

## Eyelids, eyelashes detection algorithm and houghtransform method for noise removal in iris recognition

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### ABSTRACT

The biometric system is based on human's behavioral and physical characteristics. Among all of these, iris has unique structure, higher accuracy and it can remain stable over a person's life. Iris recognition is the method by which system recognize a person by their unique identical feature found in the iris. Iris recognition technology includes four subsections as, capturing of the iris image, segmentation, extraction of the needed features and matching. This paper is a detail description of eyelids; eyelashes detection technique and Hough transform method applied on iris image.

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## 1. INTRODUCTION

In recent years, the technology which is based on biometric identification got an instant development. Due to its high reliability, noncontact and some other advantages, iris recognition technology has widely acceptable [1-9]. Iris recognition is a method of biometric authentication, based on extracted features of the iris of an individual's eyes [1-3]. Every individual has its unique and stable iris features [11] Iris recognition technology is based on unique pattern which is found in human eye [12-14]. Iris recognition system is the fastest system as compare to the other biometric recognition system. It is having number of different characteristics. Iris recognition system can be used for recognition purpose. The different parts of the eye as shown in Figure 1.

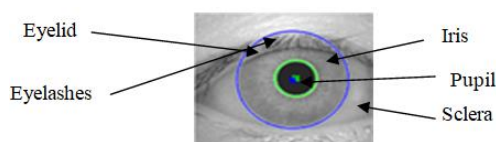


Figure 1. The different parts of the eye

## 2. RESEARCH METHOD

Idea of the iris recognition system is very old and it is firstly proposed by Frank. Among the all algorithms, most wellknown algorithm is proposed by Daughman [2, 15-16]. He has produced improved

result. M. Monro et al has proposed eyelashes removal method for human iris recognition [13]. Criteria based eyelashes detection model for IrisSegmentation is proposed by Wai-Kin Kong et al [15]. B. Kang et al proposed method of robust eyelashes detection based on iris focus assessment [9]. Many researchers also concentrate on the accuracy of the iris recognition system [2, 10, 13, 17-18]. Also many of them focused on the iris feature extraction and recognition systems. Noise factors affect the accuracy of the iris recognition system, so recently many researchers doing work on the noise removing techniques for iris image [2].

An Iris recognition system uses a small and high-quality gray scale camera to capture an image of the iris. Then we segment and normalize the iris image. After that, we use eyelashes detection algorithm to detect the eyelids and eyelashes in this iris image. Eyelids and eyelashes are the noise factors in the iris image. And we must have to remove these noise factors from the iris image to ensure an effective recognition's rate. For this, canny edge detection technique can be used [17]. To detect the pupil and boundaries in the iris image, we can use Hough transform method. Hough transforms method works on the basis of parametric equations [19-20]. Hough Transform method can find geometric shapes such as circles, or lines within an image [19]. In this case we use the circular transform. In Figure 2, iris recognition system is made up of number of subsystems. Our paper is based on the first two part of this system i.e. capturing of the iris image and pre-processing.

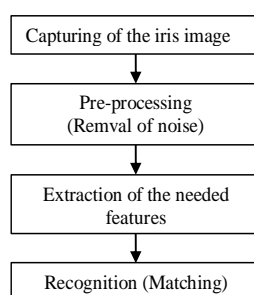


Figure 2. Iris recognition system block diagram

### 2.1. Image Capturing

The iris image can be taken by a gray-scale camera in specific distance from the camera [1, 17, 21-22]. When eye is properly stable then, iris image can be taken from this camera. This camera captures number of images and these images can be used for further use. We used CASIA Ver.01 iris database for this purpose. Numbers of images are available in the CASIA Ver.01 iris database. We have taken number of these iris images for recognition purpose.

### 2.2. Pre-Processing

Iris image is captured from camera [18]. This iris image may have some amount of noise [23-24]. This noise can be eyelids, eyelashes, masked regions etc. These noise factors affect the accuracy and speed of the iris recognition system [25]. Due to this noise, performance of the iris recognition system gets reduced. So, we have to remove these noise factors from the iris image. Preprocessing step helps us to remove iris image noise. Though performance of the system depends on this step, it plays important role in the iris recognition system. To remove these noise factors, we have used eyelids, eyelashes detection algorithm and circular, linear Hough transforms on the iris image.

### 2.3. Feature Extraction

This is also a very important step in iris recognition. This step can be used to get needed features of the iris image. Due to the memory problems, we need more small size iris data. In this step, needed features in the iris input image is chosen. These features can be used for further processing in matching step. With the help of these features, we can match one iris image with other iris image.

### 2.4. Recognition

Unique iris pattern is already stored in the iris pattern database. In this section, new iris pattern of the same individual is taken and matching of the already stored iris pattern and new iris pattern is takes place with the help of matching algorithm. We have not concentrated on this part in our paper.

### 3. RESULTS AND ANALYSIS

#### 3.1. Eyelids and Eyelashes Detection Algorithm

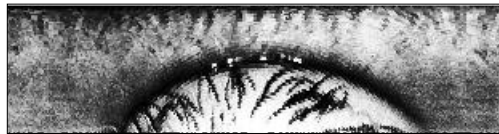
Eyelids and eyelashes are the noise factors in the iris image . And we must have to remove these noise factors from the iris image. To remove these eyelids and eyelashes from iris image we can use eyelids and eyelashes detection algorithm. This algorithm runs in six stages as follows:

For the upper eyelids,

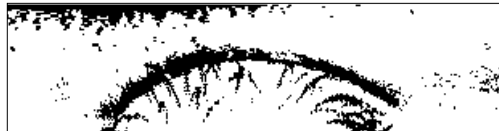
Ex:



1/ Histogram equalization:



2/ Using a scale (see [13])



3/ Complement of the image



4/ Eliminate noise greater than 50 pixels



5/ Add the right and left areas

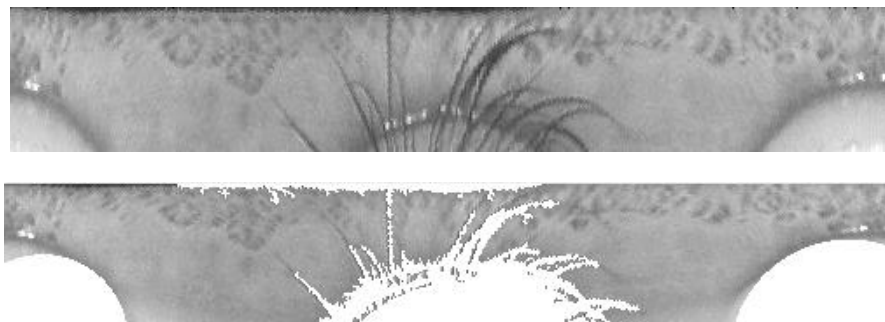


6/ Apply the circular Hough transform



We repeat these steps for the lefts and rights eyelids,

Ex:



According to these results the recognition's rate is: 99.99%

#### 4. CONCLUSION

A new eyelid and eyelashes detection method is discussed with reduced noise. Eyelids and eyelashes detection method is more accurate. This system will reduce the time for detecting the eyelids and eyelashes of the iris image with the help of circular Hough transform.

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