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A Review on Iris Recognition Techniques

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Abstract - Identify and verify the features of Iris is basically a method of extracting biometric graphical patterns over the images of irises of human's eyes that contains complex patterns which are unique, stable. Iris is the most chosen method of biometric in comparison to the other available methods due to its features that have exclusivity, constancy. Nevertheless, tainted pictures of iris confined under less-constrained acquisition setups. Previously developed systems are often based on deprived edge recognition approaches and filters. The majority of techniques employed basic algorithms available for the operations needs to take place for the recognition of Iris. Distinctive actions executed to identify an iris are the methods of segmentation, normalization, feature extraction and matching. Canny Edge detection, Hough Transform, Gabor Filter, Daugman's operator are some frequently used techniques in the field of Iris recognition. There are few limitations as complex computational approach, lack of accuracy for complex noisy image, obstructions due to lens, eye lashes and reflection examined in the prior work done. So, a system is required which can efficiently recognize the Iris with zero false rates and secure the crucial applications. This paper reviews previously proposed systems that employed with various feature recognition techniques where precision level is distinct.

Keywords - Iris Recognition, Biometric, Canny Edge Detection, Gabor Filter, Daugman's Operator.

I. INTRODUCTION

Technique of Iris identification consists of different phases for accurate recognition, which contains the approach of image acquisition. The technique also considered the factors likes light wavelength, reflection of light from the iris base and various other aspects. After that Preprocessing is the stage of recognition in which boundaries and other parts of an eye are taken into consideration with enhanced image quality. Image segmentation which includes the analysis of background texture, image normalization is used to change the intensity value of pixels obtained from an image.

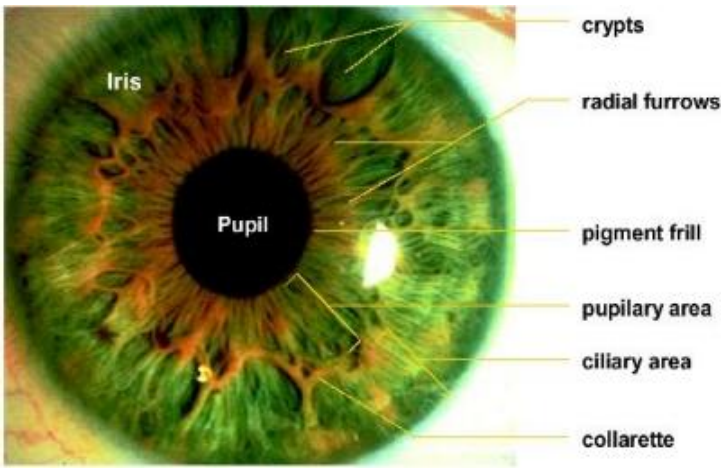


Figure 1.1: Features of Eye [10]

Feature extraction is taken as a crucial stage of recognition, as it extracts the vectors of those areas of the picture which is taken under consideration. Final stage is matching where the acquired data in the form of coding from previous stage is matched up with the accessible information stock up in the database to accomplish the recognition process. Algorithms in various forms have been developed to execute those operations of localization, preprocessing, normalization, feature extraction and matching. Some of the acknowledged methods which were extensively employed are canny edge detector, Circular Hough transform, Daugman's Integro-differential operator and so on.

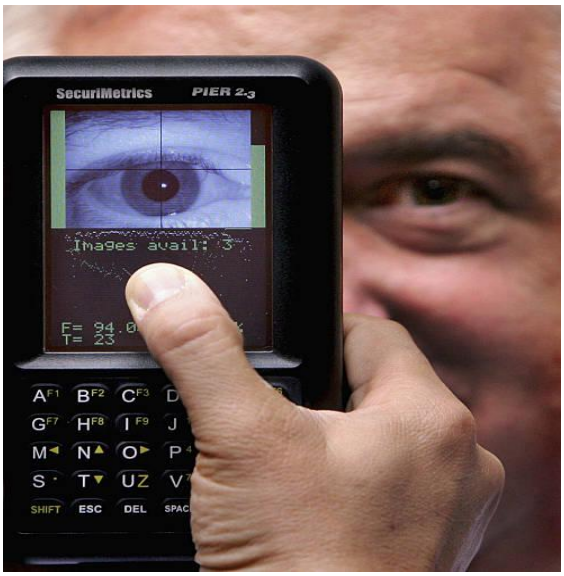


Figure 1.2: Iris Authentication Scanner [11]

