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Cursor Movement Control Using Eyes and Facial Movements for Physically Challenged People

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ABSTRACT:Controlling the mouse by a physically challenged person is really a tough one. To find a solution for the people who cannot use the Mouse physically, we have proposed this mouse cursor control using Facial Movements. Eye gaze is an alternative way of accessing a computer using eye movements to control the mouse. For someone who fine touchscreens, mouse inaccessible, eye gaze is an alternative method to allow a user to operate their computer, using the movement of their eyes. Eye movement can be regarded as a pivotal real-time input medium for human-computer communication, which is especially important for people with physical disability. In order to improve the reliability, mobility, and usability of eye tracking technique in user-computer dialogue, a novel eye control system is proposed in this system using Webcam and without using any extra hardware. The proposed system focuses on providing a simple and convenient interactive mode by only using user's eye. The usage flow of the proposed system is designed to perfectly follow human natural habits. The proposed system describes the implementation of both iris and movement of cursor according to iris position which can be used to control the cursor on the screen using webcam and implemented using Python.

KEYWORDS:Human Computer Interaction (HCI), Conventional mouse, Nonintrusive, Eye movements , Haar Cascade, Dlib.

I. INTRODUCTION

Moving the finger or the computer mouse has become a common way to move the computer cursor along the computer screen in the present technology. To map it to the movements of the cursor the system detects any movement in the computer mouse or the human finger. This current technology will not be able to make use by some people like 'amputees' as they do not have their hands to operate. Hence, the amputee and other physically challenged people can be able to operate, if their eyeball movement can be mapped to the cursor. If the direction of the eyeball movement is traced and direction towards which eye is looking at can be tracked, the cursor will be mapped and the physically challenged people can able to move the cursor. An 'eye tracking mouse' will be of a lot of use to disabled and an amputee currently, this technology is not available at a large scale, only a few companies are trying to develop this technology and have made it available. This paper intend to develop an eye tracking mouse where most of the functions which present in the computer mouse will be available, so that an amputee or disable people can operate mouse using their eye. Eye tracking technology has become one of the most popular techniques within the human and computer interaction (HCI) this is very important for the people who have difficulty with speech and movement disabilities, especially for the handicapped and amputees person. The idea of computers with the eyes will remove the help required by other person to handle the computer.

II. RELATED WORK

The existing system which was proposed by Margrit Betke introduced the camera mouse for nonverbal and quadriplegic people. Here, by using a camera the user movements can be tracked where these can be plotted to the cursor points of the mouse which can seen on the computer screen. Furthermore Robert Gabriel Lupu proposed another method for human computer interaction which has made use of head mounted device to trace eye movement and to convert it on screen. Another technique by Prof. Prashant salunke proposed a technique of eye tracking using Hough

transform. In this project, we develop a system which will use only Webcam, and to use human eyes as a pointing device for computer device and to provide user friendly human-computer interaction. Designing a system for tracking face and eye using camera and also using facial landmark's technique. This project is mainly developed to help physically disabled people. We can accurately detect the eye movement by detecting the exact location of iris present in our eyes and counters, here we use regression tree algorithm or Decision trees algorithm. This paper introduced a system which is a human computer interface for performing the mouse operations using their eyes. Our idea is to make mouse cursor hands free by using light-reflection based systems with non-imaging sensors, thus providing an alternative to computer mouse.

II.METHODOLOGY

The main contribution of our project is building user friendly human and computer interaction. Since our project is about detecting the features of the eyes and facial movement and plotting them to the computer cursor. Primarily the webcam wants to be accesses, which means the webcam is on and starts capturing images in video. Once webcam is started, the process begins and it extracts all frames from the captured video. The video captured by webcam has frame-rate around 30frames per second, at every 1/30th of a second a frame will be processed. Before the features of the frame are detected the frame goes through a set of processes and then plotted to the cursor. And this process interminably occurs as a part of a loop for every frame.

IMPLEMENTATIONMODULES:

- ❖ Importing the necessary libraries
- ❖ Open cv
- ❖ Eye detection Using Dlib
- ❖ How It Works
- ❖ Eye-Aspect-Ratio (EAR)
- ❖ Mouth-Aspect-Ratio (MAR)
- ❖ Prebuilt Model Details

MODULES DESCRIPTION:

Importing the necessary libraries:

We will be using Python language for this. First we will import the necessary libraries such as open cv and dlib for building the main model

Open cv:

Open CV (Open Source Computer Vision Library) is an open library of python that is mainly aimed at real-time computer-vision. It is also available in C++ and Java. It is an open source machine learning software library. It makes use of Numpy, which is a python library that is used for implementing multi-dimensional arrays and matrices along with high-level mathematical operations on these arrays. OpenCV is mainly used to capture data from a live video hence it is mainly focuses on image processing and video capture. In this paper OpenCV is focused mainly on video capture. OpenCV is also used for applications such as face detection, OCR, Vision-guided robotics surgery, 3D human organ reconstruction, QR code Scanner etc., Using OpenCV we can perform detection of specific objects such as eyes, faces etc., we can also analyze videos such as estimating the motion in the video or subtracting the background from the video, and tracking objects [8] in it. OpenCV covers the basic data structures such as Scalar, point etc. that are used for building OpenCV applications. OpenCV library is imported into the python using the code 'import cv2'.

