EYE BALL CURSOR MOVEMENT USING OPENCV

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ABSTRACT

In this study, a specific human computer interaction system using eyeball movement is presented. Conventionally, computer system uses mouse as one of the data input devices. But in this system, we use eyes instead of mouse which provides a unique way of operating the computer with the help of eyeball movements. The implementation work underlying this system for pupil identification uses OPENCV library to control the cursor of the personal computer and moreover Eye Aspect Ratio technique is ascertained along with Dlib to detect the pupil. This system tracks the eye movements of the user with an IP cam (Internet Protocol camera) and simulates the eye movements into mouse cursor movements on screen and also detects user's eye staring on icon and will translate it into click operation on screen. The main aim of this system is to help the user to control the cursor without the use of hands and is of great use especially for the people with disability.

KEYWORDS

Eyeball movement, Mouse, OpenCV, IP Cam (Internet Protocol camera).

INTRODUCTION

Nowadays, computer systems have become a vast part in our day to day survival since they are used in various areas such as at workplace etc.Personal Computers mostly use input method as mouse. But in case of disability or physically handicapped they cannot able to operate computers. In such cases, it might be preferable to use input methods such as eye movements. To enable such input method , a system is designed to control cursor on a computer system without the use of mouse . In the new system, the cursor movement is controlled by the eyeball movement using OpenCV. It has camera which detects the Eyeball movements and based on these eyeball movements the cursor is controlled using OPENCV.

OpenCV is used with processor pace with 1 GB of RAM and in-built Wi-Fi. Camera (IP Camera) is associated with the OpenCV to understand the vision of the machine. The camera will grab the eye movement and controls the cursor. Likewise, it will also perform the activities like scrolling and moving. It has some steps to foolow .They are,

1. IP cam captures the eyeball movements which are processed using OpenCV
2. Eye Aspect ratio (EAR) technique for pupil detection
3. Frames getting started and EAR values being detected based on the eyeball movements.
4. cursor activities are performed

EXISTING SYSTEM

In the existing system the detection of Iris of the eye is done using Matlab and controls the cursor. In matlab it is difficult to predict the Centroid of eye so we go for OpenCV

LIMITATIONS OF EXISTING SYSTEM

1. Less Accuracy.
2. Can't use a regular camera.

PROPOSED SYSTEM

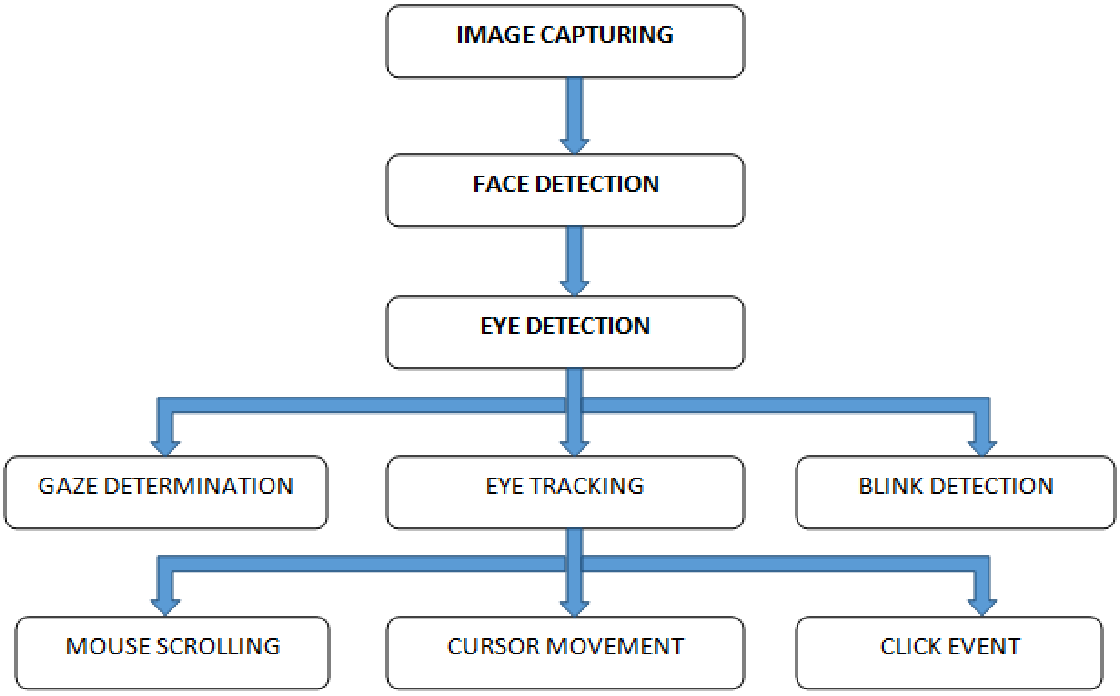
In our proposed system the cursor movement of computer is controlled by eye movement using Open CV.Camera detects the Eye ball movement which can be processed in OpenCV.By this the cursor can be controlled. The user has to sit in front of the display screen of private computer or pc, a specialised video camera established above the screen to study the user's eyes. The laptop constantly analysis the video photo of the attention. To "pick out" any key, the user seems at the key for a exact period of time and to "press" any key, the user just blink the eye.

