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CURSOR CONTROL BASED ON EYEBALL MOVEMENT USING DEEP LERNING

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Abstract-- A special computer programming system is developed using the movement of the eyeball. Typically, a computer system uses a mouse as one of the data entry tools. Researchers in this field have explored the power of eye contact as a means of communication. Some marketing solutions have already been introduced, but they are very expensive and offer limited usability. Mimics eye movements into a mouse cursor movement on the screen and detects the user's eye focused on the icon and will translate to on-screen operation. Eye contact indicates an interesting point a person means it possible to say what he thinks based on where he is looking. Eye-tracking is intended to keep track of a person's gaze. Eye movements can be captured and used as control signals so that people can interact with visual connectors directly without the need for a mouse or keyboard input. This can be achieved by using computer vision and image processing algorithms. In the proposed way, rust tracks a person's face in a real-time video sequence to extract eye circuits using a webcam. Then, find the facial features to clear the eye area to find the viewing area. Then the corresponding location for each view of the cursor movement on the monitoring screen is performed.

Keywords— facial landmark algorithm,eye gaze

I. INTRODUCTION

Today computers are still widely used. They are used for communication, education, entertainment, and scientific research. Unfortunately, the disabled, the elderly, and those with limited limb movement experience difficulties use them. The project focuses on the development of a handheld computer and home-based visual aid for the disabled. This project is a real-time eye-tracking system that will control the movement of the cursor by tracking the movement of the user's eyes and mapping it to a computer screen. Real-time performance is achieved through a webcam (video streaming) and continuous photographic frames. The Haar cascade algorithm is applied to each frame to get all the faces in the image. Next, a facial scanner is applied to each detected face to detect facial features such as eyes, eyebrows, nose, mouth, etc. A particular area of interest, the eyes in this situation, are considered and some image processing techniques are used to work better in eye tracking. . Eye tracking is done by tracking the limbus area whenever users view changes. The cursor can be controlled by certain functions in the Python library. A delayed blink of an eye performs a click-through action on the device. The applicable web camera frame with patient frame pictures is taken continuously (Photography). The patient's face and eyes are captured on a photo using Facial Landmark Detection. By using eye-to-eye eye recognition features are obtained and by using those links we are able to track eye movements. Then by mapping those links with a computer cursor link, the cursor control can be accessed. The slight delay is set in such a way that, when the blink time is equal to the delay time the click action is performed.

OBJECTIVE

- This advanced program helps people especially the disabled to use the computer easily through the

movement of their eyes and the web camera of the program.

• By keeping track of their eye movements this model helps people to click left and right-click the mouse pointer.

• Easy interaction with the computer without the use of a mouse.

II. LITERATURE SURVEY

[1] Mehta, Sukrit, et al. "Real-Time Drug Detection System Using Eye Aspect Ratio and Eye Closure Rate." 2019

A sinless Drow detection algorithm that takes into account different drivers when driving drownings in real time. The deep waterfall convolutions network is designed to provide a surface area that prevents slower precision due to artificial discharge. The soft attribute he faces in the picture is found in the base of the Dib toolbox. Driver sleep with essis calculate on the basis of eye dots using a new metric called Eyes Aspect Ratio.

[2] Sharma, N. Jain and P. K. Pal, "The discovery of blindfold / open eyes on the EOG and your performance in robot arm control" 2020

The added capabilities of EGT and EMG-based cursor control systems also lead to the development of a system that integrates all types of input users and effectively uses the cursor in a variety of situations. The EMG / EGT mixed method is suitable for use of portable location controls (standing) from the sub-EMG system for small cursor movements in a limited area of the cursor site. Cursor accuracy and usefulness for EMG tests indicated by a hybrid method are inherited.

[3] Balamurugan, P., J. Santhosh, and G. Arul Kumaran. "Hand-Based Mouse-Based Mode Control Using Image Processing Method." 2020

The photography method is maintained when the palm of the hand feels the sensor. Additional processing inputs will be processed images. The acquisition method focuses on facilities and boundaries. Hand acquisition conveys deleted features, which are used in the next step only for the captured one.

[4] Gergely Sziladi, Tibor Ujbanyi, Jozsef Katona, Attila Kovari. " 14, 2017

Touch-Based Method: Identify the gestures of a particular person and use them to transmit information or a control device. Touch is given as it is embedded in a computer program, the system and performs its corresponding function which is already predefined according to the application. Based on color, the hand area is tracked and with the help of trained separators different touches are detected.

[5] H. Bharathi, U. Srivani, MD Azharudhin, M. Srikanth and M. Sukumarline, "Home automation using raspberry Pi and android app," 2017

International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, 2017, pages 687-689. The home automation system will control the fan, turning on another home appliance. The instantaneous signal works as a real-time input and sends the appropriate control signal to the controller. The controller makes the appropriate decision based on the various sets of input and output of the controller used to control electrical equipment.

