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# IRIS SEGMENTATION AND RECOGNITION FOR HUMAN BIOMETRIC SYSTEMS

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**ABSTRACT:** A common way for person authentication in biometric recognition is iris identification, one of the utmost stable and suitable biometric technologies. Nowadays there is a big interest on using iris recognition in visible or in near-infrared spectrum, on smart phones and tablets, to authenticate a person. Generally, this process will takes two steps. In the first step, one or even several images of the person's iris are acquired, using digital cameras in visible or in near-infrared spectrum. In the second step, comparison of captured iris images with images stored in an iris database will take place. So accuracy of an effective iris recognizer depends upon how accurately iris region is localized in the images so that eyelashes, eyelids will be accurately remove from the iris region as they effect the features of the iris. In this work, an effective iris localizer has been proposed which uses number of process such as contrast enhancement, edge enhancement, segmentation, clustering, eyelid detection etc. In this,Snake contouring is used for detecting the boundary of the iris which has been assisted by CHT algorithm to detect the rough iris circle. After that sclera region has been detected and both eyelids has been detected. Finally upper and lower cut-off has been used to exclude the eyelid eyelashes in the detected iris. The proposed algorithm has been tested on UBIRIS database.
***Keywords:*** *Iris segmentation, Snake contouring, Sclera region, Biometrics.*

## I. INTRODUCTION

Rich texture has been contained by the humanwho is highly steady and distinct. Remarkable performance has been achieved by the existing state-of-the-art iris recognition algorithms [1] with the iris images captured in a well-controlledsituation and also with full assistance of the consumers. In the iris recognition system, there are many testing issues like mistake in segmentation(because of impediment by eyelid, eyelashes, hair, and eyeglasses, off-point, movement obscure and non-uniform enlightenment), high changeability between intra-class pictures while low variability in between class pictures. A conceivable answer for these issues is to separate a reasonable arrangement of elements from iris design which are invariant to above issues. It is normal that these components can segregate diverse subjects effectively. For the iris acknowledgment framework analysts have investigated different sorts of elements and different sorts of classifiers. Case of such frameworks incorporates the multi-determination portrayal of iris design in view of wavelet [2], and Gabor [3]. As of late, noteworthy research exertion has been given to enhance the ease of use and common sense of iris acknowledgment innovation by permitting the iris images to be caught in less compelled situations, with the subject at-a-separate and progressing, or with cross-sensor captures [4]. These less obliged iris acknowledgment frameworks take care of the expanding demand for legal, observation and cell phones security applications. Be that as it may, there are still difficulties in less compelled iris acknowledgment. With the subject at-a-separate and moving, the captured iris images usually suffer from noise and degradations, including low resolution, specular reflection, motion blur, out of focus, and occlusion of glasses and eyelids. Such images deteriorate the iris recognition performance [5]. With respect to cross-sensor iris captures, the iris acknowledgment execution may drop on account of the variety in the captures of various sensors [6]. An iris acknowledgment framework typically comprises of three parts: iris segmentation, include extraction and iris indexing. Right now, iris segmentation and highlight extraction for captures in less constrained conditions have been broadly explored [7]. Be that as it may, moderately less works concentrate on outlining a strong iris matching technique.

## II. LITERATURE SURVEY

**Chiara Galdiet. al. [8]** investigated new techniques for improve the algorithm. In their, work, three descriptors has been developed.

**Yang Hu et. al. [9]**explores a method, named as novel iris weight map. This method is used for iris recognition in less reserved environments. They model intra-class and inter-class matching individually to produce two weight maps: a stability map and a discriminability map.

**SaiyedUmeret. al. [10]** proposed a cancelable iris recognition system. In their work, several techniques have been used for extraction of features from iris pattern. These techniques aresparse representation coding, bag-of-words, and locality-constrained linear coding technique. The exploit of the recognition system using these features suggests that the sparse representation coding technique discriminates the iris image well.

**Naglaa F. Solimanet. al. [11]**developed a fast iris localization algorithm, in which comparison of accuracy with another approaches will take place. In their work, first step is considered to be Thresholding instead of full search of a 3D parameter space for a great number of image pixels.

**ImranNaseemet. al. [12]** proposed an algorithm, in which incorporating class-specific dictionaries, for the problem of iris recognition. In their work, they uses class-specific dictionaries to develop linear models for each subject in which the inverse problem has been solved. This problem has been used by using the linear regression and in favor of subject; the decision has been ruled with small amount of reconstruction error.

## III. PROPOSED WORK

A brief introduction of all the presented steps has been written below:

### Step 1) Enhancement of luminance

The eye's image is captured such that the iris is properly visible in the captured. Pre-processing like filtering and smoothing is applied on the input iris image to make it noise free and it is also normalized [13]. For this gamma correction has applied which enhances dim regions of the image in order to increase brightness.

### Step 2) Edge preserving and smoothening filter

In this step, median filter, a well-known local image operator has been used. This filter is frequently adopted for image de-noising or smoothing purposes. Median filtering has the reputation of good edge conserving ability, and new pixel values have not been introduced to the processed image.

**Step 3) Edge enhancement**

The gradient of an image is a low level feature fundamental in image processing and computer vision. It expressed as first-order discrete derivative and represents the directional change of the intensity in an image. There are number of filters available i.e. Prewitt, Canny, Soble etc. but Soble has been used in this work.