ADVANTAGES

1. High accuracy.

2. Physically handicapped people can operate computers.

PROPOSED ARCHITECTURE



IMPLEMENTATION

This project is mainly predicting the eyeball movements. At first we need to identify the facial landmarks By the use of landmarks we can easily identify the movements of the eye. We can detect eyeball movements, eye blinks in a video and also predict emotions.Understanding the Dlib's facial landmark finder: Dlib's model, allows us to predict the 68 2D facial landmarks accurately. The 68 facial landmarks picture is shown below.

Fig 1. Picturing the 68 facial landmark positions

Only the eyes are taken into account while determining eye ball motions. The eye is designated by 6 (x, y) coordinates, starting from the far left corner and proceeding clockwise to the right, encompassing the remaining region of the eye, as seen in the image.

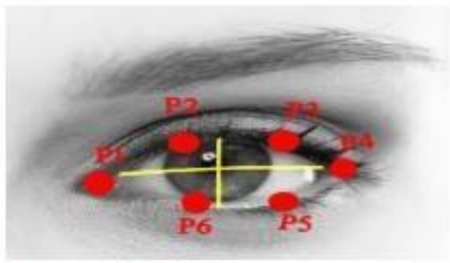


Fig 2. The 6 facial points linked with the eye.

Based on the study work done in real-time Eye Blink Detection utilising Face Landmarks system, an equation can be derived that satisfies the relationship between all 6 facial co-ordinates known as eye aspect ratio and may be computed as follows:

$$\mathrm{EAR} = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

In the equation above, points p1 through p6 are two-dimensional facial landmark positions. The numerator of the equation is substituted with the distance between the eye's vertical points, and the denominator with the distance between the eye's horizontal points. The eye aspect ratio is nearly constant when the eyes are wide open, but it goes to zero when the person blinks.

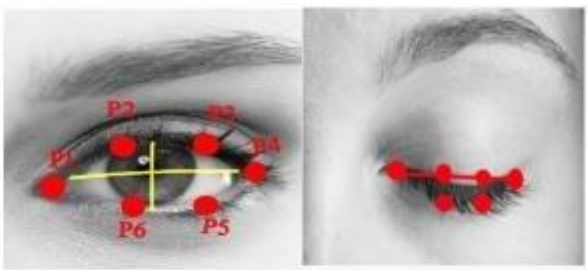


Fig 3. Landmarks of the eye when the eye is fully open (left) and landmarks of the eye when the eye is closed (right)

When the user's eyes are fully open, the eye aspect ratio will be greater and will remain consistent throughout time, as shown in Figure 4. (Left). When a person blinks, the eye aspect ratio drops dramatically and approaches zero.Furthermore, the eye aspect ratio remains constant throughout time and gradually approaches zero. The number then climbs, indicating that the subject has blinked once.

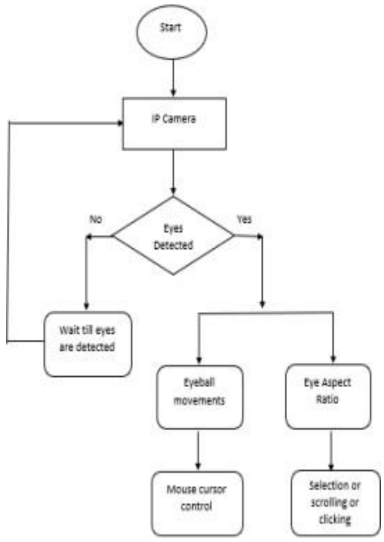


Fig 4. Flowchart of overall process in eyeball movement based cursor control

The flowchart above depicts the overall procedure for controlling a cursor using ocular movement using a Raspberry Pi and OpenCV. The Raspberry Pi is the core aspect of the processing module, which uses an Internet Protocol camera to track facial expression. The camera captures the image after waiting for the eyes to be recognised. OpenCV technology's photo handling method is used to distinguish eyes. The mouse pointer can be controlled based on eyeball movement, and blinking of the eyes is used to calculate the Eye Aspect Ratio (EAR) to execute various actions such as clicking, scrolling, or selecting..

RESULTS AND DISCUSSION

Change the current working directory before starting the Python software, and then launch the Python software by entering the commands in the terminal as shown in Figure 6. We obtain a frame window after typing the commands in the terminal, and the camera starts capturing the face that reads the input. When the user opens their lips, the input begins to be read, and if the user wants to move the cursor upward, the Anchor point should be moved to up.