III. EXISTING METHOD & PROPOSED METHOD

EXISTING METHOD:

In this existing method of wearing an eye tracker in everyday life to find the distance between the eyes tracking system and the purpose of real-time viewing. • During the visual interaction of the eye tracking system, in order to determine the distance from the direction of the eye to the ball in real time, the world camera's mobile eye tracking system camera begins by collecting the position and scale information of the recipients. A real-time target image, and uses a camera measuring system, a PIN camera model and a reverse camera model to determine the distance range, and then real-time calculations are verified by a specified distance test. A measurement system that uses a combination of the target acquisition of the Tensor Flow api framework and the eye tracking system to determine the distance between the eye tracking area and the person who installed it in real time. Test results show that when a targeted acquisition framework is put into student labs, the average accuracy of targeted acquisition is 91.85%.

DISADVANTAGES:

- Can only track the eye and find the distance between the eye tracking system and the target view.

- In the present system it is not able to control the eye movement based on the monitor.

PROPOSED SYSTEM:

In this proposed method of using the mouse cursor control based on eye movement using an in-depth reading method. Personal video is captured on a web camera in the system using Open CV and processed using python. After that, the captured video can be converted into an image. Then the algorithm begins to detect a person's face using a 68-point facial recognition algorithm. The Facial Landmark Detector contains pre-trained models. To estimate the location of 68 links (x, y) that reflect facial features on a person's face, the dlib library contains a pre-trained history marker. The next step was to find the eyes only in this frame. Then the movement of the watch was followed. Since the color of the iris is dark, its image is much lower than the rest of the eye. This helps us to easily locate the iris. Taking the left and right eye angles as reference points, the rotation of the iris as a person changes the focus of his eyes was determined. After locating the eye area by using the face history algorithm and controlling mouse functions such as left click, right click, and cursor movement based on eye view.

ADVANTAGES:

- Handless computer, helping the disabled using a computer.
- An eye-based computer interaction provides real-time eye tracking and eye-tracking.

IV. SYSTEM FUNCTION

ARCHITECTURE DESIGN:

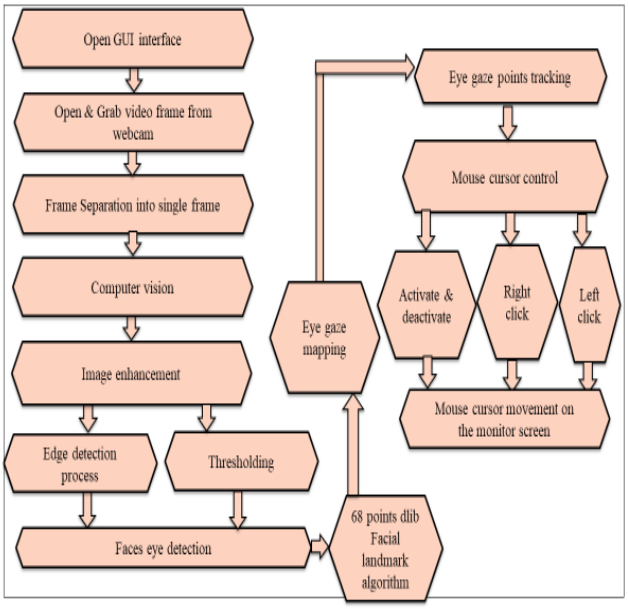

Fig.no:1 Architecture Design

MODULES

There are 5 modules used in this project

- Camera module
- Conversion module
- Pre-Processing module
- Face and eye gaze detection module
- Controlling module

Modules description

1. **Camera module:**
   The video of the person is captured by webcam in the system. The captured video is considered as input. Then the input is given to next step for further process.
2. **Conversion module:**
   The captured input video in multiple frames. We want to detect the face and eyes from the images.so, we can convert the multiple frames into single frame.
3. **Preprocessing module:**
   In this module the image quality can be enhanced by resizing and thresholding the image and edge is marked in this step.
4. **Face and eye gaze detection module:**
   Then 68-point dlib facial landmark algorithm will detect the face from the input image and to

detect only the eyes from this frame. Then the gaze movement was tracked.

5. **Controlling module:**
   After detecting the position of eyes gaze position by using facial landmark algorithm and controlling the mouse functions such as left-click, right-click, and cursor movement based on the eye gaze position.

V. FACIAL LANDMARK ALGORITHMS

Finding facial features is part of the problem of predicting the shape. By providing the embedded image (and usually the ROI that specifies an object of interest), the shape forecast attempts to make the geographically key points relevant to the shape. In the context of global landmarks, our goal is to identify important facial features using vertical prediction techniques.

