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Eye Ball Cursor Movement

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Abstract:- Some people cannot operate computers because of some diseases. The idea of eye control is very useful not only for the future of natural input but especially for the handicapped and disabled. In addition, the implementation of the control system allows them to control the computers without the help of another person. This gadget is most useful for a person who can control the cursor by eye movement. In this project, the camera is used to capture the eye movement image. First, it detects the center position of the pupil. Then a different change in the position of the pupil causes a different movement of the cursor. The implementation process for pupil detection is done using the OpenCV library in python, which is an open-source library for computer vision and image processing. It can be used to process images and videos to identify objects, faces, etc. In this project, we instruct the mouse cursor to change its location based on the movement of the eyeball, connect to the webcam, and then extract each image from the webcam. and pass it to OpenCV to detect the position of the eyeball. Once the position of the eyeball is detected, we extract the x and y coordinates of the eyeball from OPENCV and then instruct the mouse to change its current position to the given X and Y coordinates of the eyeball.

I. INTRODUCTION

Personal computer systems play a big role in our daily survival as they are used in areas like the workplace etc. These applications have one thing in common the use of personal computers is mostly dependent on input methods such as a mouse. But this is not a problem in the case of a healthy individual, it can be a problem in people with less freedom of movement of the limbs. In such cases, it may be more appropriate to use input methods that support the region's capabilities, such as eye movements. To enable such an input method as a substitute, a system is proposed that follows a low-cost approach to mouse-free cursor control on a computer system. In the proposed system, the movement of the computer system cursor is controlled by the movement of the eyeball using OpenCV. It is connected to an IP camera that detects eyeball movements and based on these eyeball movements, the cursor can be controlled accordingly, which is processed using Open CV (Open Computer Vision).

II. EXPERIMENTAL

Eyes are recognized utilizing the picture-handling mechanism of OpenCV technology.

Based on the eyeball movement, the mouse cursor can be controlled and blinking of the eyes is utilized to figure out the Eye Aspect ratio(EAR) to perform various operations such as clicking, scrolling, or selecting.

➢ *Existing Approaches And Drawbacks*

In the existing system, the detection of the Iris of the eye is done using Matlab and controls the cursor. An eye movement-controlled wheelchair is an existing one that controls the wheelchair by monitoring eye movement. In Matlab, it is difficult to predict the Centroid of the eye so we go for OpenCV

➢ *Drawbacks*

- Less Accuracy.
- Can't use a regular camera.

III. RESULTS AND DISCUSSION

First, we use a virtual eyeball model, which is based on the 3D characteristics of the human eyeball.

Second, using the camera and three collimated IR-LEDs, we calculate the 3D position vector of the virtual eyeball and gaze.

Third, the calculation of 3D eye position and gaze position on the HMD monitor is enabled. This used simplified complex 3D translation calculations that have three reference images (camera, monitor, and eye reference images).

Fourth, based on kappa compensation, a simple user-dependent calibration method with a single position view was proposed. In our work, we try to compensate for the need of people with disabilities who would not be able to use computer resources without the help of other individuals. Our application mainly uses facial features to interact with the computer, so you won't need your hands to control the mouse. Paralysis is a special case where there is a loss of muscle function in a part of your body. It happens when something goes wrong in the way messages are transmitted between your brain and muscles. When such a thing happens, a person's ability to control movement is limited to the muscles around the eyes. Blinking and eye movement is their only

way of communication. For such communication failures, the assistance provided is often intrusive, that is, it requires special hardware or equipment. An alternative way to connect is through a non-disruptive communication system such as Eye Keys, which works without a special flash. Eye direction is detected if a person is looking into the camera, which can be used to control various applications.

IV. EXECUTION PROCESS

➢ *Face Detection*

The computer technology used for various applications in identifying human faces in digital images is called face detection. The proposed method detects features from the face. A simple face-tracking system has been developed. Face images can be analyzed without requiring any interaction with the user/person. Facial recognition can be used as an important metric for tracking attendance and time information. Human faces provide facial information that can be used for many applications such as emotion recognition and human-computer interface. Local binary pattern algorithms can be used to extract features. A 3×3 pixel image can be taken from the web camera. An encoding operation can be performed on the pixel values and converted to binary values of 0 or 1. The face image is divided into N blocks. The thresholding function is described below:

$$S(g_c, g_i) = \begin{cases} 1, if\ g_c \geq g_i \\ 0, if\ g_c < g_i \end{cases}$$

➢ *Eye Region Detection*

The exact position of the pupil is known using vertical integral projection and horizontal projection. These projections divide the entire image into homogeneous subsets. An arbitrary threshold is used in the proposed method. Noise can be removed using a Gaussian filter. The strong pixel value is based on the minimum transition point. The lower threshold protects against frayed edges in the contrast area. The circular Hough transform is used to find the inner and outer boundaries. The Hough transform checks all edge points with center coordinates.

➢ *Eye Movement Classification*

Different eye movements are classified using a support vector machine classifier. Eye movements are eyes open, eyes closed, eyeball left and eyeball right captured by web camera. SVM can analyze data and can be used for classification and regression analysis. SVM is a set of associated supervised learning functions used for classification and regression problems. A multi-class file is used in SVM. This PIR sensor is connected to the General Purpose I/O port of the raspbian board, it detects the movement of the pupil and thus causes the camera to start taking pictures. The sensor can cover a range of up to 5 cm.