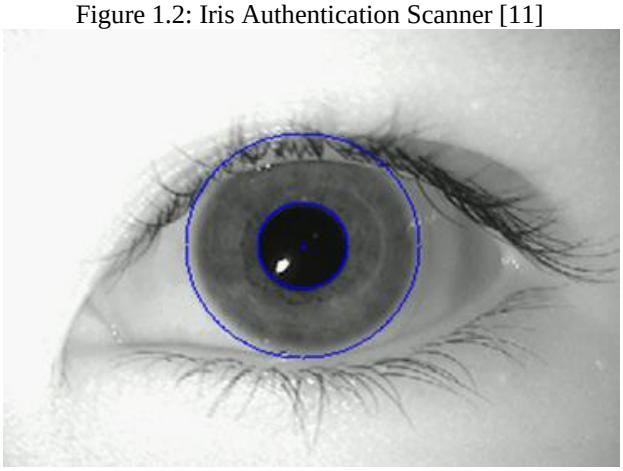


Figure 1.3: Segmentation of Iris [12]

There are various stages of iris recognition and storing as template for future matching i.e. image acquisition, image preprocessing, image segmentation, normalization, iris feature extraction, classification. Several researches took place which extracts those approaches with some internal modification to develop an ideal system but for the implementation on wide applications, some flaws limit those systems.

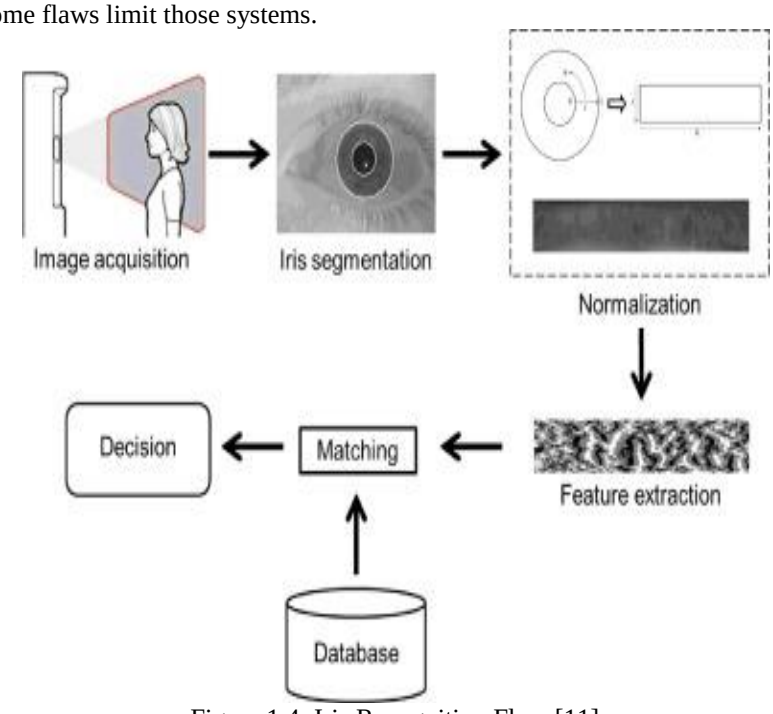


Figure 1.4: Iris Recognition Flow [11]

II. LITERATURE SURVEY

Fabián Rolando Jiménez López et al. developed a system for iris recognition that elaborates the segmentation and normalization module. Here the Implementation of segmentation algorithm accomplished by utilizing Gabor filter is a linear filter basically employed for texture analysis where as Hough transform is an approach employed to segregate the aspects extracted from an image. Increment in the quantity of cells will consume memory. The outcome of the system stated as- deviation in intensity among the area of iris and pupil, utilized the algorithm for edge detection doesn't construct dexterous detection that enhances the rate of error. Though the overall system is very comprehensive and not adequate for actual time execution as the result of realized method may fluctuates. If a system has even 0.1 of false acceptance rate then the overall system goes failure and security or authenticity has been broken down that does not possess ideal system.

