Controlling Mouse using Eye tracking and Facial gestures through Computer vision

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Abstract:

This paper introduces a program to control the mouse actions using eye tracking and Facial gestures using webcam. The main functionofthisprojectistoprovideahands- free interaction with computers. This project provides an alternative to thepeople who are not having limbs to control the mouse through webcam. It calculates the facialmovementsusingthefacialcoordinate points. This algorithm will help thedisabled people to control mouse using eyeball movement and face. It allows the disabled people to scroll up, scroll down, right click, left click, cursormovement.

I.INTRODUCTION

Computers arrived in 1938 to comfortably improve our lives. There have been stringent improvements. They first worked hard tosolve problems with mathematics and word processing and now have made a long way to make our lives a necessary part of their professional and personal needs, such as Internet surfing, Connect the globe through social media. In due time, operations on Computers can simply be done by people withhandsandeyesandcanoperate mouseand keyboard and also can see, what's on the screen. The computer with the speech text alternativearenowusedby blindpeoplewhich speak-out the layout on the screen. But people who don't have hands can't use it because ofitsmouse and mouse features That's why they are not able to compete with modernizing and changing world. By introducing technology and making them compatible to their computers, they don’t have to get down from their dreams and expectations because of disability, that they can learn and live. Professionals work hard to help disabled people to use signals such as brain electroencephalography, EMG, facial muscle signals and electrooculogram tool to interact with computers. They are (EOG). In addition methods such as limbus, tracking of eye and detectionofblink,contactlensmethod,corneal related things and reflection of pupil are also used. Operations with keywords. In the competitive environment of today. All must be equipped with various skill sets. Well, just like get a job. Computers are a knowledge and use nowadays, necessity. The use of attachments and electrodes are needed in these methods, so the head is not physically connected. Thereare no such expensive equipment in the method described in this paper. Also, every equipment needs to make even physical connections with the user. It just needs a webcam computer, making it a simple, inexpensive and straightforward way. By capturing real-time user pictures, it is intended to evaluate these pictures and to identify the action type by matching the previously stored phrases to recognize the procedure to be performed and, when necessary, parameter when the cursor is moved. The application with proposedmethod would offer people with no hands a wide range of options.

II.LITERATURESURVEY

In this section we will discuss about the existing work done related to this model and will have a brief look at their advantages and drawbacks, functioning, proposals etc.

[1] ThedetectionpaperDrowsinesspresentsan algorithm which takes account of the different drivers when driving drowning detections in real time. A deep waterfall convolutions network has been developed to detect the face areathatpreventslowaccuracyduetoartificial extraction. Theattributesofthefaceinanimagearefound on the basis of the Dlib toolbox.Driver sleepinessiscalculatedonthebasisofeyedots using a new metric in called the Eyes Aspect Ratio.[8] The Eyes Aspect ratio is qualified by the same fatigue designation using vector support machines(SVM).

[2] The additional power of EGT-based and EMG-based cursor control systems also resulted in the development of a system that integrates all kinds of input users and makes a more effective use of the cursor in different circumstances. The hybrid EMG/EGT method is ideal for the use of gradable (stop) position controls from the EMG subsystem for the small-cursor moves in the restricted area of a cursor site. The cursor accuracy andusefulness of the EMG evaluation shown by the hybrid approach is inherited.

[3] A first study of Paikinje's image of the visual field, based on certain points of reference, reveals that a detailed ocular and pupilometer system that doesn't disturb head movements or intervene visually, is possible. Where two or more reference points are in the centre of the visual field, the eye camera picks up the picture of reference points and the pupil overlaps. In this study, four IR LED's are used as references to not disturb the person's focus. The four reference points serve as highlightsin the pupil picturetaken.

