

Eye-Controlled Mouse Cursor for Physically Disabled

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Abstract: - In this paper we will be talking about how we can use our eye movement to control the mouse cursor. This project is mainly developed to help physically disabled people. We can accurately detect the movement of eye by detecting the position of iris present in our eyes this can be done by converting the recorded image into edges and counters, here we use regression tree algorithm or Decision trees algorithm. This algorithm is used to give the best possible outcomes of the eye position using the decision tree algorithm so that the eye movement is detected and the mouse moves accordingly. It also enables the user to open and close the applications by blinking of the eye. [8]

I. INTRODUCTION

In this project we use the eyetracker which is used to measure the eye movements and its positions which is the process of motion or measuring of the eye the point of gaze .By this, movements of our eyes can be captured and used as signals to control and enable people to interact with the computer just by using our eyes.[2]

The project developed uses a simple mechanism .besides, the user doesn't need to interact with the system physically. This is a simple solution for physically disabled people using eye tracking. All we need is a computer or laptop with a web cam pre-installed built-in web-cam in laptop or pc.[2]

Eye control mouse cursor is mainly focused for physically handicapped people to help them use computers on their own. Providing them a chance to use the modern day computers and work on them.Previously many have developed

method for helping the disabled to work on computers by using signals such as Electro Encephalography (EEG) from the brain, facial muscles signals (EMG) and electro-oculogram (EOG).[2,8]

We use Image processing for the background elimination which is Grayscale and edges and counter to detect the eyes, mouth which is present in the frame

II. METHODOLOGY

Firstly, with the help of web camera, the video is said to be recorded. The recorded video is converted into Frames. From the frames it is further converted into Grayscale for the background elimination .After the elimination of background it takes a proper face image to find counter and Edges in the image. From edges and counters it Identifies Eye and Mouth in the Frame.

After identifying we calculate Aspect Ratio of Eye and Mouth. Eye Blink and Head Moment is Detected through Decision Algorithm .Here both the eyes are used for a better or faster processing time.

III. IMPLEMENTATION

MODULES

The modules which are used in this project are has follows

Facial Features Extraction:This module is used to process the present of an eye gaze tracking algorithm and facial features detection which are mouth and eyes extraction.[5]

Point of Gaze Calculation:PoG can be calculated by the extraction of eye patch and other crucial eye features.

When the person uses this mechanism. Their eyes are focused on the screen we firstly detect the face and the extract the midpoint between the two eyes which can be used as center point. This is done by converting the image into 2D.

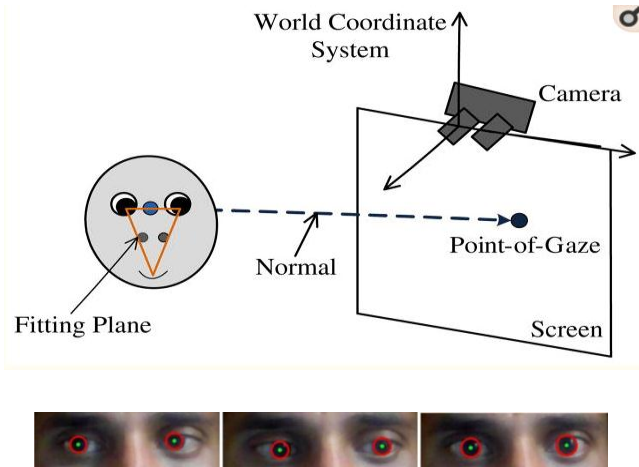


Fig-1 Detection of point of gaze

Eye Features Detection: There are two important eye features necessary to detect the PoG were to identify,

Pupil and Eye Corners. These are the techniques which are used for eye extraction.

Here in the following equation, x and y are the co-ordinates which is used to calculate the Center of Eye(COE) [2]

$$COE_x = \frac{TopRightCorner_x + TopLeftCorner_x}{2} \quad (1)$$

Aspect Ratio calculation: The basic formula for calculating the aspect ratio is:

$$Aspect\ Ratio = (old\ Width / old\ Height) .$$

In this project to calculate the aspect ratio we need to check the movement of eye in the previous frames to the current frames:

$$Aspect\ ratio = (new\ frame / old\ frame). [2]$$

IV. ALGORITHM

Decision Tree - Regression

- Decision tree regression is the fast algorithms which are commonly used in ensemble methods which is in the form of a tree structure. It is the process which breaks down a dataset into smaller and smaller subsets. The final result is a tree with decision nodes along with leaf nodes. numerical data.
- Regression trees are used to calculate the face's critical positions directly from apixel intensities which produces high quality [7]