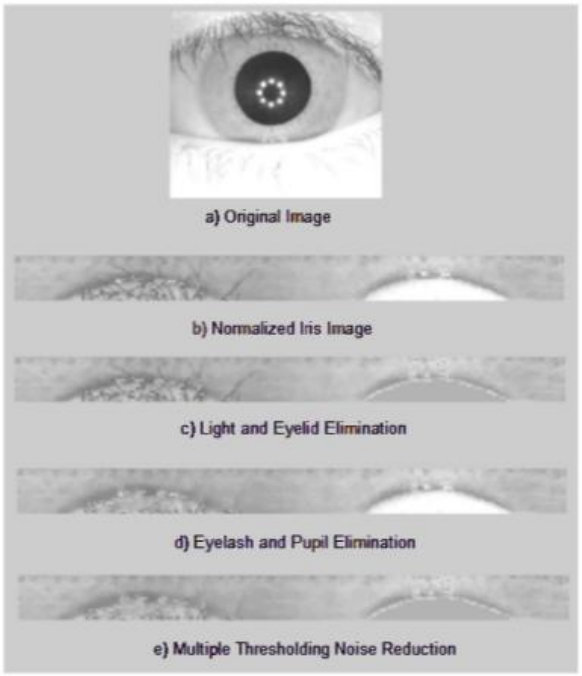


Figure 2.1: illustration of given noise reduction method [2]

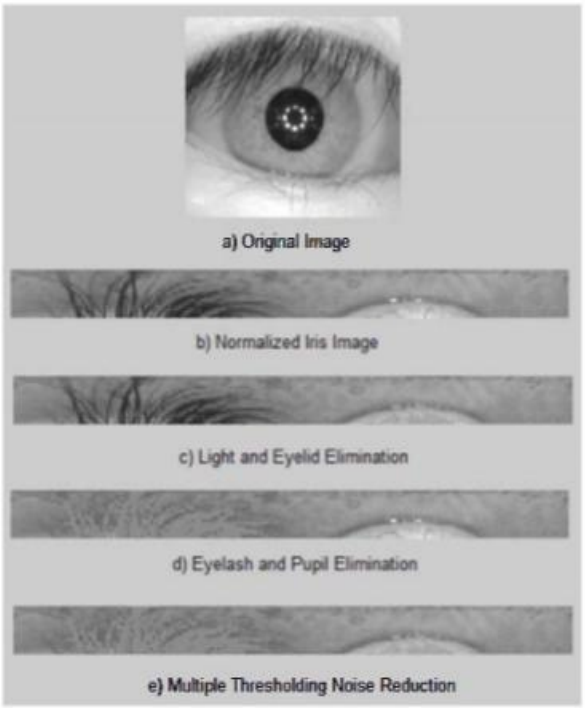
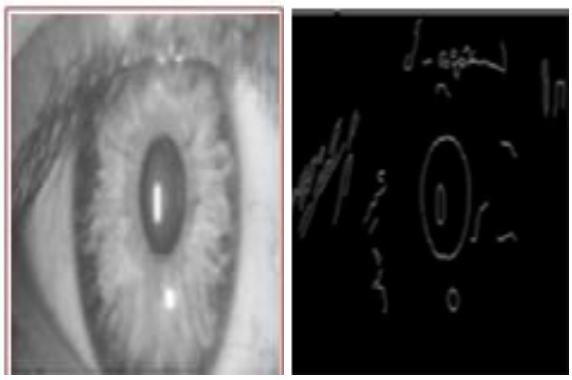


Figure 2.2: illustration of an iris image tainted with strong eyelash pixels [2]

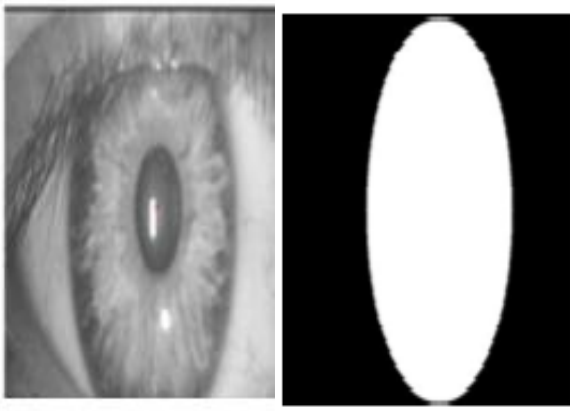
P.Thirumuruga et al. proposed a system which is relied on fusion technique i.e. Canny Edge detection algorithm along with Hough transforms. Hough transform employed for feature extraction that is generally exploited in analysis of images, digital image processing and computer vision approaches. Moreover wavelet transformation method used to