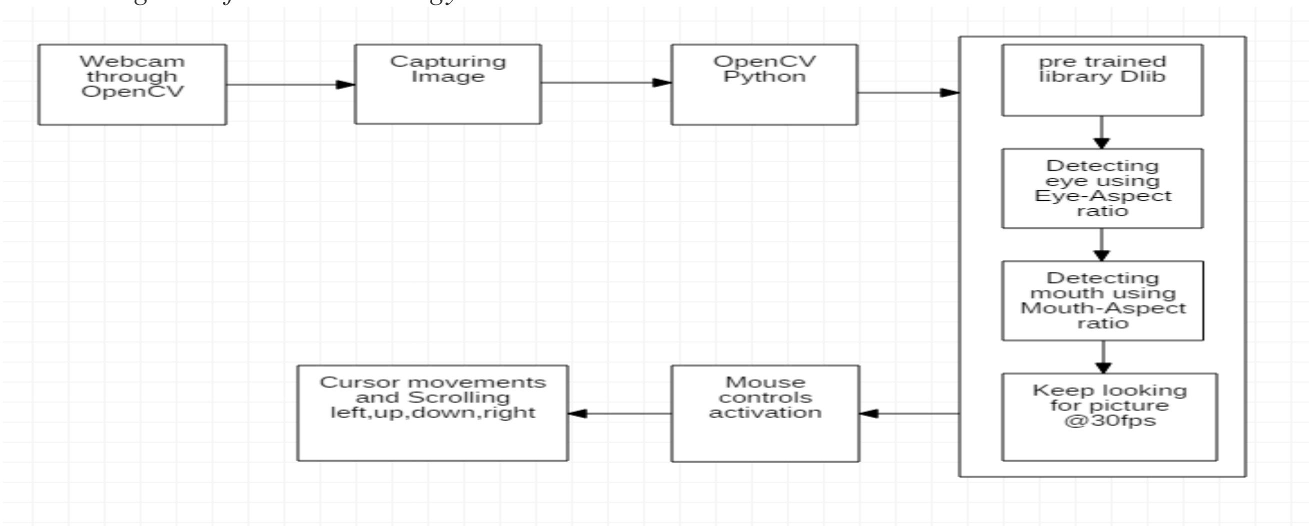
[4] The image capture mechanism is stored when the palm is sensed by the sensor. Input forthefurtherprocessingshallbetheprocessed images. The method of detection is then focused on the centres and borders. The hand detection moves the removed features, usedfor the next step for the only caught frame.[9] The methodwillthusbeareal-timesystem,because with each frame taken by an on-line camera a routine operation can takeplace.

[5] The paper provides an analysis on the measures of pupil size differences dependent upon visual focus used for the identification of mental and cognitive approaches (e.g. measurements, fixtures, shootings, etc..). We would analyse their involvement and the processing processes used for a detailed emotional and cognitive evaluation. Details were collected and data specifications andother similar information established that were open to the public and used for the relevant projects of study. The accuracy ineye-tracking are diverse methods and other instruments (e.g., bio-signals) are needed to beimproved.

III.METHODOLOGY

In this section, we will discuss about the proposed approach to implement the mouse cursor detection using eye and face gestures. The process repeats to detect the face of a person using the computer vision and shape predicting library . The location of the mouth and eyes is registered until the face is identified, to monitor functions of the mouse, such as left clicking and moving cursors. For this system, no special equipment and sensors are needed. It is a hands-free machine for handicapped persons. You must first turn on mouse control mode by opening your mouth. To move the cursor to appropriate pointed direction, we only move the head in the direction the cursor needs to be moved. We need to turn the eyes in the camera to activate scroll mode and it shows scroll mode on when you start. We can move our head up and down to scroll the page

Block Diagram of the methodology:



IV.MPLEMENTATION

The following methods used for mouse movement.

A. *FaceDetection:*

Theindividualshouldfacethecamerain parallel with the webcam when detectingtheface.Thewebcamcandynamically capture the image, read the user's inputs using OpenCV librandrunwithpython3.6.Thepre-trained DLIB library consists of pre-trained data collection of 68 facial points, nose and mouth control co-ordinates for the identification of theface as shown in the below fig.2.

