International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Iris Localization: A Biometric Approach of Feature Recognition

Amol M. Patil[1], D. S. Patil [2]

[1]Electronics and Communication Department, North Maharashtra University

[2]Assistant Professor, North Maharashtra University

Abstract: ***Now a day's iris localization method is very powerfully used in all the iris recognition. There are many methods which can be used for iris localization. Such feature based method and object based method. There are many feature based methods invented by Daugman's. These all methods deal with feature extraction of iris. These methods are very commonly used in all the major security areas, in medical field. This paper contains information regarding feature extraction method of iris and new iris center(IC) localization method. In this paper we are proposing some new technique of Iris center localization. Paper is discussed in such a way that starts with introduction, then some previous method comparison, new technique of IC localization and then finally results and conclusions.***

Keywords: Integro differential operator, Feature based method; Model based methods, Iris Center(IC)

1. Introduction

In day to day life security of any system plays an important role in everybody's life. There are multiple systems that can be controlled and computed by the human body objects. Such body objects can be used to identify or only the genuine parts which cannot be easily copied by any other. So that biometric methods are widely used in everybody life. There are multiple systems such as fingerprint authentication, Heart beat identification and recognition, Palm recognition, iris or retina scan. By using all such methods of identification anyone can secure his life or his very personal or important things. There are latest mobile communication technologies which uses human eye as input password without that input mobile can't even open the lock.

This paper also gives the brief study of such systems, so that we can use eyeball or eyelashes as a input and through that we can control the movement of any part in computer system. In this method we propose the technique which helps all persons in future to control a machine using human machine interface just by rotating an eyeballs.

It is really mandatory to all persons to secure their data using such techniques. One can make a password through such movements and access his or her lockers in bank or email which can be really helpful to all persons. Now a day's hackers are hacking your mailboxes which are rally harmful to you. May be sometimes your important data may be lost. So that to avoid such a losses a biometrics is the best suitable media which cannot be robbed by anybody. This can also reduces the chances of dummy things. There are multiple methods of iris recognition & localization of eyeballs. My base paper also explains some of the techniques feature based method by Valenti & Gerves. In feature based method isophote properties are used Isophote property. Explain about curves connecting to equal intensity points of iris. These equal intensity points are used to locate the iris center.

2. Previous Methods Comparison

Iris localization methods are broadly divided into two categories 1. Feature based method, 2. Model based method. First we discuss feature based method. Feature based method used by Valenti and Gerves [2], they have used isophote property of feature detection. But drawback of that system is, it can also detect eyebrows with the iris center. Another feature based method proposed by Wang et al [3] and Zhang et al [4] exploit the fact that the shape of the iris contour projected onto an image plane is an ellipse. In this method among the all the edges of iris extracted from the input eye image two longest vertical edges are selected and used for ellipse fitting to find IC.

The model based methods are also popularly used for estimating the location of eye. The model based method by Moriyama et al [5] which uses minutely subdivided eye region templates can extract the components of the eye accurately. Daugman's method uses an integro-differential operator (IDO) which calculates the curve integral of gradient magnitudes under the target shape mode in order to extract the circular shaped IB in the eye image. But the entire above mentioned model based method have drawback that the parameter of model need to be iteratively or manually adjusted. That is really inappropriate for the practical applications.

In this paper we propose a new IC localization method which not only locate the center of iris but also control the machine through movement of eye. This technique is also called as Gaze tracking. This method is mainly divided into following subparts. To process on any image we first have to look in image acquisition. After acquiring an image we can make some part of that image such as binarization or convert that analog image into some digital coordinates that is known as image preprocessing. After preprocessing of iris image, actual IC localization and Gaze tracking part has been carried out. Figure [1] gives information to know more about Iris center localization.

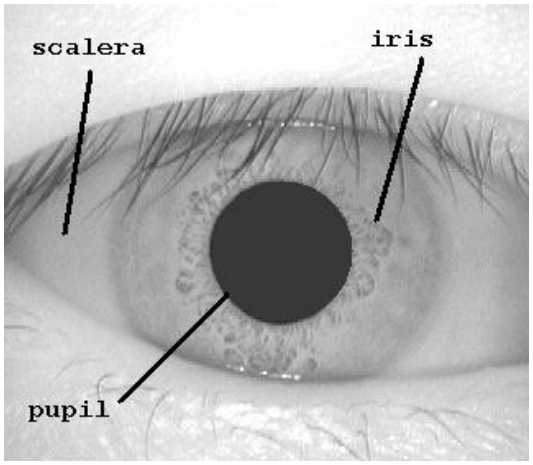


Figure 1: Image of an eye

Above figure shows image of an eye which shows the different parts of eye such as iris, pupil and scalera. We will discuss more about the gaze tracking system in next part. That part provides the detailed information about new technique of IC localization and gaze tracking system.