extract the cognitive patterns of an eye for iris features. Hamming distance method is helpful for comparing two irises. The technique which has been involved for feature extraction are two different mechanisms i.e. prepositioning of image and matching which is further executed on the platform of MATLAB. While considering usual image, Result showed an effective detection of the edges and removed background of the iris but noisy iris images may vary the result as the intensity contrast of eyelids can be less. Use of wavelet transform diminishes the rate of false rejection however the rate of false acceptance is unaffected which can fails the whole system of recognition.



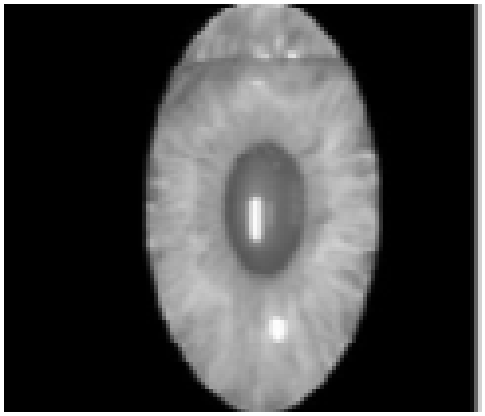
(a) (b)

Figure 2.3: a) Considered Image, b) Edge Detection [3]



(c) (d)

Figure 2.4: c) Hough Circle, d) Background Removal [3]



(e)

Figure 2.5: e) Iris Detection [3]

Navjot Kaur et al. proposed a survey on previously implemented algorithms and various methods which have been formed by other examiners used for iris identification system. Further the author discussed the stages engaged in iris recognition. Steps required, recognizing an iris is shown in fig. 2.6. There are different algorithm exists for the segmentation of image like Canny Edge detector, Circular Hough transform etc. Canny edge detector is basically utilized to situate the rim of an iris while Hough transform is utilized to set up the boundary of an iris.

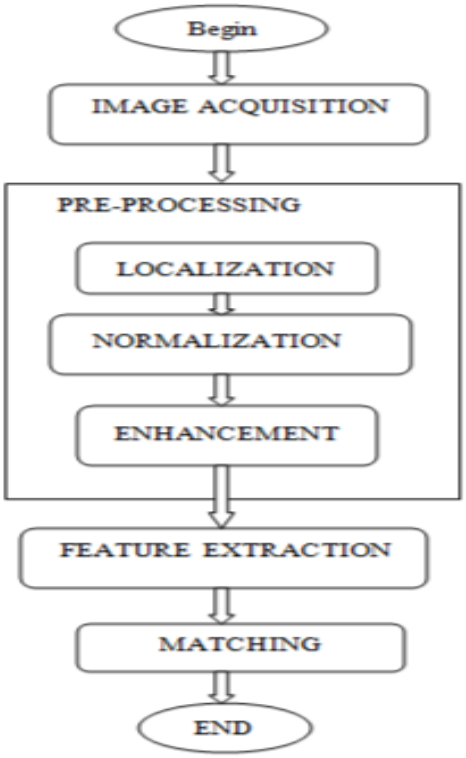


Fig. 2.6: Phases of Iris Detection System [4]

Amena Khatun, A. K. M. Fazlul Haque et al. proposed a technique to manage attendance by employing iris recognition; it requires identifying a student using that feature. System exploited both execution of hardware and software. Implementation of proposed method took place by capturing images using webcam and processes it in MATLAB to extract their feature and further compare it with the existing images stored in the database. The technique which has been used in the system has many flaws and limitations for practical implementation. Use of web cam in the system, which is just a VGA camera, is not capable to capture high definition images. Iris recognition requires high precision rate, so the extraction and comparison may proceed with true rate of recognition.