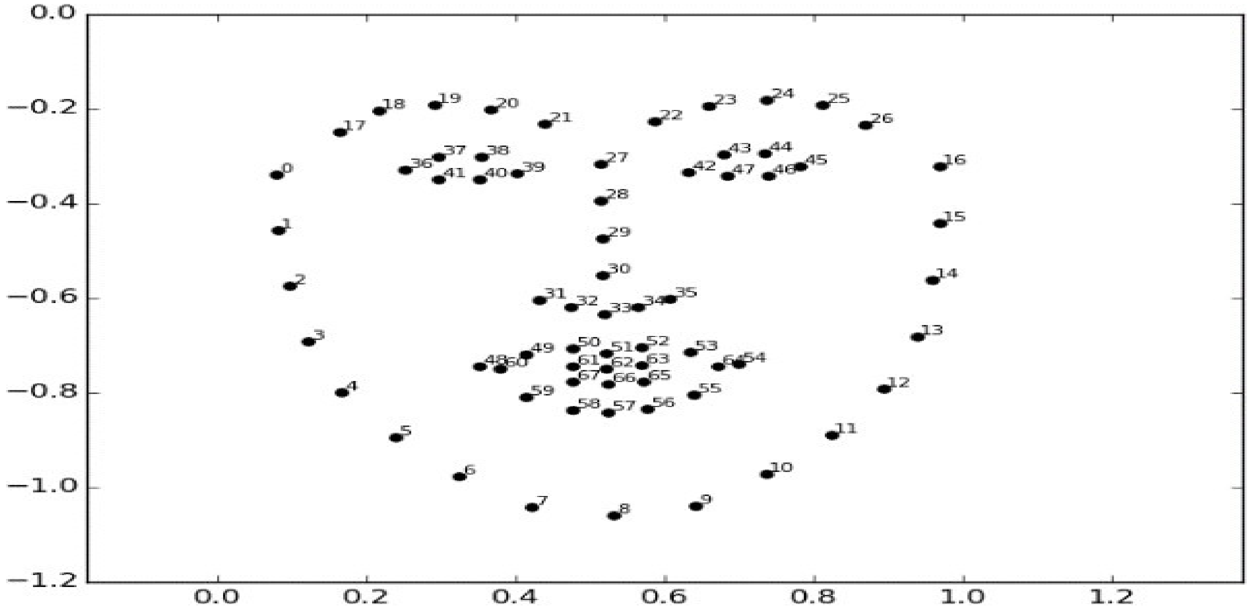


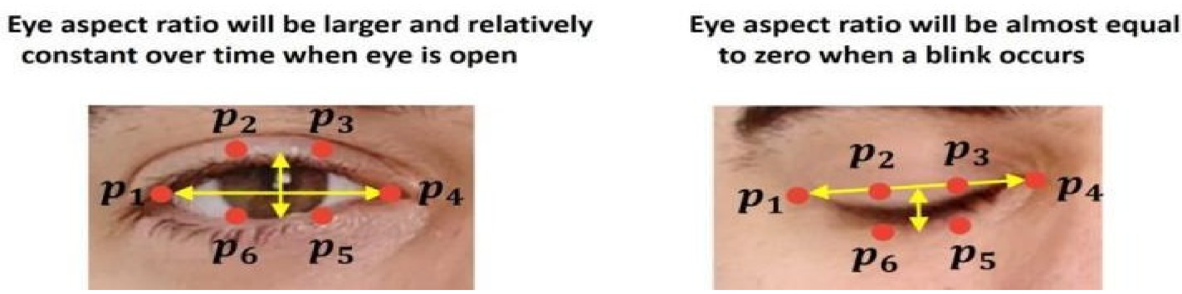
Fig:2: CO-ORDINATE POINTS DETECTED & DETERMINED FROM REAL TIME FACE IMAGE

B. *EyeDetection:*

Eye-Aspect-Ratio for eye detection is used(EAR).Itisusedtoseewhetherthe eyeofthepersonclicksornotinsidethe dynamicvideoframe.Ontheleftsideof the eye there are six Eye coordinates (p1-p6).Thepositionisintheclockwise direction when we move from p1 to p6, (p2-p6).

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

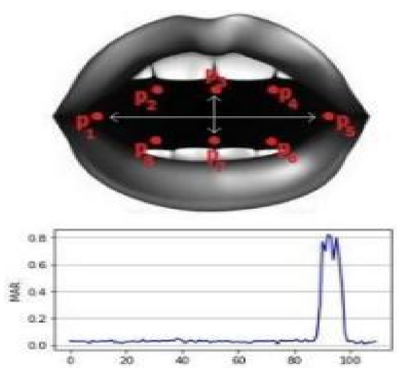
*(p1top6) → These are the co-ordinate points as addressed on the eye.
*(p2-p6) & (p3-p5) → It calculatesdistance vertically between the mentioned points.
*(p1-p4) → It calculates the distance horizontally between the Mentioned points.