3. New Technique of IC Localization

Now we discuss the IC localization techniques in detail. This topic is first start with Image acquisition then image preprocessing and then localization and gaze tracking. Use of movement of an eye gaze tracking will be done.

3.1 Image Acquisition

This step is very important in all system, because all the image preprocessing, iris center localization and tracking part is totally depends on this. In our proposed method we are using the web camera of laptop to acquire the image of iris. We can also use any camera, but for that some configuration change has to be done before preprocessing of an image. So after capturing image our system starts to store all the image parameters. In this way image acquisition part is completed. Figure 2 shows the snapshot of that image acquisition process.

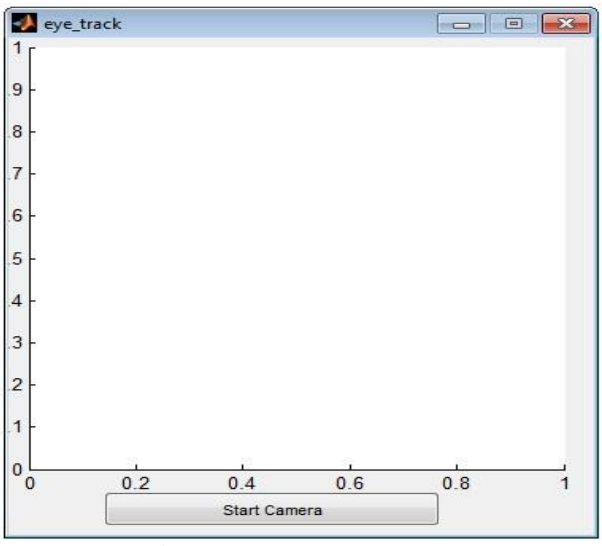
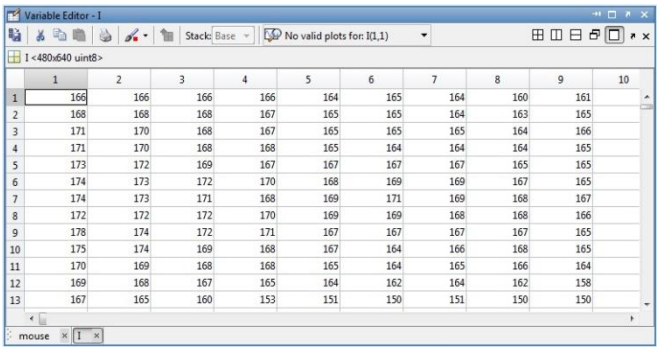


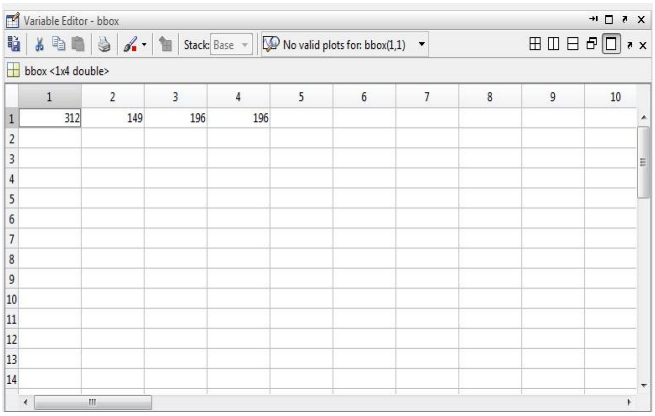
Figure 2: Image Acquisition

In figure we can see that two coordinate graph. In above graph position of gaze tracking using eyeball is projected. According to movement of eye mouse pointer is move. After acquisition of image by clicking on start camera the next part is started.

3.2 Image Preprocessing

In image preprocessing part actual image is stored and binarization of image has been prepared. Figure 3 shows acquired image and processed on binary image. The variables in binarization process are stored. Figure 4 shows the stored variables.





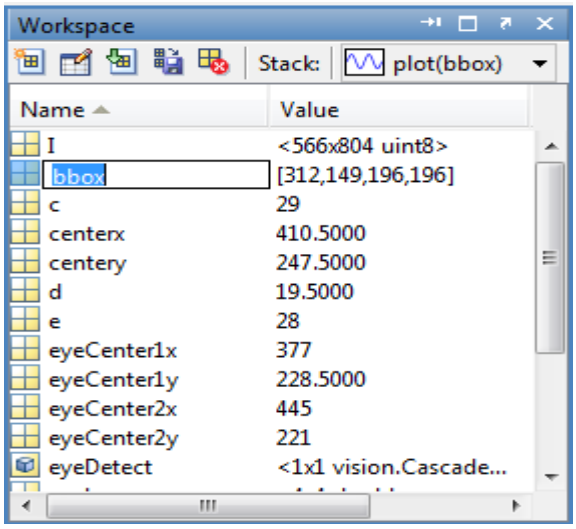


Figure 4: Stored Variables

3.3 Iris center localization and Gaze tracking

In this section actual gaze tracking and Iris center localization has been done. After binarization and storing of

variables iris center is calculated using bounding box values. To calculate bounding box values step function is required. Using step function bounding box values are calculated. To find out the exact iris center there is a function cascade object detector (), this function gives values of iris when frontal head pose and in non frontal head pose also.