**Step 4) Image Segmentation**

The computation of the watershed transform (WT) [14] is considered as next step. The popular segmentation method named as watershed transform is a originated in the field of mathematical morphology. The image is considered as a topographical relief, where the height of each point is related to its grey level. Imaginary rain falls on the terrain. The watersheds are the lines separating the catchment basins.

**Step 5) Binarization[15]**

To discover the ROl the limbus boundary has been used to place a binarized version BW of the watershed transform. Binarization is finished in such a technique that even if the foreground of BW does not coincide exactly with the region of the eye consisting of iris, its contour includes portions of the limbus boundary that are large enough to reliably apply circle fitting.

**Step 6) Circle fitting**

To detect the iris region, CHT has been used. The Hough Transform (HT) is a very powerful tool that detects the parametric curves in images. By voting process, it has been implemented that maps image edge points into manifolds in a properly defined parameter space. The Circular Hough Transform (CHT) is the improved versions of the HT.

**Step 7) Snake contouring method for iris segmentation**

Snake contouring is a deformable model widely used in image analysis applications given its flexibility and efficiency [16]. Snakes are generally interactive in nature and demand user input or an initial guess, followed by movement of a curve towards the border of the object of interest. Behind the snakes, mathematical formulation has been considered as energy-minimizing spline, with an associated 'snake energy' as a cost function.

**Step 8) Localization of scleraregion**

Clustering method is used in this method in which image is changed into fix number of clusters. That cluster is finding by checking mean intensity values of all the clusters. As sclera region has high intensity, its boundary comes in one of the clusters which is further improved by dilation and erosion process.

**Step 9) Locating and removing upper and lower eyelids**

After segmenting out the sclera region on both sides, upper eyelid has been detected basis on the end point of the curvature of the sclera region in the eye. Similarly lower region has been detected where the iris circle ends from the bottom.

**Step 10) Generating features of iris**

Finally, iris features have been generated in which canny edge are implemented and binary values of the iris are stored in a matrix.

## IV. RESULTS AND DISCUSSION

The software implementation of the project has been done using MATLAB.MATLAB stands for MATRIX LABORATORY, software developed by Math works honor in USA. At first, it is used in military area. For this proposed work, both Image Acquisition commands and image processing toolbox commands has been used.

### Graphical representation of the results

Results of matching have been graphed in the figures below in terms of sensitivity, specificity and accuracy**.**

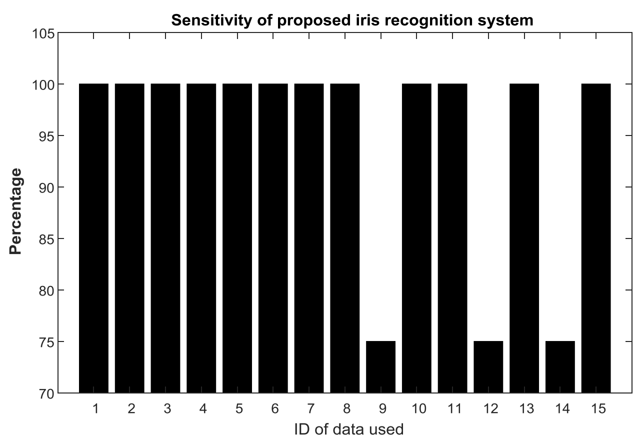


Figure 1: Sensitivity values proposed iris recognition system

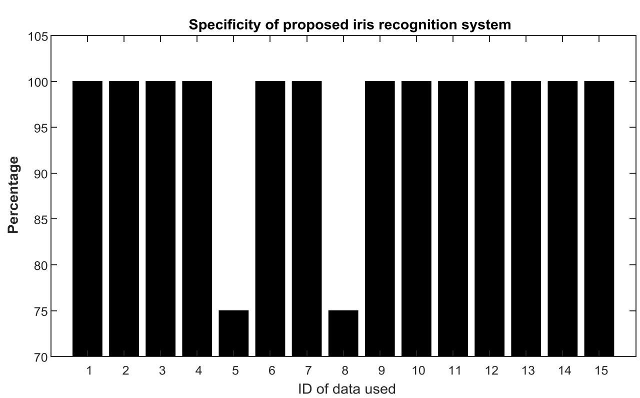


Figure 2: Specificity values proposed iris recognition system

The algorithm has been checked on 15 individuals from the UBRIS dataset available on the internet. Experimental results shows 96% overall accuracy in actual detection of all iris images in the dataset.

## V. CONCLUSION

In this work, effective iris segmentation has been carried out using different methods in which contrast enhancement and edge enhancement has been carried out by different filters. Contrast has been improved by gamma correction of the dim regions in the image and smoothening is carried out to localize the iris circles in the image. CHT has been performed to localize iris circle whose center has been used as seed by snake contouring method. As there are possibilities of eyelashes and eyelids in the detected iris circle, further processing has been carried out by clustering methods which detects the sclera region on both sides of the iris and then upper eyelid and lower eyelid has been detected from that. Finally performance of the proposed segmentation method has been proved by matching the templates form different dataset which shows about 96% accuracy in true recognition of iris images.

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