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A SURVEY PAPER ON DIFFERENT METHOD FOR IRIS SEGMENTATION

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ABSTRACT

A biometric system offers automatic identification of a human being based on the unique feature or characteristic which is being possessed by the individual. The iris segmentation has its own major applications in the field of surveillance as well as in security purposes. The performance of the iris recognition systems depends heavily on segmentation. A review of various segmentation approaches used in iris recognition is done in this paper. In survey among different segmentation techniques, Circular Hough transform have better performance than other techniques.

KEYWORDS: Circular Hough transform, Iris recognition, segmentation, biometric, surveillance

INTRODUCTION

Iris recognition is playing an important role in many mission-critical applications recently, such as access control, personal identification, border crossing .E-passport etc. Iris recognition has higher accuracy and reliability compared with other biometrics. It is highly believed that it is impossible to get two identical iris image from two persons, even if they are twins [1]

The human iris begins to form in the third month of gestation and the structure is complete by the eight month, even though the colour and pigmentation continue to build through the first year of birth. After that, the structure of the iris remains stable throughout a person's life, except for direct physical damage or changes caused by eye surgery. The iris hence parallels the fingerprint in uniqueness but enjoys a further advantage that it is an internal organ and less susceptible to damages over a person's lifetime. It is composed of several layers which gives it its unique appearance. This uniqueness is visually apparent when looking at its rich and small details seen in high-resolution camera images under proper focus and illumination [2].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.

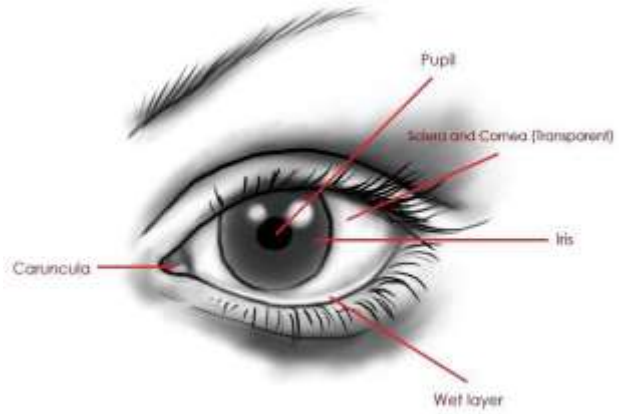

Fig.1 IRIS

The iris is ring shaped structure that encircles the pupil, dark centered portion of the eyes.

IRIS SEGMENTATION

Iris segmentation refers to the process of extracting features that provide information of iris pattern[9] The main objective of segmentation is to remove non useful information, namely the pupil segment and the part outside the iris (sclera, eyelids, skin).The success of segmentation depends on the imaging quality of eye images. The segmentation step detects the boundaries of

iris region. The segmented region is then converted into template in the normalization step.[12]
Inaccurate segmentation is the major reason for most failures in iris recognition system.[7]
The basic method for iris segmentation is

1. DAUGHMAN'S INTRO DIFFRENTIAL OPERATOR

Daugman uses an integro Differential operator for segmenting the iris. It find both inner and the outer boundaries of the iris region.[1;].The equation is as follows

$$\max(r,x_0,y_0)|G_\sigma(r) * \frac{\partial}{\partial r}\varphi \frac{I(x,y)}{2\pi r} ds|$$

Where x0,y0,r0 are centre and radius of coarse circle ds is circular arc of radius r;
I(x,y) is the image;
Gσ (r) is Gaussian function, Δr is radius range for searching for, and I(x,y) is original iris image.
The outer as well as the inner boundaries are referred to as limbic and pupil boundaries. This method are based on linear search methods.[5]

2. ACTIVE CONTOUR MODEL

.Active contours, the snake model originally introduced by Kass, is a classical approach to edge detection based on deforming an initial contour towards the boundary of the object to be detected, and it is widely used in medical image processing [7,8,9,10,11]. The contour consisting of various vertices and their positions may be changed by internal and external forces. The internal force depends on the characteristics and an external force is image dependent.[8]

3. CIRCULAR HOUGH TRANSFORM

The Hough Transform is an algorithm presented by Paul Hough in 1962 for the detection of features of a particular shape like lines or circles in digitalized images. The classic Hough Transform is a standard algorithm for
line and circle detection. [10] Circular hough transform is employed to find out radius and centre coordinate of iris[19] The Hough transform method requires the threshold values to be chosen for edge detection, and this may result in critical edge points being removed, thus resulting in failures to detect circles/arcs. In addition, Hough transform is computationally intensive due to its "brute-force" approach, and thus may not be suitable for real time applications [14].