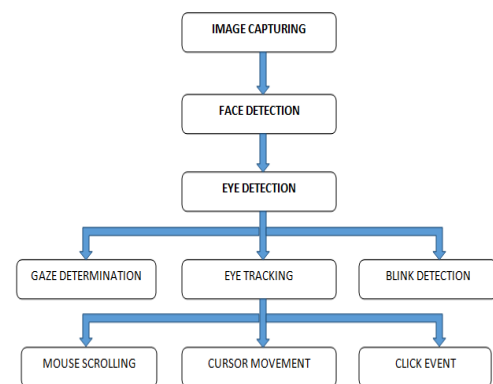


Fig 2-Regression tree architecture

Gradient Boosting:

In machine learning, gradient boosting is the method that gives a prediction model for learning an ensemble of regression trees that optimizes the sum of square error loss and naturally handles missing or partially labelled data. [4]

V. STEPS

1. With the help of web camera, the video is said to be recorded
2. The recorded video is converted into Frames

3. From the frames it is further converted into Grayscale for the background elimination
4. After the elimination of background it takes a proper face image to find Counter and Edges in the image
5. From edges and counters it Identifies Eye and Mouth in the Frame
6. After identifying we calculate Aspect Ratio of Eye and Mouth
7. Eye Blink and Head Moment is Detected through Decision Algorithm

LIBRARIES USED IN THIS PROJECT:

Numpy :

The NumPy is a multidimensional array used to store values of same datatype. These arrays are indexed just like Sequences, starts with zero.

Pyautogui :mainly used to operate mouse events

imutils: It is a series of OpenCV + convenience functions for translation, rotation, resizing, and skeletonization.

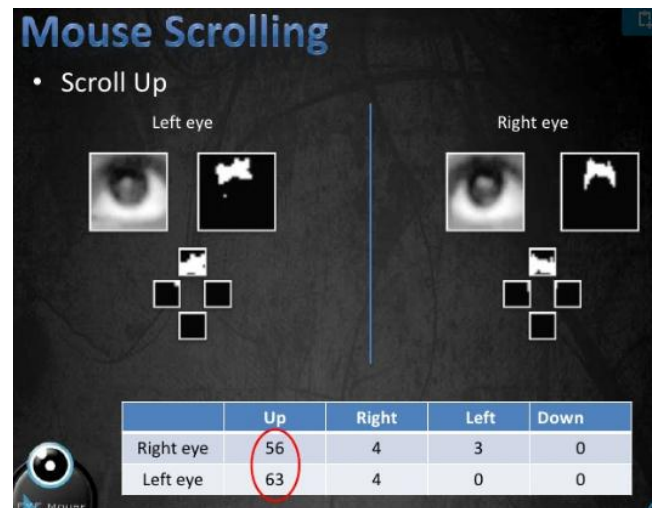
Dlib:dlib is a generally written in the programming language C++ toolkit which consists of machine leaning algorithms in C to solve the real world problems

OpenCV2:OpenCV is a cross-platform library. That shall be used to develop the real-time computer vision applications.

CLICK ACTIVITY

It used to read the input from the video and starts detecting the face features like eyes and mouth

We can enable the scroll mode by simply opening mouth and disable by closing it for few seconds



For clicking purpose we use

Right Eye	Left Eye	Action
True	False	Left Click
False	True	Right Click
True	True	Moving mode
False	False	Blink

Fig-2 Blink actions

VI. UML DIAGRAMS

Here we be using 4 types of umldiagrams,there are-
 use case diagram is a simple process to represent the interaction of the user with system.

It is used to show the relation between user and different use cases in which the user is involved.[9]

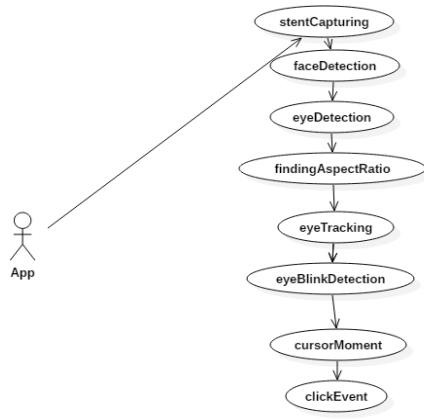


Fig 6.1-Use case Diagram of eye controlled mouse cursor

Sequence Diagram: Sequence diagram is an interaction diagram which shows the relation between the objects participating in a particular interaction and the messages that are exchanged in the time sequence.

