

# Identification of a Person Using Iris Features: Challenges and Trends

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**Abstract:** Iris detection become a very useful biometric feature in today's era, when more emphasis given on security of data, because of need of authentication of data. Iris identification is among one of the most widely accepted biometric feature used for identification of a person. Here, we are going to review available iris detection techniques with their merits and demerits. The paper contains the basic steps used for iris recognition along with detailed analysis of each step and focuses on previous works done by different researchers in each step with a conclusion part. At the end we ensure that the paper will be helpful for new researchers in order to identify the gaps in existing system and to identify the right path for research.

**Keywords:** Human Eyes, Iris Detection, Segmentation, Pattern Recognition.

## I. INTRODUCTION

Iris is the outer circle beyond the pupil. The iris may have different texture patterns, so it can be used as a very important biometric feature for recognition of a person. Iris recognition becomes very trustworthy technique in recent decade because of less accuracy in other biometric system based on figure print. In iris recognition, both eyes have different patterns, so it can be also used as single or combined features [1,2]. Other biometric features like thumb may get affected according to age where, iris features does not have any effect of age and remains same in all over the life. In early 2010, some of the biometric features like thumb, figure print and face recognition becomes important method for identification of a person but all these features get affected with change in age. so, iris becomes most important feature for many recognition system. The center part of human eye is known as pupil, which are generally of black color and circle in shape. When we go for iris recognition then we need to apply some pre processing steps to remove the pupil part and eyelashes from input image. So, iris recognition system contains, sub sequent steps of pre processing, segmentation and feature extraction for recognition.

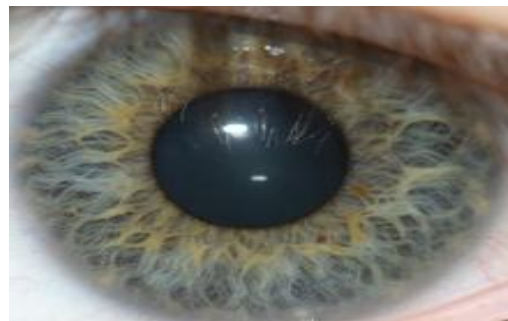


Figure 1: Human Eye[12]

Every Human eye contains a novel pattern of texture as shown in figure 2. the most issue in such detection is to urge rid of unwanted area and extraction of region of interest because iris is found at middle area of eyes so outer layer and inner layer of pupil should be subtracted from the input image to get the iris pattern. Another challenge is to convert this circular iris pattern to a rectangular pattern to form is straightforward for recognition. there's always be a requirement of a strong iris recognition system because other similar biometric system like finger print, palm print couldn't perform well as they depends on impact of the input. If impact of finger or palm get light then it'll become difficult to spot the person. In such area iris system may play a really important role in recognition.

This paper is arranged as, the section 1 contains the introduction of iris recognition system, why iris recognition is powerful method for biometric systems and the challenges occurs while iris detection. Whereas the section 2 contains the literature survey in which most common methods and recent iris detection methods are reviewed along with their limitations and scope of future work, section 3 contains the general methodology used in iris detection and also focus most common way adopted by various researcher for iris recognition, last section contains the conclusion part which mainly focuses on various paths for the other researchers where they can work.

## II. LITERATURE SURVEY

Daugman [4] proposes a Iris detection system by using Gabor wavelet and pattern recognition method, while testing this method on various iris patterns it had been found excellent in performance. Then an equivalent author proposes another enhancement in his existing work where he proposed that the human iris also can be identified in crowd. during this paper he proposes many statically calculations[5]. Proenca H. proposes extension to Daugman’s work where he proposed a completely unique method which may be implemented in biometric system and suggested that the iris pattern of each human is different from others so it are often saved in device then are often used for matching or verification purpose later[6].

Yu Chen [7] presented a highly efficient method for recognition of a person using bio metric features they uses unique segmentation technique for iris segmentation and also novel approach for preprocessing of images, which can reduce the effect of noise from environment and effect due to distance of camera and its position. Mohamed et al [8] proposes a replacement technique for iris recognition in his paper he suggested the utilization of iris localization and morphological features, for localization features he used canny edge detection algorithm and for morphological features he extracted boundary features, area, opening and shutting etc. Mabrukaret. al. [9] uses a novel method to perform localization. To achieve the correct iris segmentation they first applied sobel edge detection method to generate boundaries of iris, then, first order derivative used for localization, finally, hough transform is used to identify the position of center of pupil and also to predict the radius of the pupil circle. Ajay Kumar et al [11] propose the use of sparse matrix to extract the features of iris pattern. To perform this task, they first divide the images into small patches of 10\*10 pixels then apply feature extraction and localization, in order to increase the chance of getting better segmentation of input image.

Shikreet. al. [13] presented a 2 level wavelet transform to recognize iris of human from self created dataset. They used complex wavelet transformation technique based on wavelet tree. This method provides good pre processing and exact segmentation of image. They applied this method on widely used dataset of CASIA. Chun-Wei Tan and Ajay Kumar[14] proposes a unique approach for feature extraction from iris images using subsequent processes for iris image clarity. This method uses a very efficient pre processing technique which can perform better in noisy environment also. They proposed the use of this method for input iris images

which are captured in presence of noise. Another author proposes the use of fast Fourier transform and for iris feature extraction and pre processing. A unique iris comparison method has been proposed by Jain et al [15] which use the Hough transform and DWT for feature extraction and matching. Here, Fourier transform is used to perform pre processing on iris image and Hough transform is used to perform perfect segmentation and feature extraction of iris image.