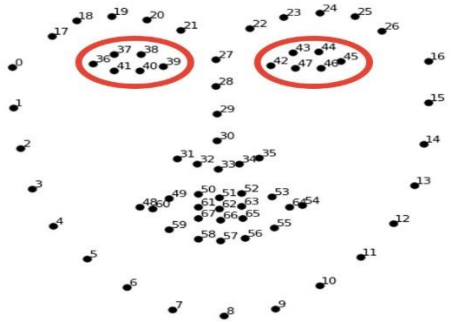

Fig.no:2 Facial Landmark Algorithms 68-point image

In particular there are two steps to finding the facial features in the picture given below:

1. **Face detection:** Face detection is the first method that detects a person's face and returns the value of x, y, w, h rectangular.

2. **Face feature:** After finding the surface of the face in the picture, we must pass the points inside that rectangle.

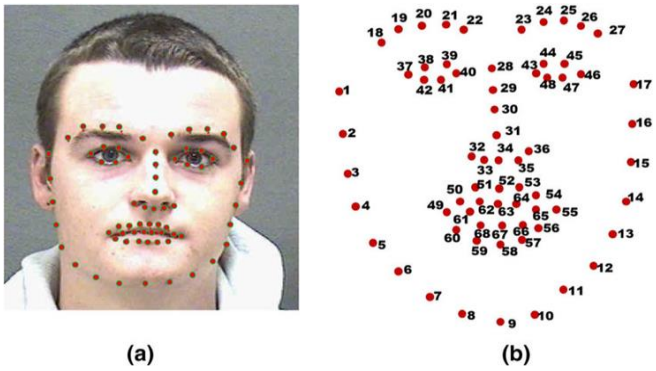

Fig.no:3 Facial landmark algorithm dlib eye tracking mouse control image

VI. SYSTEM SPECIFICATION

HARDWARE SPECIFICATION

Processor	:	INTEL I5 (7th generation)
RAM	:	4 GB RAM
Hard disk	:	1TB
Monitor	:	20’ color monitor

SOFTWARE SPECIFICATION

Front end	:	GUI
Back end	:	python
Software used	:	Mu software
Platform	:	Windows 8

VII. SYSTEM SOFTWARE

MU SOFTWARE

Mu is a Python editor for beginner programmers, designed to make learning experience more enjoyable. It gives students the ability to achieve success early, which is important whenever you learn something new.

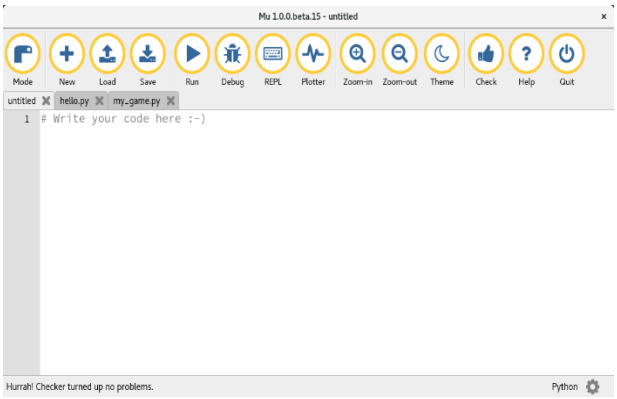

Fig No: 4 MU Software Window

LANGUAGE USED-PYTHON

The program uses the programming language of Python and Google's Tensor flow Machine Learning Library to create and use CNN. Performance is analyzed based on real-world conditions tested on the neural network. The network architecture uses 9 flexible and compact layers, followed by 2 fully integrated layers. The network is a combination of classification and identification of models. Python is a popular programming language.

Used for:

- Web development (server side),
- Software development,
- Statistics,
- System writing.

GUI (Graphical user interface)

By using its simple drag-and-drop interface, the visual interface of the GUI can be built quickly without coding. However, it is not an IDE like Visual Studio. Therefore, Qt Designer has no room for debugging and app building. The creation of the interface GUI using Qt Designer begins by selecting the advanced application window. You can then drag and drop the required widgets into the widget box into the left window. You can also assign a value to the formats of the widget set in the form.