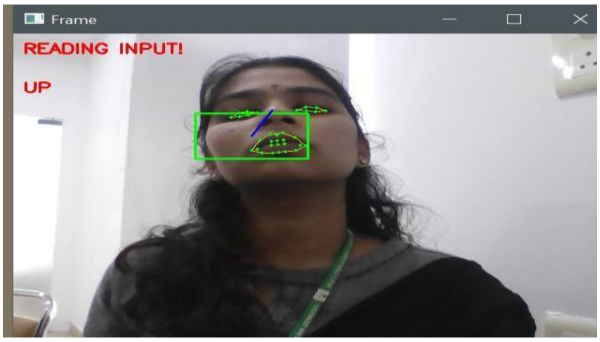


Fig 5. If the user wants to move the cursor towards upward direction then the user should move the Anchor point to up

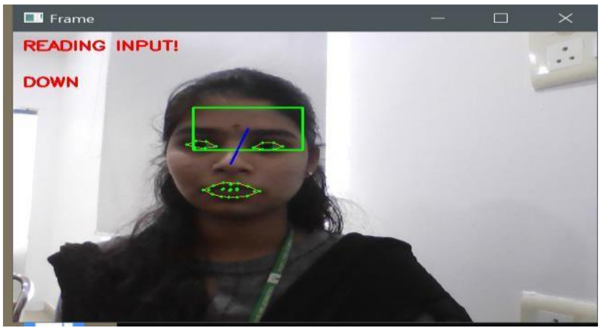


Fig 6. If the user wants to move the cursor towards downward direction then the user should move the Anchor point to down.

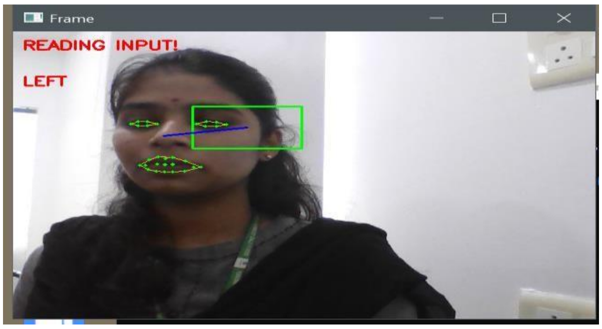


Fig 7. If the user wants to move the cursor towards left direction then the user should move the Anchor point to left.

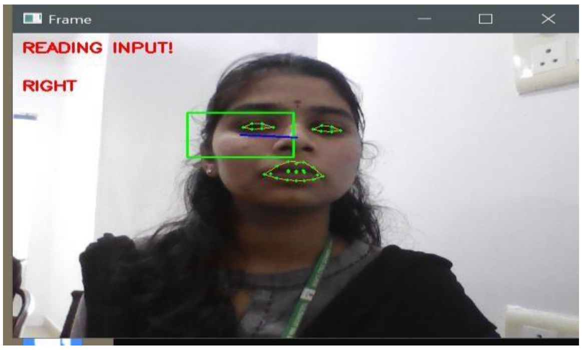


Fig 8. If the user wants to move the cursor towards right direction then the user should move the anchor point to right

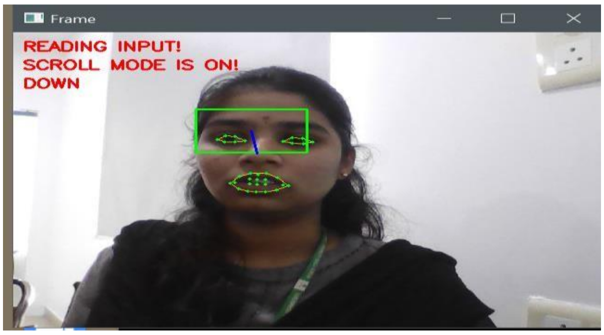


Fig 9. If the user wants to Scroll Down then the user should move the anchor point towards upwards and then blink the eyes for a second .then scroll operation will be enabled and user should move the anchor point towards down.

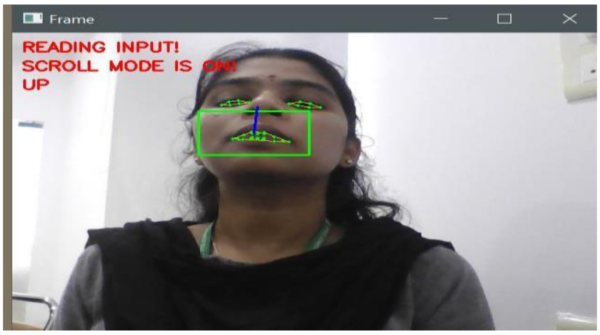


Fig 10. If the user wants to Scroll Up then the user should move the anchor point towards upwards and then blink the eyes for a second .then scroll operation will be enabled and user should move the anchor point towards up.

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