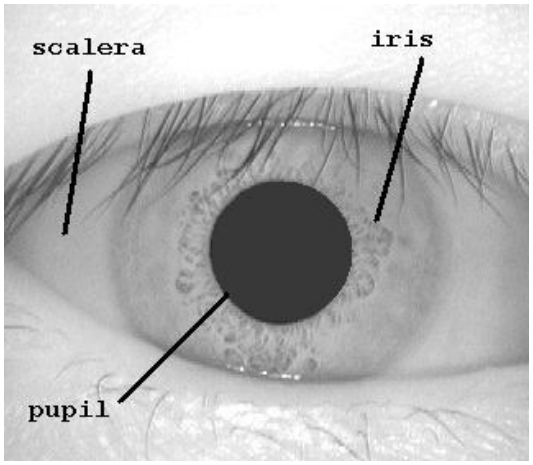



**Figure 1:** Image of an eye

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.

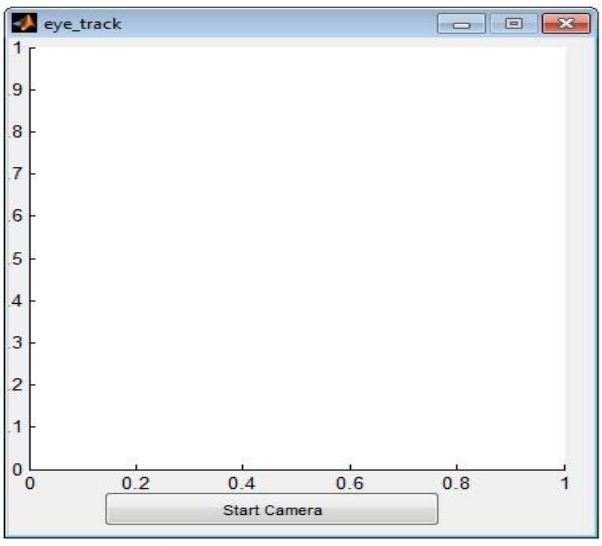
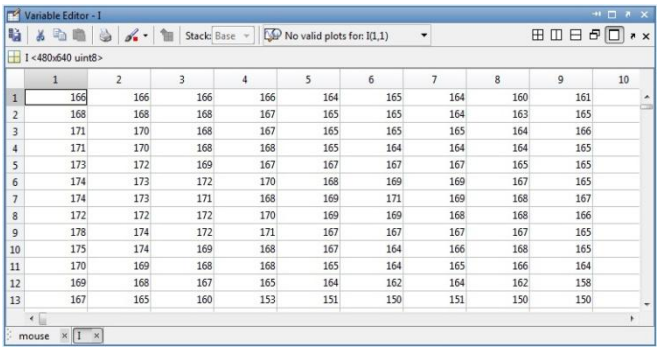


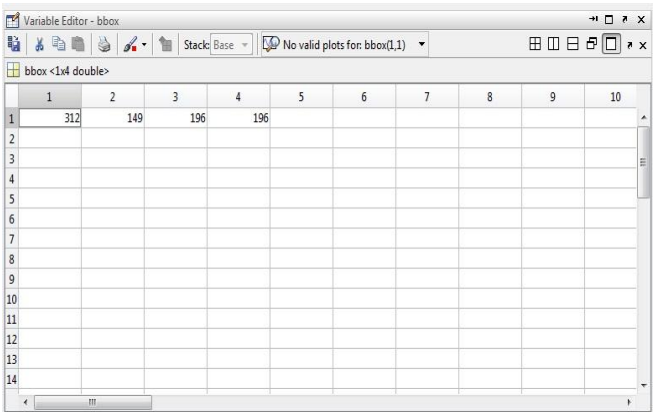

**Figure 2:** Image Acquisition

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.



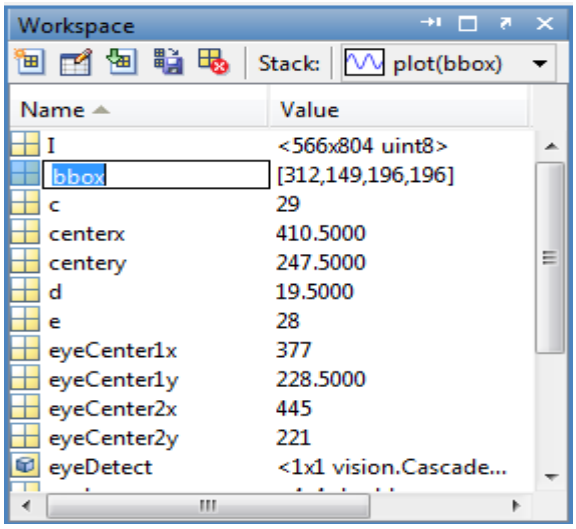




**Figure 4:** Stored Variables

### 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.

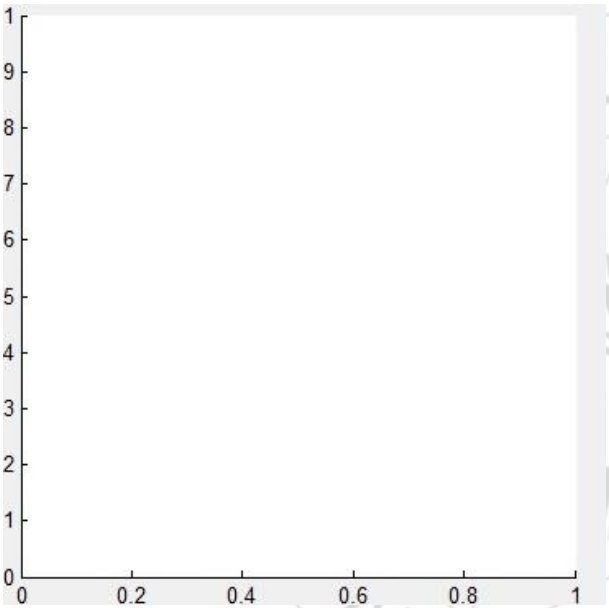



**Figure 5:** 2D plane

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.

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## Author Profile

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