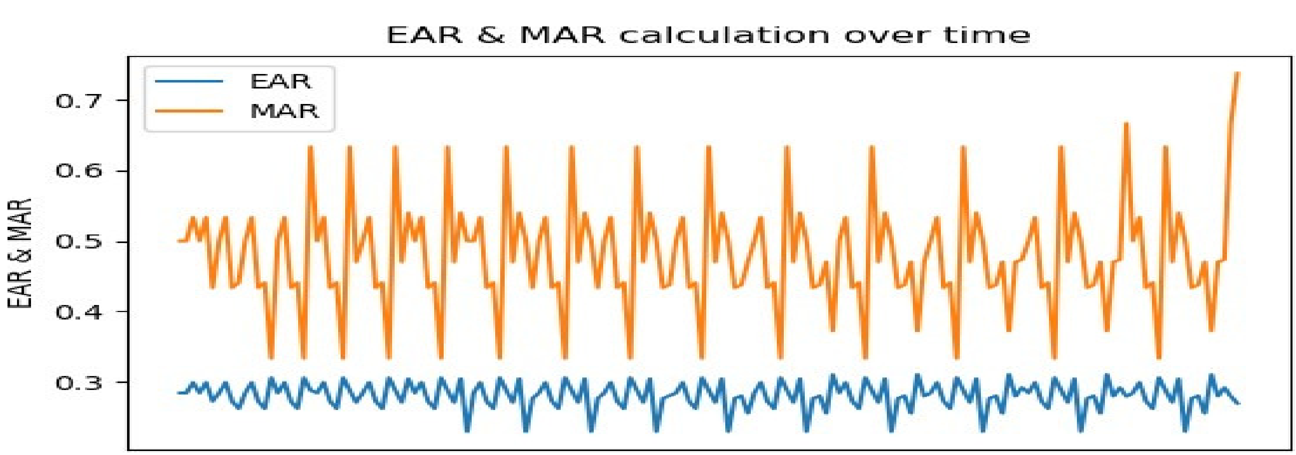
C. *MouthDetection:*

We use Mouth-Aspect ratio (fig.3) to detect that the mouse is open or not. If the mouth is open once then the mouse cursor will be activated and if it detects another time then the mouse cursor will be deactivated.

FIG.3:-



$$\text{MAR} = \frac{\|p_2 - p_8\| + \|p_3 - p_7\| + \|p_4 - p_6\|}{2\,\|p_1 - p_5\|}$$



V.ALGORITHM

Step-1:
As soon as we start the application the desktop raises a frame window and the camera starts capturing the image and the frame window display's the video capturing that is being captured by the camera.

Step-2:
Then Shape Predictor will try to landmark the co-ordinate points on the face and the continuous capturing of the video will depict the changes being made spontaneously.

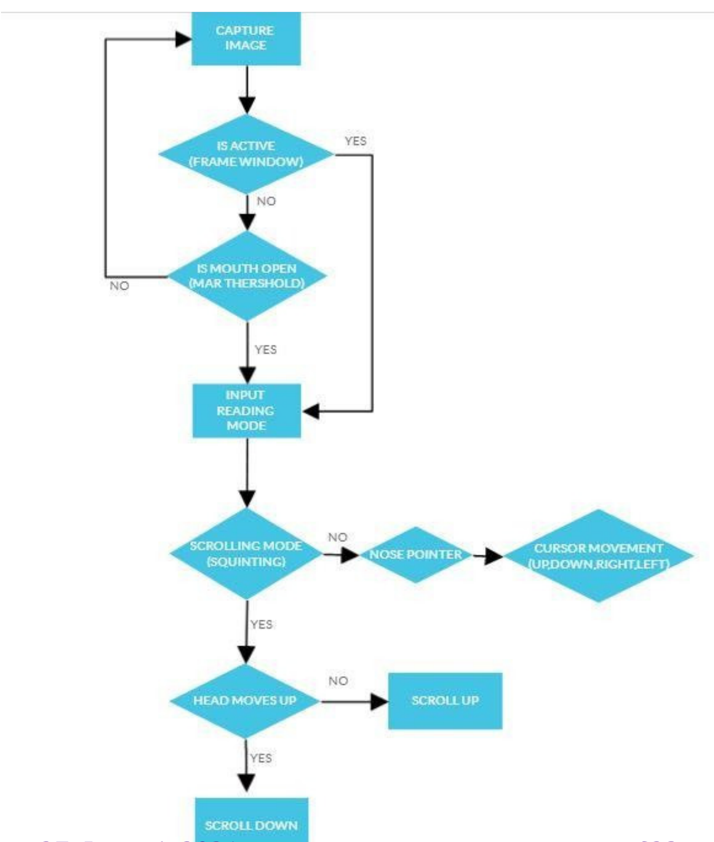
Step-3:
In order read the input, the application will check for change in mouth aspect ratio, if it is more than the threshold then the frame will start reading the input.

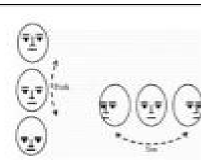
Step-4:
Ininputreadingmode,wewillhavearectangle around the nose and the nose point movements makesthecursormoveup,down,leftandright.

Step-5:
In the reading mode it will also check the change in Eye aspect ratio, if it is below the threshold for either of the eye then that particular click is made (right-click,left-click).

Step-6:
IftheEyeaspectratioofboththeeyesisbelow the threshold (squint)then, it is considered as scrolling mode for scrolling up and down to navigate throughdocuments.

Step-7:
If we want to stop the input reading mode, the mouth aspect ratio has to meet the threshold again (this will stop the application frame window).



