radius and centre coordinates of the pupil and iris areas, the circular Hough transform can be employed [4]. First, by measuring the first derivatives of intensity values in an eye image and then thresholding the outcomes, an edge map is created. Votes are cast from the edge map to decide the parameters of circles moving through each edge point in Hough's space. The central coordinates xc and yc and the radius r of the circle are these dimensions, which are capable of describing any circle according to the equation:

$X_c^2 + Y_c^2 - r^2 = 0$ (1)

2. Daugman's method:

Using integro-differential operator, Daugman suggested the algorithm to define internal and external borders of Iris, both the upper and lower eyelid boundaries were detected [5]. The operator follows the spherical aspect of the pupil and limbus and functions as a circular edge detector. Where there is a maximum difference in the pixel value, the radial path is observed by varying the circular contour radius. By using the parabolic curve as a contour path, the upper and lower eyelids are detected.

3. Sobel operator:

This approach is used to precisely localise the representations of the Iris and the characteristics produced are resistant to illumination. Using sobel operator, the pupil and Iris edges are defined and then gradient is added to convolved images. To define the pupil centre and pupil radius, the Circular Hough transform is applied.

4. Binary maps:

In comparison to approaches using colour and grey scale images, iris detection is based on binary maps. In terms of low storage capacity, quick processing and hardware compatibility, the edge maps have benefits [6]. Using circular Hough transformation that detects the circular borders from the edge map of the eye image, the Iris localization is carried out. The canny edge detection algorithm produces the edge map.

5. Level set algorithm:

A computational methodology for monitoring interfaces and forms is the level set system (LSM). The value of the level set approach is that without having to parameterize these objects, one can perform computational computations involving curves and surfaces on a fixed grid. The level-set approach also makes it very simple to follow shapes that modify topology, such as where a form separates into two, produces holes, or reverses these operations [7]. For iris with non-circular edges, it is not feasible to add Hough transform. Such boundaries are detected using contour based models such as level set method.

6. Lower and Upper Eyelid Detection:

Similar to iris outer boundary detection, the suggested approach chooses two scan regions to locate upper and lower eyelids. The pupil centre, iris inner and outer boundaries are used as reference to select the two search regions. The distance of two search regions is same and is restricted within the inner and outer limits of diameter of the pupil. To detect the eyelids, Sobel edge detection is added [8]. The Sobel kernel is tuned in the horizontal direction in order to decrease the identification of false edges caused by eyelashes.

The edge image is created after the edge detection phase. Using the linear Hough Transform procedure, the eyelids are marked. The system calculates the total number of edge points within the quest regions in a horizontal row. The horizontal row is selected as the eyelid border, for the highest number of edge points. If the cumulative number of edge points falls below the predefined threshold, the eyelid is not considered to be found in the quest regions. The eyelid borders are roughly modelled as straight lines in the system suggested. Both pixels around the eyelid borders can not be detected by Edge detection..

Normalization is achieved by the rubber sheet model of Daughman in which the circular Iris area is transformed into a fixed-dimension rectangular block. Using quadrature 2D Gabor, step data is encoded and hamming distance is used for template matching. The potential false match likelihood of 1 in 4 million is celebrated by this approach [9].

The remapping of the iris area to the normalised non-concentric polar representation from (x,y) Cartesian coordinates is modelled as:

$I(x(r,\theta) ,y(r,\theta)) \rightarrow I(r,\theta)$

Feature Matching And Encoding:

I. Local binary pattern:

The significant information present in an iris pattern must be collected in order to provide correct identification to individuals. It is necessary to encrypt only the essential features of the iris so that comparisons can be made between templates. With efficient discrimination and low computational complexity, LBP is a grayscale local texture operator. An LBP operator thresholds a neighbourhood by its center's grey value and represents the outcome as a binary code that specifies the pattern of the local texture.

LBP is defined in the general description as a circular symmetric neighbourhood requiring interpolation of intensity values for precise computation. To hold programming clear.

II. Fast fourier transform:

The Fourier transform transforms the signal to the frequency domain from the spatial domain and filters the noise in the image as well. Moment values are the invariant size and orientation of the object under analysis [10]. A sequence of numbers named moments defines the field, centroid, moment of inertia, orientation in the methods of moments. In terms of origin, size and orientation of the object, the simple moments differ according to position. Invariant moments are moments which are normalised. Using the Euclidean distance formula, which is determined by calculating the normal between two moment vectors, iris image matching is achieved.

III. CONCLUSION

Due to its rarity, stability over the years and challenge in forging the Iris, iris identification has received greater popularity. This paper presents the study of numerous existing approaches suggested by various authors. This technique typically follows a 5-step approach: eye localization, segmentation of images, normalisation, extraction of features and matching. The best authentication technique is the Iris recognition system. The uniqueness of the Iris and low risk of a false acceptance or false reject rate add to the advantages of using Iris recognition technologies..

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