In this cascade object detector () function we can calculate all the values in one array that is mapData. This mapData function contains all the face values such as nose, left eye, right eye coordinates, mouth and profile face. After calculating the bounding box values image is crop through imcrop function. After this function both the eye image is cropped and there x and y coordinates are calculated. After calculation actual position of eyeball is track using gaze tracking. Then these coordinates are plot on to the 2D plane using markersize function. Following figure 5 shows the actual 2D plane.

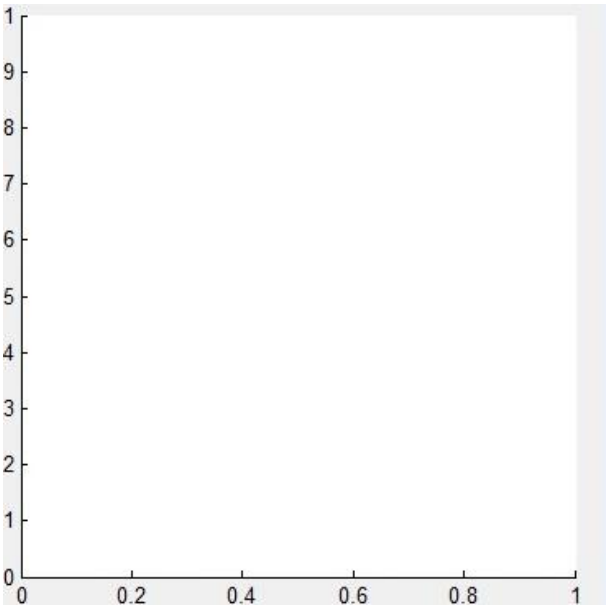


Figure 5: 2D plane

On this 2D plane actual position of eye is track and shows that position using pointer. After this actual image and iris center localized images are shown as a result. Figure 6 shows the actual iris center localized images. These figures show both frontal and non frontal pose iris center localization. While changing the head pose randomly exact iris center is localized.

Figure 6: Actual Iris Center localized images

4. Algorithm

In the following way Iris localization and gaze tracking is done. Following algorithm is the short description of all above process.

1. Start
2. Image acquisition process
3. Acquired image is stored in variables.
4. Convert this stored image into numbers.
5. Process the image.
6. Calculate all coordinates in frontal and non frontal head pose.
7. Locate iris center.
8. Plot gaze tracking on 2D plane.

After this process we will see the previous as well as new results obtained.

Following topic discuss all the results obtained in previous method and the new technique.

5. Results

Figure 7 shows the previous results obtained using feature based and model based methods. We can very clearly observe that in non frontal pose iris center is not localized in proper way.

Figure 7: Results in previous methods

Figure 8 shows the results of our proposed method. These obtained results are more accurate and precise as compare to our previous methods. In these results we can see that exact iris center is localized. We can observe that in non frontal, frontal head pose and even head position was slightly tilted exact iris center is localized. We can also observe that camera program does not affect with specs used by the user.

By using specs also iris center is localized properly. The various results taken at various positions are shown in figure 8.

So as the more accurate results are obtained, this method is working in good condition. Also the red eye reduction technique is implemented in this proposed method. So we cannot observe the camera red eye effect. Clear image is observed in the results.

Figure 8: Results for proposed method

6. Conclusion

From the above discussion we can easily say that our proposed method is working in proper way. We can easily identify the differences between two methods. We try vigorously to eliminate the drawbacks of previous feature based and model based methods and achieved a good results. This is the final conclusion of this paper. Some future modifications can be done in this system such as increase the camera capability and enhance the image quality.

References

[1] Seung-Jin Back, Kang-A Choi, Young-Hyun Kim, "Eyeball Model-based iris center localization for visible image based Eye-Gaze Tracking System."
[2] R. Valenti, N Sebe and T. Gerves, "Combining Head pose and eye location information for gaze estimation." IEEE Trans Image Process Vol.21, No. 2
[3] J-G Wang "Estimating the eye gaze from one eye."
[4] W. Zhang "Eye gaze estimation from the elliptical features of iris."
[5] J. Daugman's "How iris recognition works." IEEE trans. Vol. 14 no.1.

Author Profile

Amol Madhukar Patil received degree of B.E Electronics from North Maharashtra University, Jalgaon with First Class and Distinction in 2010. Currently pursuing Masters degree in Electronics and Communication from North Maharashtra University.

Asst. Professor D.S.Patil Currently working as Asst. Professor at North Maharashtra University in Electronics Department.