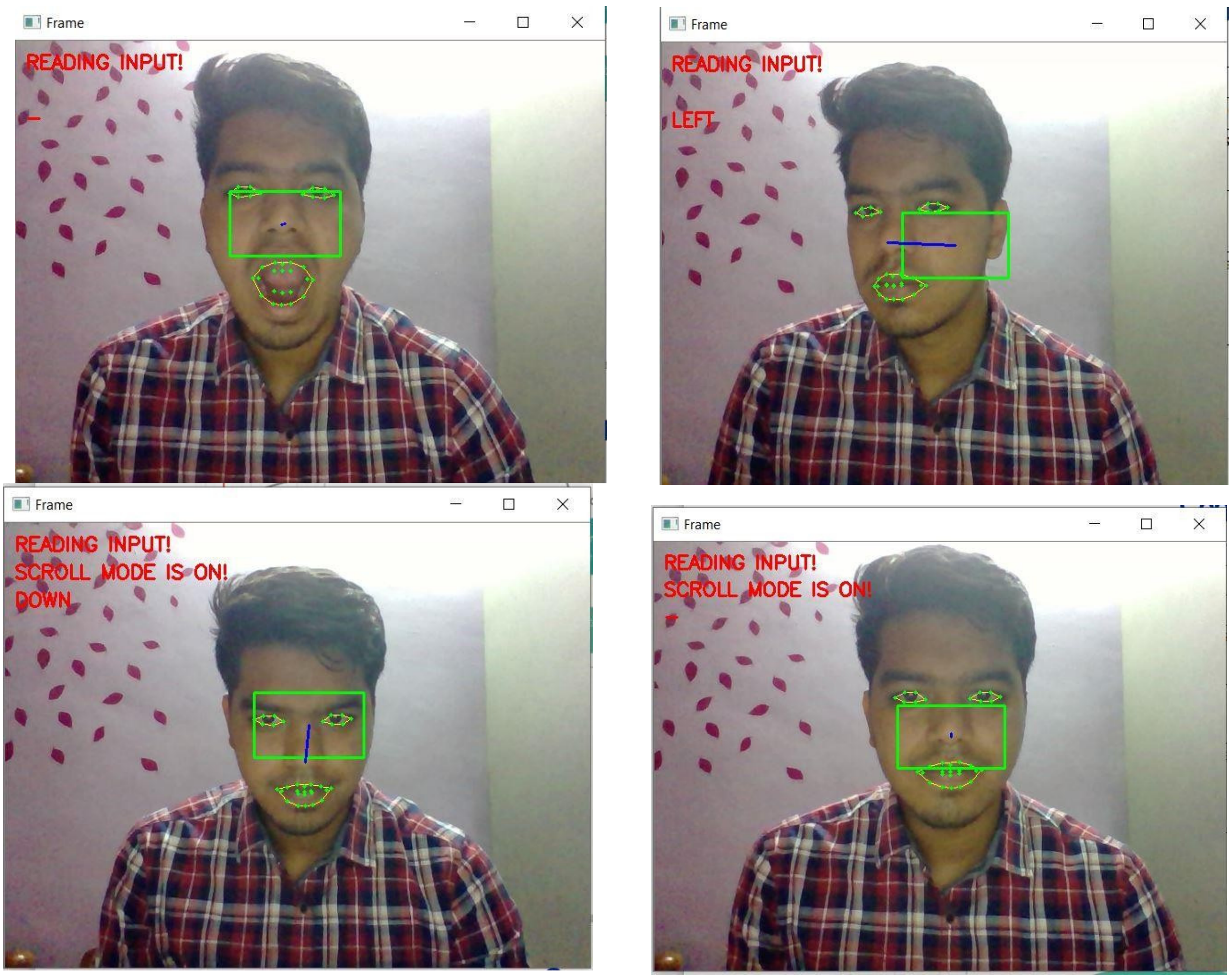
Action	Function
 Opening Mouth	Activate / Deactivate Mouse Control
 Right Eye Wink	Right Click
 Left Eye Wink	Left Click
 Squinting Eyes	Activate / Deactivate Scrolling
 Head Movements (Pitch and Yaw)	Scrolling / Cursor Movement

VI.CONCLUTION AND FUTURE WORK:

In this paper, we proposed an approach that usescomputervisiontomovethemousecursor with facial gestures using Eye-aspect-ratio, Mouth-aspect-ratio and dlib with shape predictor. Despite of having delay in recognizing the particular functionality we successfully able to meet therequirement.

This application can be modified further with tensor flow to reduce the delay and this application gives hand's free experience of operating any level of system with just basic setup rather than spending expensive sensor to captureeyegazetoperformsamefunctionality.

Output:



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