Eye detection Using Dlib:

The first thing to do is to find eyes before we can move on to image processing and to find the eyes we need to find a face. The facial keypoint detector takes a rectangular object of the *dlib module* as input which is simply the coordinates of a face. To find faces we can use the inbuilt frontal face detector of dlib. You can use any classifier for this task. If you want high accuracy and speed is not an issue for you then I would suggest you use a CNN as it will give much better accuracy especially for non-frontal facing faces

How It Works:

This project is deeply centered around predicting the facial landmarks of a given face. We can accomplish a lot of things using these landmarks. From detecting eye-blinks in a video to predicting emotions of the subject. The applications, outcomes, and possibilities of facial landmarks are immense and intriguing.

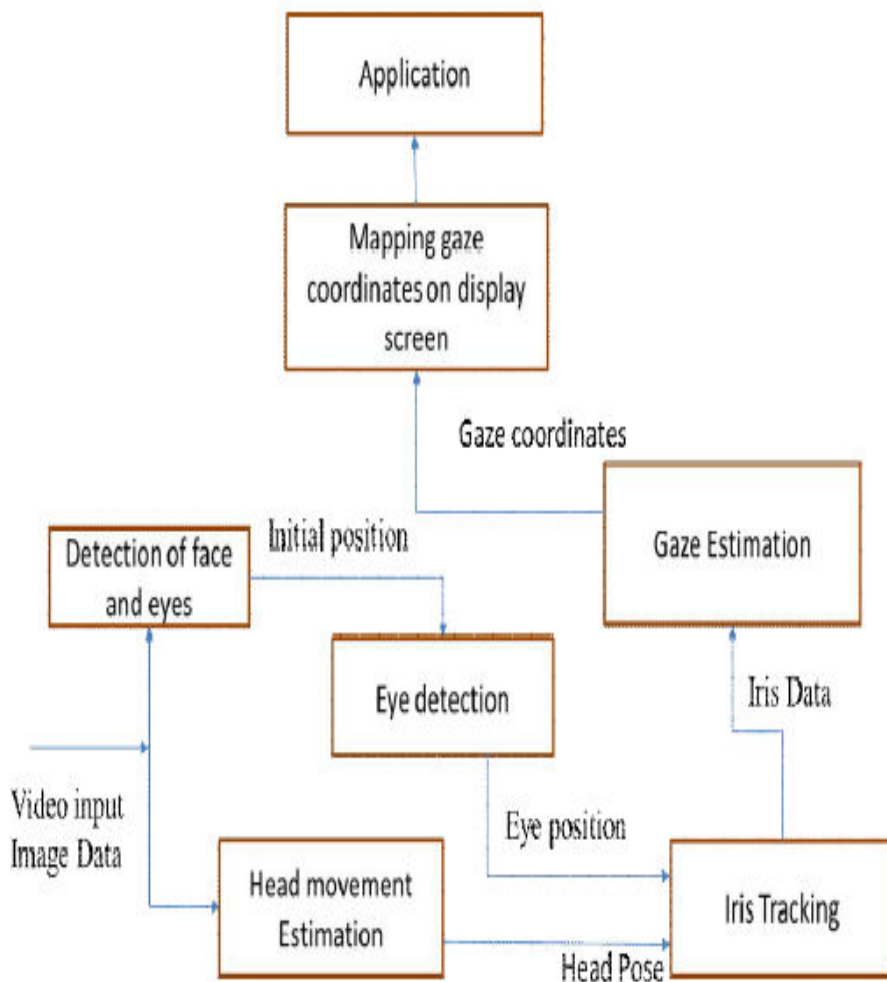
Dlib's prebuilt model, which is essentially an implementation of , not only does a fast face-detection but also allows us to accurately predict 68 2D facial landmarks. Very handy

Using these predicted landmarks of the face, we can build appropriate features that will further allow us to detect certain actions, like using the eye-aspect-ratio (more on this below) to detect a blink or a wink, using the mouth-aspect-ratio to detect a yawn etc or maybe even a pout. In this project, these actions are programmed as triggers to control the mouse cursor. PyAutoGUI library was used to move the cursor around.

Eye-Aspect-Ratio (EAR):

You will see that Eye-Aspect-Ratio is the simplest and the most elegant feature that takes good advantage of the facial landmarks. EAR helps us in detecting blinks and winks etc.