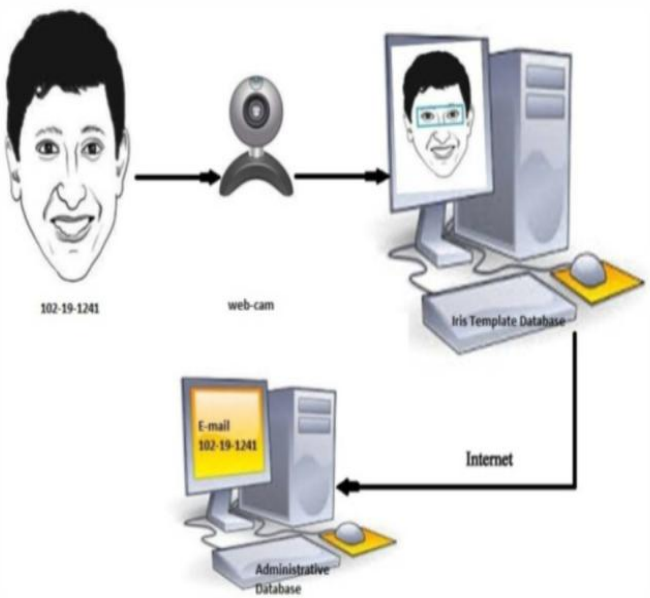


Figure 2.7: Developed System of Attendance Management [5]

Mateusz Trokielewicz et al. proposed a paper, which maintains a database for iris captured images from mobile cameras in the presence of proper luminance. The outcome is relied on given methods such as IriCore, VeriEye, MIRLIN and OSIRIS. Surveillance executed in four diverse criteria that are taken into account. Following to preprocessing the acquired iris image, it is able to represent the real texture of iris. The second stage of this system is an enrollment that having independent data inputs. Third phase is template matching and the genuine match rates of the system is 94.5%. At the end, trial reveals that segmentation of image should be proper; otherwise it may reduce the accuracy of recognition.

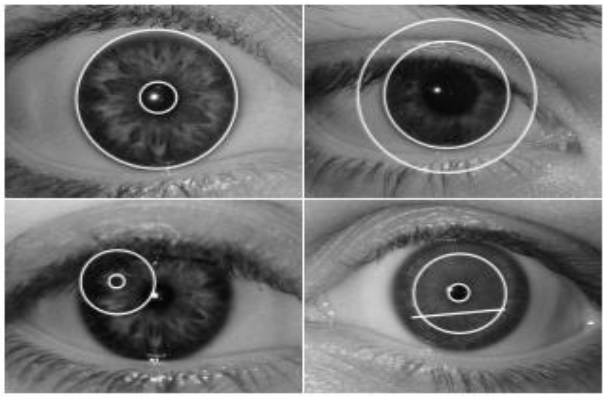


Figure 2.8: Results of the Iris Localization performed by MIRLIN algorithm.

Sarika B Solanke et al. proposed a summary for previously proposed systems that was relied on the characteristics of Iris identification methods. This paper emphasized on segmentation process which is used to locate the area of iris and plays a vital job in the detection process of iris. Various techniques have developed for the segmentation proposes, proposed paper assessed those methods. This paper surveyed various methods such as cascaded classifiers, wavelength band selection, indexing algorithm, approach of occlusion estimation etc and concluded by presenting an approach that is able to extract the iris features from both eyes and merge them to make it more proficient. However utilization of both irises for identification enhances computational intricacy and storage of information in terms of data could amend the result.

Jagadeesh N. et al. proposed an algorithm for processing iris recognition. The work which has been projected in this paper is to highlight the segmentation method by using GUI. System is based on UPOL database basically for image acquisition and also able to access those images from that database. Recognition ethics is based on various approaches such as Pre-Processing, Segmentation, Gaussian Filter, Canny Edge Detection, Finding the intensity gradient of the image. Though the system utilized the preset algorithm that can restricts the realistic accomplishment of system as slight illumination can affect the exactness of iris scanner and also utilized the visualized form of iris which is occluded due to eyelashes that could block the extraction.

