

# Controlling Computer System using Eye Movement

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**Abstract-** In this paper, a human computer interface using eye movement is introduced. This eye tracking technique provide hand free access to the handicapped people. In this technique we use eyes instead of input devices. This system tracks the users eye movement with a camera mounted over user's face and translate them into the movement of mouse cursor on screen and also detect user's eye staring on icon and translate it into click operation on screen.

**Keywords:** Gaze, Haar Features, Object detection, Voila Jones.

## I. INTRODUCTION

Now a days human being need more efficient and quick results of anything which they are doing. As technologies are developing day to day the results get more quickly. The computers which have been used by us can be improved and can give us more efficient result by replacing mouse by eyes. Here what we are doing is that using eyes gaze as a cursor of the mouse by using eye detection and tracking. In this we are using webcam to record the videos. These videos will be then converted into gray scale format which will help us to detect and track the eyes. After tracking we will perform some operations such as click, double click, right click, left click etc. This will save our time by doing tasks rapidly as compare to mouse. This will also be helpful to those people are handicapped and not able to use computer are now will able to use it.

## II. LITERATURE REVIEW

There are many research done on this topics many of them are having certain drawbacks. Here are some algorithms and techniques used in researches done previously.

**A. Limbus Tracking:** Limbus tracking is the Technique used to detect the eye using limbus. The boundary between the eye sclera and the iris is called as limbus. As the iris is darker and sclera is white it is very easy to detect the boundary. This technique is based on the position and shape of the limbus. So we should place our head quite at one place or attach the apparatus to the head. So that it can detect limbus. This technique need very much time to detect the limbus [1].

**B. Pupil Tracking:** In pupil tracking the use of infrared light is needed. In this the gaze of eye is detected using the bright spot on the eye such as when we click the photo the red eye is formed when the flash is on. Here also they were using the infrared light to form the spot on the eye. There is low contrast between the pupil and iris which makes too difficult to detect the border [1].

**C. Electrooculography (EOG) Technique:** In this technique the mouse is controlled by using retina. It uses signal which helps to control mouse movement. EOG electrodes are place near eye and the head of user which record eye gaze of the user. Here the signal is captured by the electrode sensor then they are amplified and the noise is removed and digitized the signals[2]. In this system, the upper corner and lower corner is not captured by electrodes that why it is not possible to detect them.

**D: Optical Tracker:** In optical tracker it consist of sensor and led light source .In this, the videos are captured and after converting it into frames. The frame is used to captures the eye movement [3]. Here they have to attach sensors to the users face which is totally uncomfortable to the user and it does not work with the real time system.

## III. METHODOLOGY

**PROPOSED ALGORITHM:** Viola-Jones algorithm which is an object detecting algorithm is implemented. It basically works on detecting on Haar features. <sup>[1]</sup>Haar features such as properties common to human faces: The eye region is darker than the upper-cheeks. The nose bridge region is brighter than the eyes. The algorithm has four stages:

1. Haar Feature Selection
2. <sup>[1]</sup>Creating an Integral Image
3. Data trained by adaboost algorithm
4. Cascading Classifiers

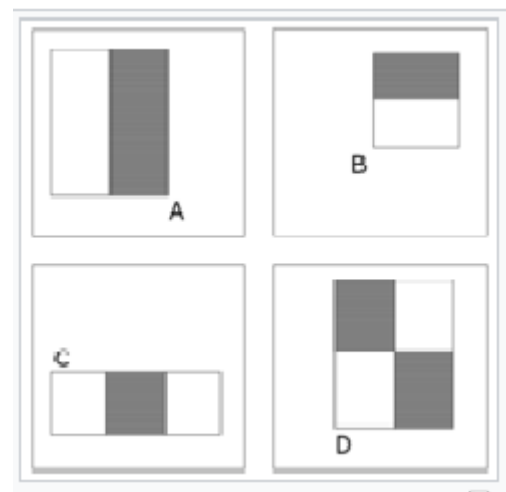


Figure 3.1: Haar Feature

A complete procedure is presented that moves the mouse from one place to another on desktop through user's eyes movement. Before the processing for the movement of mouse begins, detailed processing is presented below:

1. Camera receives the input videos from the eye.
2. After receiving these streaming videos from the cameras, it will break into frames.
3. The captured frames that are already in RGB mode are converted into Black 'n' White.
4. Images (frames) from the input source focusing the eye are analyzed for Eye detection (Corner of eye).
5. After this, eye point is calculated.
6. Finally the mouse will move from one position to another on the screen

The features of Rectangle shape are as follows:

- <sup>[1]</sup>Value =  $\Sigma$  (pixels in black area) -  $\Sigma$  (pixels in white area).
- <sup>[1]</sup>Three types: two-, three-, four-rectangles, Viola & Jones used two-rectangle features.
- <sup>[1]</sup>For example: the difference in brightness between the white & black rectangles over a specific area.

#### IV. DESIGN AND IMPLEMENTATION

The proposed system which will accomplish our objectives for projects are defined in those below stages of figure system flow.