SYSTEM ARCHITECTURE:





III. EXPERIMENTAL RESULTS

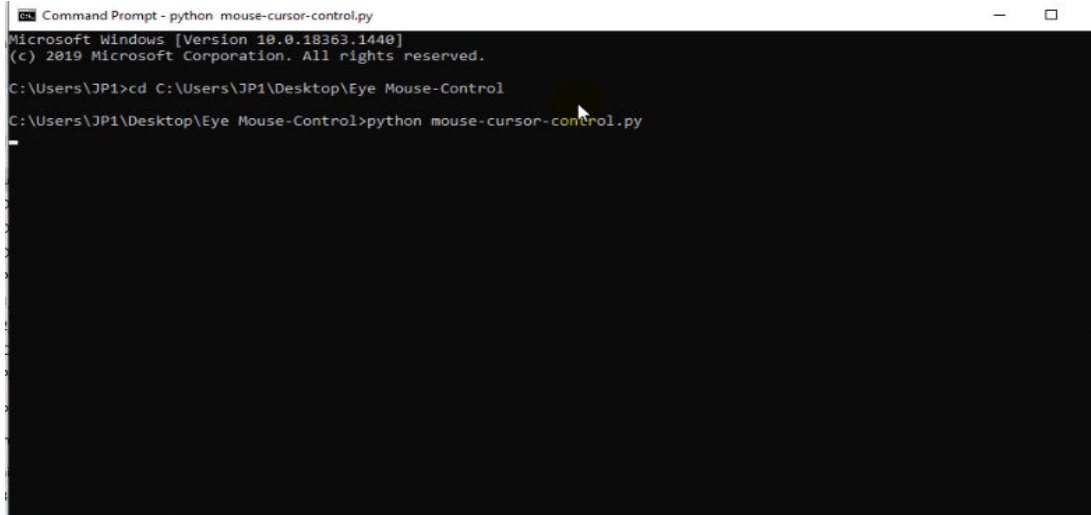


Fig.1

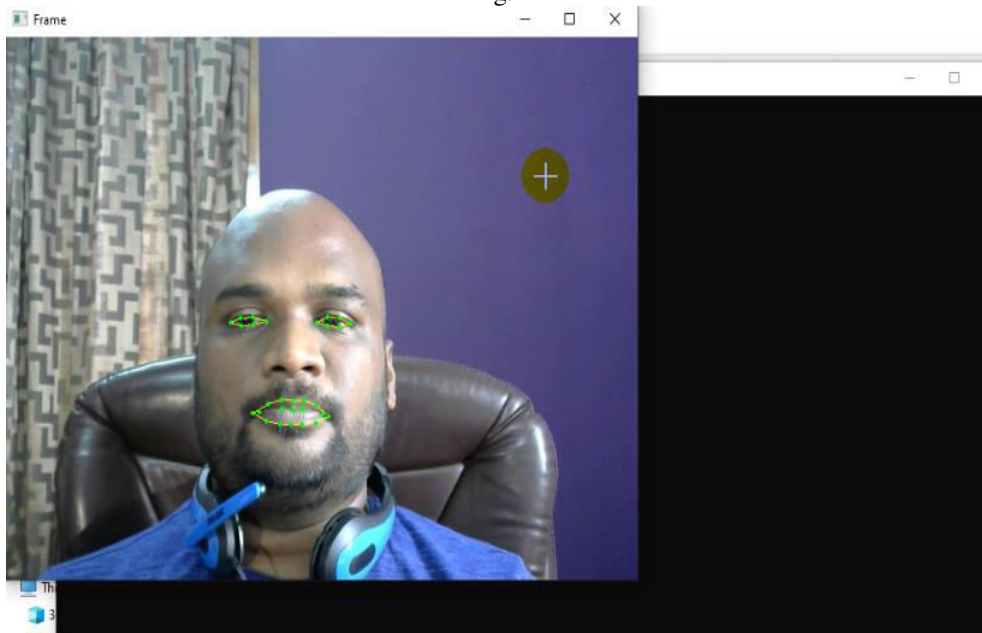


Fig.2

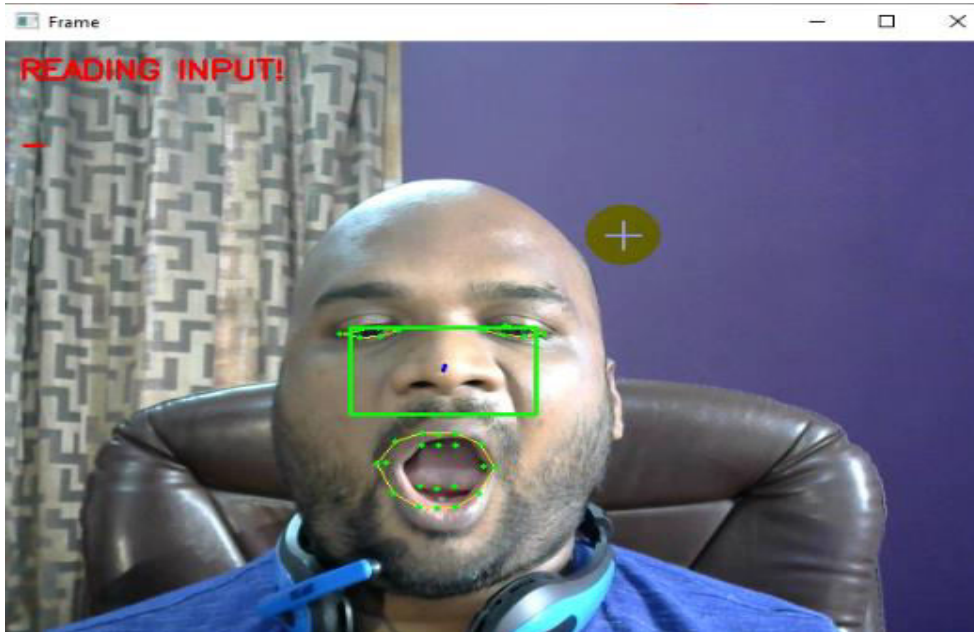


Fig.3

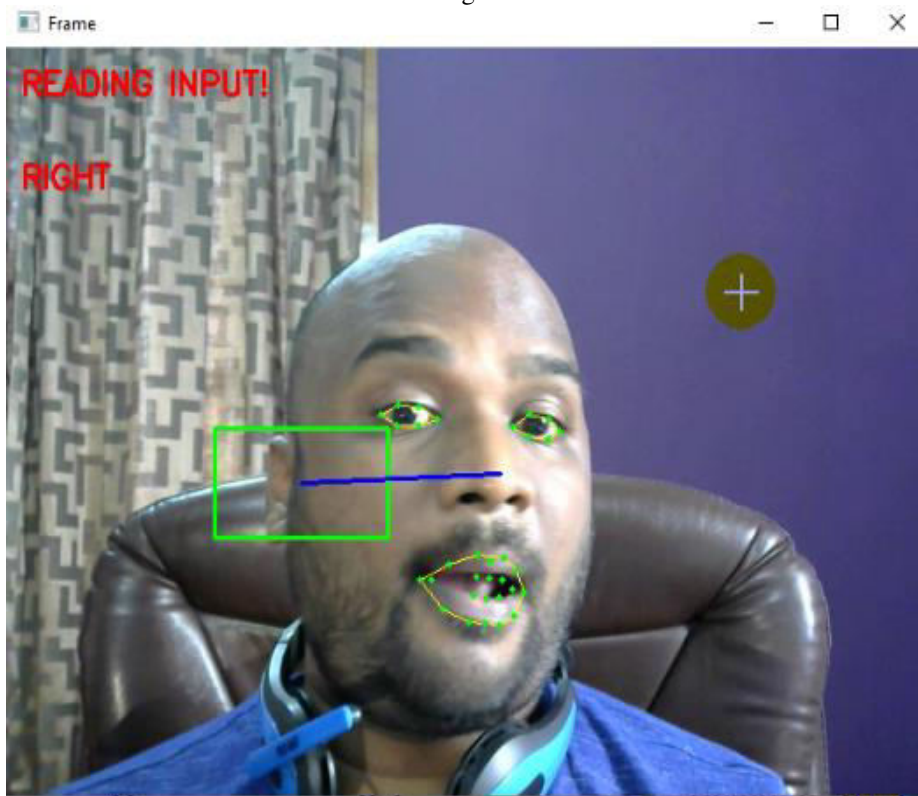


Fig.4

IV. CONCLUSION

In order to make user interact with computer naturally and conveniently by only using their eye, we provide an eye tracking based control system. The system combines both the mouse functions and keyboard functions, so that users can use our system to achieve almost all of the inputs to the computer without traditional input equipment. The system

not only enables the disabled users to operate the computer the same as the normal users do but also provides normal users with a novel choice to operate computer. According to our experiments, it is considered our eye movement system to be easy to learn. Meanwhile, participants show their interest in using the proposed eye control system to search and browse information. They are looking forward to see more of our research results on the use of eye tracking technique to interact with the computer.

Future Work:

Currently, this system is applied for the general operating behavior to interact with computer by simulating mouse. In future, we will try to add new operation functions for more usage situations for users to communicate with media and adjust our system on new platform, such as tablet or phone. We will also develop series operation modules in order to achieve a complete operating experience for users from turning on to turning off the computer

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