As soon as the sensor detects the movement of the pupil, the camera starts taking pictures and sending them to the raspbian board via the USB cable. The camera used here is an affordable USB webcam. The transmitted image is then processed and monitored. The function of the SD card is to store the Raspbian Jessie operating system module and store the program in it. The Raspberry Pi board is activated using the Python programming language. The capacity of the SD card is up to 8 GB.

The monitor input is output from the HDMI port of the raspberry board. HDMI is a high-definition multimedia interface port used to view uncompressed video data. HDMI converts the digital video signal to analog and transmits it to the monitor. The camera is used to capture the movement of the eye. The middle part of the eye is identified as well as the position of people to obtain different eye movements. The process is implemented using a Raspberry Pi. Giant. 1 shows that the pupil reference has (x, y) coordinates. The Raspberry pi will be combined with a USB camera. The raspberry pi will use the SD card and then install the raspbian OS and Opencv raspberry pi. The first picture will be taken with a USB camera. Focus on the eye in the image and detect the center position of the pupil using Opencv code.

Req_id	Tkt_id	Req_descrption	Expected Output	Actual Output	Req_tckt_status
1	1	When Face and Eyes are detected in proper lighting condition	Movement of cursor is seen	Movement of cursor is seen	Pass
2	2	When Iris movement of the eye is detected	Respective operation is seen	Respective operation is seen	Pass
3	3	When no face is detected	No operation is seen	No operation is seen	Fail
4	4	When face is detected in improper lighting condition	No operation is seen	No operation is seen	Fail

Fig 1:- Reading The Input

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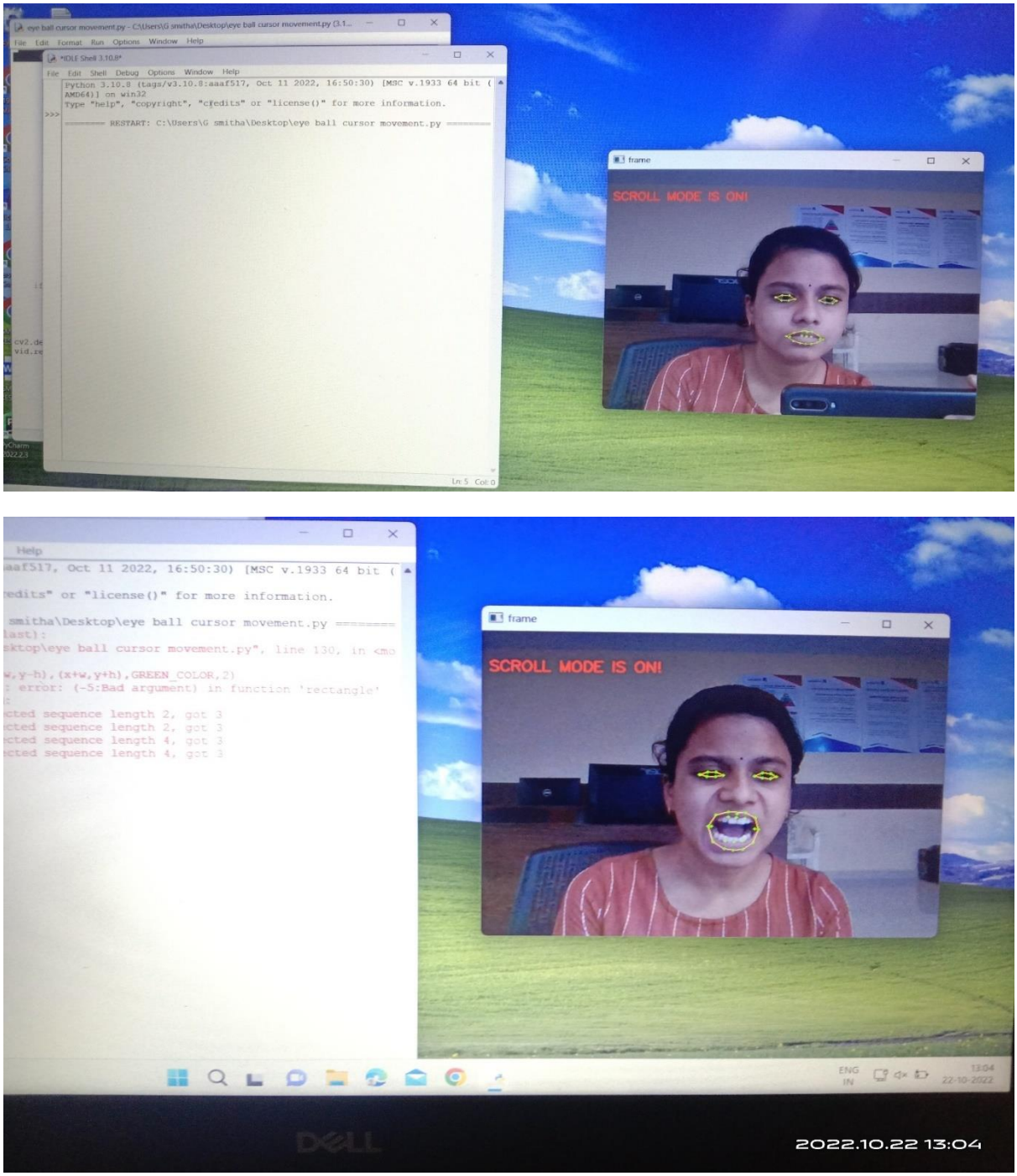

Fig 2 :- Output

V. CONCLUSION

- The project "Eye Ball Cursor Movement using OPENCV" is developed. The results show that we can effectively control cursor functions without using a mouse.
- This system is a possible solution to all the problems we face with the existing mouse cursor control manual, which is not possible for people with disabilities

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