Puhanet. al. [16] has proposed the use of binary maps. The binary maps are generated from into gray or color iris images after performing segmentation. the binary maps are very useful in order to reduce the recognition time and also needs less memory. They proposes the use of hough transformation for iris localization and to perfectly identify the circular ring of iris.

## III. METHODOLOGY

A general iris detection and recognition system which is adopted in various researches can be comprised in following steps:

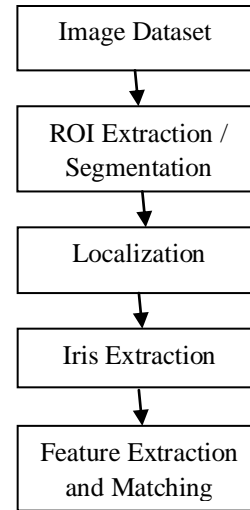


Figure2: Iris Detection Methodology

**A. Image Dataset:** Input image can also be taken directly from any input device like camera or any integrated device, but most of researchers used online verified datasets like CASIA, UCI dataset and datasets online shared by various universities and IITS like IIT Delhi etc. Some other freely available datasets are MMU, Bath, UPOL, and UBIRIS [11,12, 13].

**B. ROI Extraction and Segmentation:** various segmentation techniques are used to get the perfect region of interest. Perfect RIO extraction places a very important role in detection of iris because accuracy of sub sequent steps depends on the ROI region. When

Hough transform applied to extract the segmented region, then we need noise removal filters also because Hough transform could not perform well in presence of noise. Liu et al. [17] use the thresholding technique to separate the region of interest, they used soft thresholding technique for segmentation. Li et al. [18] proposed the use of Adaboost method to perfect detection of boundaries of eye and also boundary of iris pattern, they got good results as compare to thresholding approaches. Uhi and Wild [19] use weighted adaptive Hough transforms in place of tradition Hough transform in order to increase the localization accuracy. He et al. [20] use some pre processing filters and histogram equalization based approaches for noise removal. Liu et al. [21] presented an hybrid model based on integro-differential parabolic arc operator and a RANSAC-like algorithm for eyelid detection.

**C. Iris Localization:**Hough transform is most widely used algorithm for perfectly identifies the boundaries of iris. Finally, circular Hough transform was proposed by many other authors in order to increase the localization accuracy. Circular Hough transform has very complex steps and heavy computations. Computations in Hough transform, done in three steps first, random point (x,y) identifies within the image then it identifies every possible circle going through points (x,y) and new matrix of (a,b,r) is created, where a and b are the coordinates of the center of the circle, and r is radius of the circle[28]. Problem of mis-localization may occur because of eyebrows, eyelashes, spaces or due to low contrast, so it is very necessary to remove such effects to get the perfect segmentation.to perform this task Hough transform is used which can classify the regions into separate clusters like iris, skin region, eye brow etc. this clustering techniques generally uses 8 neighbor method which is proposed by various authors in their work[29]. To perform clustering k means clustering may be applied or fuzzy based clustering may also used for separating the similar portion of eye images. Elements inside a cluster should include similar properties, like eye lashes may be separated by using intensity of pixels present in eye lashes. The pixel intensity in pupil region may have very low intensity because its color will be near to black always. The region havng skin part may also be cluster easily because intensities in such region will be higher than the pupil region and lower then the iris region. Similarly, color of iris region is nearby white, so high intensity pixels may grouped together to make a cluster of iris region. [30].

**D. Iris Extraction:**iris is the portion between pupil and outer layer of human eye. So, to extract iris portion we need to subtract the pupil from input image and we need to remove the outer layer information by using

segmentation and localization techniques.Pupil is the inner most circle in eye image and next outer circle contains iris patterns, whereas the outer most circle contains the segmented eye image. To get the iris from segmented image we need to subtract the pupil circle from input image.

**E. Feature Extraction and Matching:**Ma et al. [22] proposed the use of spatial filters for feature extraction. Noh et al. [23] used wavelet based Haar transform for feature extraction fro iris image. In [24], DCT method is used to extract texture features from iris image, on comparing the performance of this method they found that the performance is better than Gabor filters. Sun and Tan [25] propose a the use of texture, color and shape features to recognize the iris patterns, texture feature to generate relationship between pixels, whereas color features supports the intensity of iris pattern. Some of the author proposed the use of gobor filter for feature extraction. Then discrete wavelet transform is used to get decomposed image for segmentation [26]. Discrete Cosine Transform (DCT) generates a rectangular window to separate the iris images and then to normalize the image patches of 8x12are created for feature extraction. To remove the effect of noise Hamming window is applied by various authors[27].

#### IV. CONCLUSION

While surveying lots of research papers we come to know that the iris detection and recognition required collection of algorithms, at first step we can take the universal datasets which are freely available online for experiments, the most common dataset used by various researchers is CASIA and for Indian the most commonly used dataset is released by IIT Delhi. For segmentation purpose we suggest the use of canny edge detection with global thresholding. Then for localization purpose circular Hough transform method was found suitable and at the last stage texture and wavelet based features are found good for recognition purpose. The new researchers can perform the basic experiments using these steps to validate their findings.

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