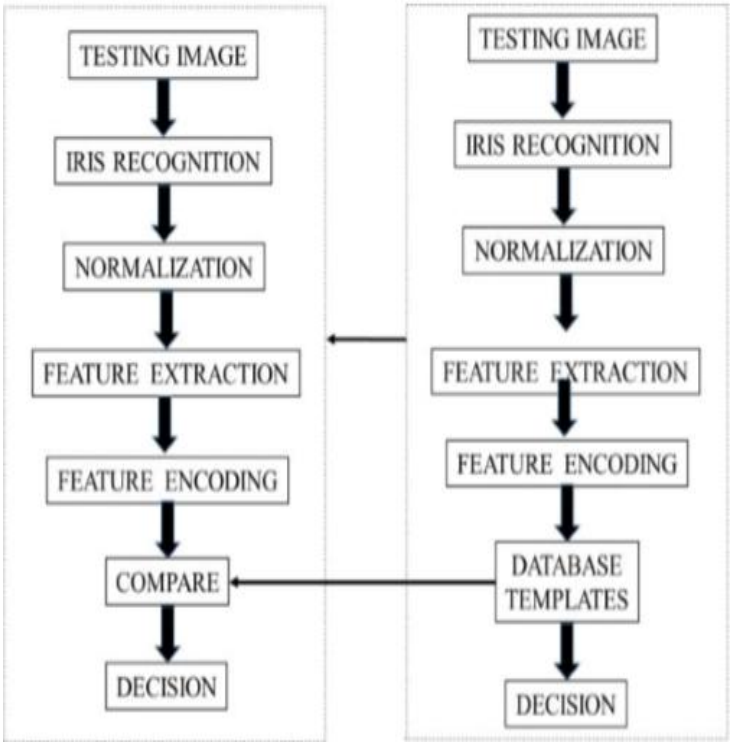


Figure 2.9: Flow Chart of Iris Recognition[8]

III. PROBLEM STATEMENT

Base paper developed a system which is relied on Canny Edge Detection and Gaussian Filter for the process of recognition. Though the approach that has been proposed in the paper utilized the predetermined algorithm confine the practical accomplishment of system as slight illumination can affect the precision of iris scanner and visualization of iris obstructed by eyelashes could obstruct the specific extraction. Since, the implementation of Canny Edge Detection is not suitable for sensitive pattern extraction that Iris belongs. In the base paper, Feature Extraction process is utilized by Edge Detection approach. Implementation of this technique affects the overall preciseness due to poor light exposure.

Accuracy also affects, if area of iris is obscured by eyelashes, lenses, reflections. If the captured image is of poor quality, it influences the result. Since, Gaussian filter has been used by several researchers but do not meet desirable accuracy.

IV. PROPOSED WORK

System proposes iris recognition or authentication system using Sobel Edge Detection for the extraction of iris features. Proposed technique also confirms that the figurative illustration successfully manages noise and degradations, together with low resolution, specular reflection, and occlusion of eyelids present in the eye images and utilizes least amount of aspects to represent iris image. Here the proposed system provides better security outcomes with precise feature extraction.

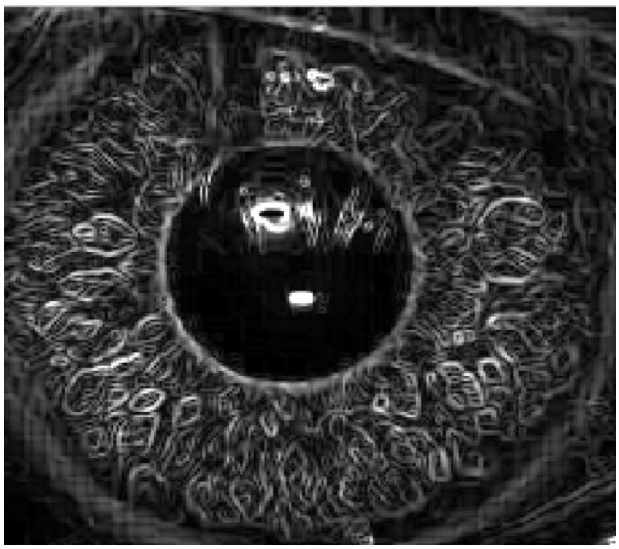


Figure 3.1: Sobel Edge Detection of Iris

V. CONCLUSION & FUTURE SCOPE

As per the review of earlier proposed systems there are following researches have been made over iris recognition for better precision rate. Most of the techniques used basic algorithms available for the operations needs to take place for the recognition of Iris. Generally the operations performed for recognizing an iris are segmentation, normalization, feature extraction and matching. Canny Edge detection, Hough Transform, Gabor Filter, Daugman's operator are some frequently used technique in the proposed systems. Though the techniques which have been proposed having few limitations as complex computational approach, lack of accuracy for complex noisy image, obstructions due to lens, eye lashes and reflection. So, a system is required which can efficiently recognize the Iris with zero false rates and secure the crucial applications.

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