4. GENERALISED STRUCTURE TENSOR

Generalised structure tensor detects the pupilar and sclera boundaries of the iris by initially assuming that they are circles.[20] GST also include eye lid detection procedure.
The pupilar boundary is detected first using circular filters sequentially. Then, its center is used to detect the sclera boundary. The structure tensor method uses both the magnitudes and direction of edges for accurate detection of iris boundaries
GST detects the circular boundary approximately, it deforms it into non circular boundaries.[21]

5. FUZZY C CLUSTERING

Fuzzy C-means (FCM) algorithm is the most popular method used in image segmentation because it has robust characteristics for ambiguity [18] and can retain much more information than hard segmentation methods. Although the conventional FCM algorithm works well on most noise-free images, it has a serious limitation, i.e., it does not incorporate any information about spatial context, which cause it to be sensitive to noise and imaging artifacts. Iunder proper focus and illumination [2].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.

LITERATURE SURVEY

This section introduces the related work of the image segmentation by various authors with different perceptions regarding to the segmentation techniques

1 In [2] proves that iris segmentation is the most important part of iris recognition because areas that are wrongly identified as iris regions will corrupt biometric templates resulting in very poor recognition

2 In [3] this show that the iris locating algorithm based on integro-differential operator suffers from bright spots of the illumination inside the pupil , so our Daugman's algorithm enhancement overcome this problem and decrease average time of calculation for searching pupil and iris boundaries and our enhancement gives a successful results for iris localization process.

3 In [9], In this paper, an effective approach for iris segmentation have

been described. . Two different coefficients have been introduced to the traditional shrinking active contour model to make it flexible to different edge effects in different axes. Experimental results have shown that the proposed method achieves encouraging performance for improving the segmentation accuracy for use in a noncircular iris recognition system.

4 In [12], in this paper there are three performance goals. First, the accurate segmentation of the iris/pupil regions from the degraded eye images that are affected by severe gaze deviation, diffusion, non linear deformation, low intensity, poor acquisition process, eyelid and eyelash occlusions and small opening of eyes. Second, the proposed localization scheme based on region-oriented active contour model addresses the issue of processing the iris images where the inner and outer boundaries are not exactly circular, elliptical and concentric. Third, the intensity inhomogeneity often occurs in iris .Active contour Model gives better performance than other existing unideal iris recognition.

5 In [13], this paper proved that hough transform achives good result in HSV and YCbCr space. This method can be tested in several applications such as biometric system, human machine interface.

6 In [14] ,this paper proves that circular hough transform is more accurate than conventional segmentation methods in noisy images which are affected with specular reflections from eye surface.

7 In [19], This paper shows that the level of accuracy of an iris recognition system depends on the precision of the segmentation of an iris region. The eyelids and eyelashes which obstruct the upper and lower parts of the outer iris boundary are removed perfectly. This enhances the accuracy of the system in that, only the iris region can be converted to biometric templates for matching. Circular hough transform method proposed on this paper proofed to be more effective compared to existing methods. The proposed system has achieved a recognition accuracy of 95.6%.

8 In[21], In this paper, a novel iris feature selection approach based on Cuckoo search algorithm is performed. First, the iris of the person who is subjected to eye scan is taken. It is segmented using Generalized structure tensor and its features are extracted using ICA. The best features are selected by cuckoo search Algorithm from the extracted texture features. The best features are then compared with the several features of different individuals in the database for identification.

9 In [23], In this research work, the algorithms used for segmentation of iris from the image obtained are implemented using powerful tool, MATLAB.. Then algorithms Fuzzy C-Means algorithm are implemented s along with normal segmentation method using the powerful tool, MATLAB.. The Fuzzy C-Means algorithm produces low error rate when compared to others. It produces high percentage of accuracy 98.20% and low error rate of 1.80

CONCLUSION

This paper presents a survey on the various segmentation techniques involved in iris segmentation. There are various techniques that can be used for segmentation .Among the analyzed techniques it is found that Circular Hough Transform gives the accurate segmented output. An adaptive threshold method can find the limbic boundary.

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