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A Comparative Study on Biometric Approach for Iris Recognition

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ABSTRACT: Iris recognition is considered to be the most reliable and accurate biometric identification system available. This is a method of biometric authentication that uses pattern-recognition techniques based on high-resolution images of the irises of an individual's eyes. In this paper we propose to study and do a comparative study on Marr-hildreth Edge detection technique, Daughman's algorithm method and Daughman's mathematical algorithm used for Iris recognition.

KEYWORDS: Pupil, Biometric, Iris, Eye.

I. INTRODUCTION

Biometrics includes fingerprints, facial features, retina, iris,voice, gait, fingerprint, palm-prints, handwritten signatures and hand geometry. Among the various traits, iris recognition has attracted a lot of attention because it has various advantageous factors like greater speed, simplicity and accuracy compared to other biometric traits. The basis of every biometric trait is to get the input signal or image and apply some algorithms like neural network, fuzzy logic, wavelet transform etc to extract the prominent features.In this paper we have made a survey of various existing iris recognition algorithms. The different sections includes structure of iris and its importance as a biometric trait in the second section. In the third section various approaches of iris recognition have been described. Fourth section shows the comparison of the implemented algorithms. Last section is the conclusion and future work.

II. STRUCTURE OF IRIS

Iris is a thin, circular structure in the eye, responsible for controlling the diameter and size of the pupil and thus the amount of light reaching the retina. The color of the iris gives the eye its color. Iris is a muscle within the eye that regulates the size of pupil, controlling the amount of light that controls the eye. Sample iris images are shown in Figure 1.

The word iris is most likely derived from the Latin word for rainbow. The very front of the eye is essentially made up of two parts: the sclera or "white" portion of the eye, and cornea. The sclera consists of closely interwoven fibers and a small section in the front and center known as the cornea. The cornea consists of fibers arranged in regular fashion. Conveniently this makes the cornea transparent, allowing light to filter in. The iris has been found to be incredibly unique from person to person, in both color and structure.

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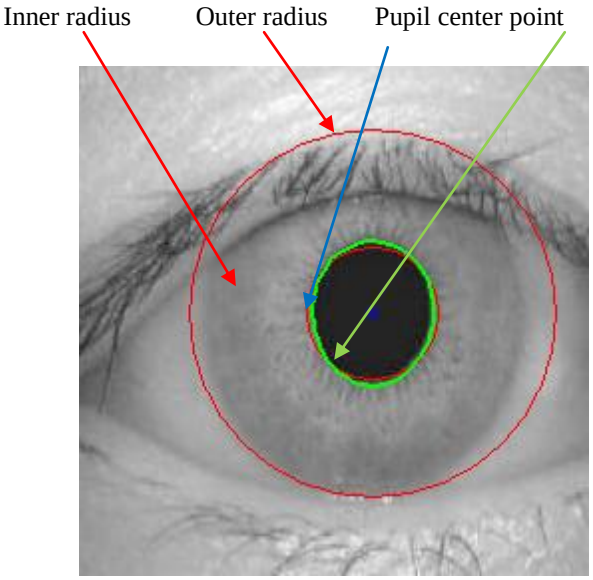

Fig 1: Structure of Iris

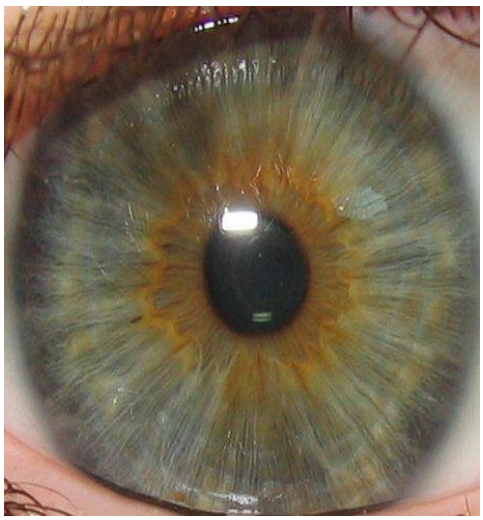

Fig 2: An example of a gray–green-brown iris.

III. ALGORITHM

A. TISSE

Introduced new algorithm for localization and extraction of iris. For localization a combination of the integro-differential operators with a Hough Transform is used and for feature extraction the concept of instantaneous phase or emergent frequency is used. Iris code is generated by threshold in both the models of emergent frequency and the real and imaginary parts of the instantaneous phase. Finally the matching is performed using Hamming distance. Results gave 11% of the false reject rate was obtained.

B. Daugman

This is by far the most cited method in the iris recognition literature. It is licensed to Iridium Technologies1 who turned it into the basis of 99.5% of the commercial iris recognition systems. It was proposed in 1993 and was the first method effectively implemented in a working biometric system. The author assumes both pupil and iris with circular form and the integro-differential operator. Integro-differential operators are then used to detect the centre and diameter of the iris, then the pupil is also detected using the differential operators, for conversion from Cartesian to polar transform, rectangular representation of the required area is made. For matching, Hamming Distance has been calculated by the use of simple Boolean Exclusive – OR operator and for the perfect match give the hamming distance equal to zero is obtained. The algorithm gives the accuracy of more than 99.9%. Also the time required for iris identification is less than one second.

C. S.M. Ali

A new iris recognition and person identification technique is introduced. The method is based on tracing the Eye image boundary, using the Marr- Hildreth edge technique. The creation of an edge image can be considered as a process of transforming the grey scale image into binary-valued image. The problem with these techniques is existed in its threshold dependence; i.e. many spurious edges are detected with certain low-valued threshold, or can give discontinuous edges if higher threshold is used to eliminate the spurious edges. The Marr-Hildreth suggested an edge method as being a model of human visual processing, which produce thin and connected boundaries. Chain coding is one of the popular error-free coding techniques for binary edge images. This technique has been introduced by Freeman not to produce an efficient code for image compression, but rather to describe the image boundaries easily and simply.

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IV. COMPARISON

We have studied three algorithms based on Iris Code. The performance results are based on error rates: False Acceptance Rate (FAR) and False Rejection Rate (FRR); and the overall accuracy. The percentage accuracy based on FAR and FRR of the implemented algorithms is shown in Table 1.This table shows that the Daugman's algorithm gives the maximum Accuracy among the three.

Algorithm	**FAR/FRR**	**Overall Accuracy**
Tisse	1.84/8.79	89.37
Daugman	0.01/0.09	99.90
S. M. Ali	1.7/7.67	92.21

V. CONCLUSION

This paper presents a review of the existing algorithms available for iris recognition. Iris recognition technology is able to give highly accurate results for human identification. But this technology needs more attention to overcome the disadvantages of the existing algorithms. This paper also shows an experimental comparison of three algorithms which shows that Daugman's algorithm gives maximum accuracy. Future work would be to make a database of large number of people which includes a large number of variations for illumination and size. We are working to develop an efficient algorithm for iris recognition using less expensive cameras and other hardware so that the cost can be reduced upto some extent.

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