This diagram is also known as Event diagrams which helps in understanding the objects we use. It has two dimensions: time, which is represented in vertical, and objects, which is in horizontal [9].

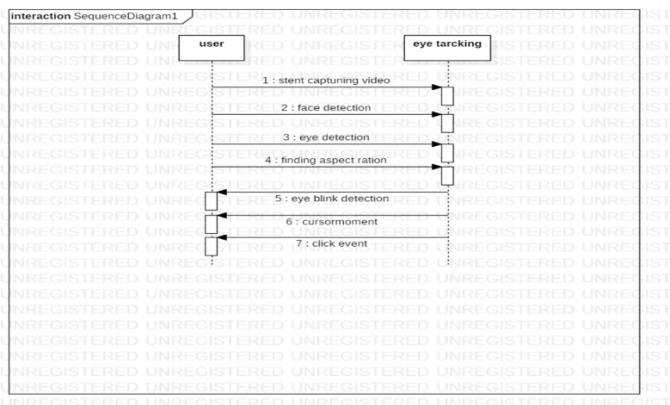
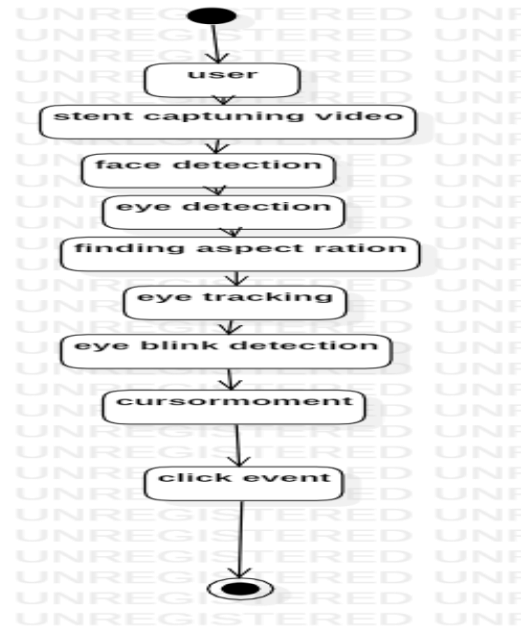


Fig 3.2-Sequence Diagram

State chart Diagram: State machine diagrams are used to capture the behavior of a software system. This diagram is used to examine the different states of object.

A statechart diagram is created for a single class. Statechart diagrams are useful to model the reactive systems.[9]



VII. FEATURES AND BENEFITS

- 1) It is very easy to use and simple
- 2) applicable to any low resolution camera
- 3) No need for any hardware requirements
- 4) specially used for disabled persons

Drawback:

It doesn't perform in low light environments

VIII. CONCLUSION

The main goal of developing this project is to provide hands free cursor control which reduces the dependency on mouse. We mainly focused on physically disabled persons who cannot use their hands to operate the system. It doesn't perform well in poor lighting environment.

In this paper a computer vision algorithm primarily based answer is enforced. an endeavour has been created towards development of low value, period answer for eye gaze trailing. There are several applications of eye gaze trailing, as an example in HCI, appliances management, usability studies and in advertising effectiveness. Accuracy for options extraction algorithms depends upon image quality and lighting conditions. algorithmic rule performance drops down in poor lighting setting. higher image quality would improve accuracy of laptop vision algorithms. refined Pre-Processing algorithms ought to be introduced to compensate lighting variations and web-cam resolution ought to even be multiplied to decrease the pointer size. A feature describing head-posture should even be introduced, it'll enable the user to maneuverer freely whereas interacting with system. Introducing the construct of gaze estimation in conjunction with gaze projection are going to be useful as a result of it'll improve gaze projections drastically. the thought of gaze estimation guarantees to be told from usage statistics and infer gaze projections. Particle Filters will be accustomed implement gaze estimation as a result of they're quite straightforward and has likeness with drawback of gaze estimation.

IX. REFERENCES

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