**A. User Interface:** User Interface is the starting point of the application. In this there will be two buttons:

1. Start
2. Stop

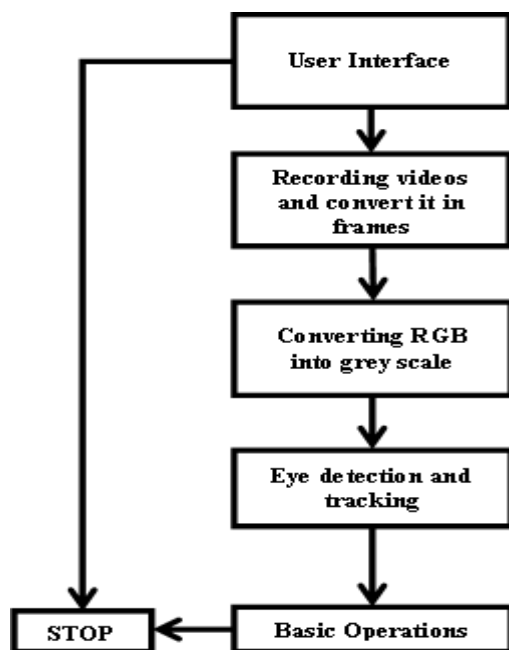


Figure 4.1 : System Flow

**Start:** Whenever the user will click on Start button the next module will open. **Stop:** Stop button will get the user out of the application. There is also another button for general information.

When user will click on the start button the camera will open automatically.

**B. Recording Videos and Convert it in Frames:** Whenever the camera will open it will start recording the video. The videos will record the movement of user. The recorded videos are now converted into number of frames. The frames recorded per second would be 100fpm .

**C. Converting RGB into grey scale:** When the videos are converted into frames they are in RGB format. These frames which are in RGB format now converted into the Grey scale format.

**D. Eye Detection & Tracking:** As, there are only two colors it will easy to detect the users eye. After the conversion of frames into grey-scale the eye will be in white color. Now, the eye detection approaches will be applied on the frames to detect eye. Then the system will detect the eye it will track the movement of the eye.

After these all above steps are done successfully basic function such as moving the cursor would be performed.

#### V.RESULT AND DISCUSSION

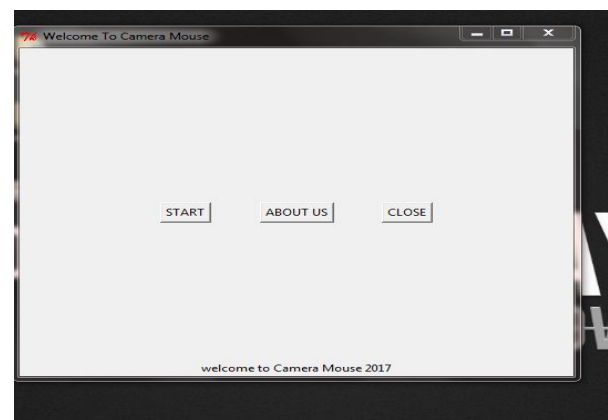


Figure 5.1: User Interface

User Interface is the starting point of the application. In this there are be two buttons:

1. Start
2. Stop

**Start:** Whenever the user will click on Start button the next module will open.

**Stop:** Stop button will get the user out of the application.

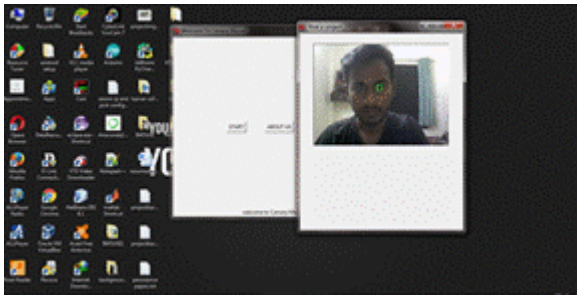


Figure 5.2: Video Streaming

When user will click on the start button the camera will open automatically.

Whenever the camera will open it will start recording the video. The videos will record the movement of user. The recorded videos are now converted into number of frames. When the videos are converted into frames they are in RGB format. These frames which are in RGB format now converted into the Grey scale format. When the system will detect the eye it will track the movement of the eye.

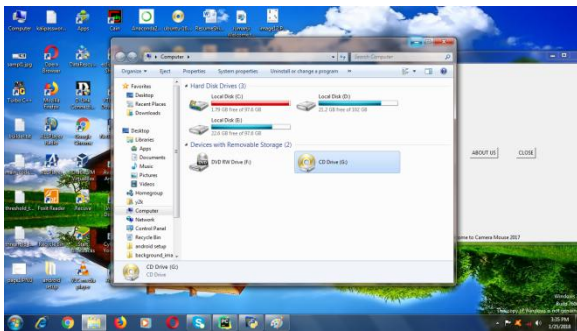


Figure 5.3: Opened Folder

After detecting the eyes it will perform the basic operations. When user will stare on a particular icon it will open the file or folder.

## VI. CONCLUSION AND FUTURE SCOPE

The paper,controlling computer system using eye movements focuses on the development of hands free computing. The study of various movement –based human-computer

interaction techniques are implemented. Mouse cursor is operated by the eye movement here, Viola jones algorithm is used to implement movement of mouse pointer and clicking operations are performed.

The paper presented above has a very wide future scope as the human computer interaction based software can be very useful in the field of modern technology.Various differentscope of this project could be driving cars with the eye movements and operating other digital appliances with the body movements.

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