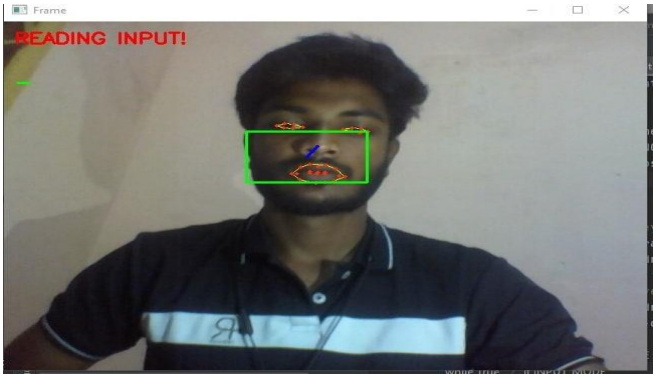

Fig No: 5 Vertical Layout Applied To Widgets On The Main Window.

VIII. HARDWARE REQUIREMENTS & SPECIFICATIONS

i5 PROCESSOR

i5 processors were developed to control the distinction between low and high performance. Some technical specifications for i5 processors related to the performance or capacity and performance of i5 processors in the computer system are listed below.

1. I5 processors have integrated memory capabilities and can improve the performance of applications. Increase memory up to 1333 MHz
2. As i5 processors have high performance so they can operate at a maximum CPU rate of 3.6 GHz
3. Turbo technology is available on a device that increases the performance speed of calculation systems.
4. It also offers 64 bit design for users with reliable and very fast performance.
5. Micro Architecture for i5 processors was introduced by Nehalem and these processors have a storage capacity of up to 8 MB.

Fig No: 6 Intel Processor

RANDOM ACCESS MEMORY

RAM is an abbreviation for Random Access Memory, a type of computer memory that can be accessed randomly; that is, any memory byte can be accessed without touching previous bytes. RAM is found on servers, PCs, tablets, smartphones and other devices, such as printers.

Main Types of RAM

There are two main types of RAM:

1. DRAM (Random Access Memory)

2. SRAM (Random Access Memory)

DRAM (Dynamic Random-Access Memory) - The word dynamic indicates that memory must be renewed or it will lose its contents. DRAM is often used as the primary memory for computer devices. If a PC or smartphone is advertised as having 4GB RAM or 16GB RAM, those numbers refer to the DRAM, or primary memory, on the device.

SRAM (Random Access Memory) - Although DRAM is commonly used for primary memory, today SRAM is commonly used for system caches. SRAM is said to be stagnant because it does not need to be upgraded, unlike flexible RAM, which needs to be updated thousands of times per second. However, both types of RAM are flexible, which means they lose their content when power is turned off.

IX. RESULTS

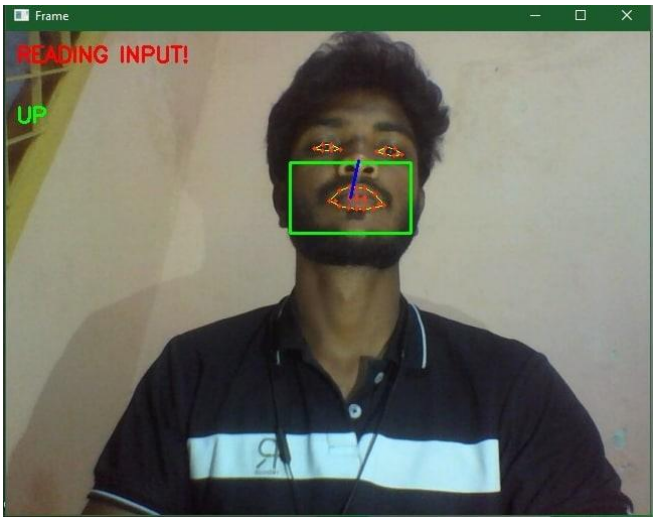

Fig No: 7. Detecting Eye movement in the upper direction

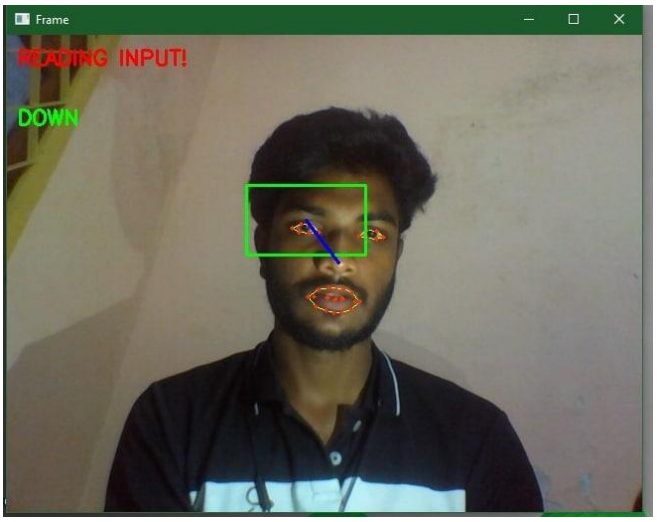

Fig No: 8. Detecting Eye movement in the downward direction

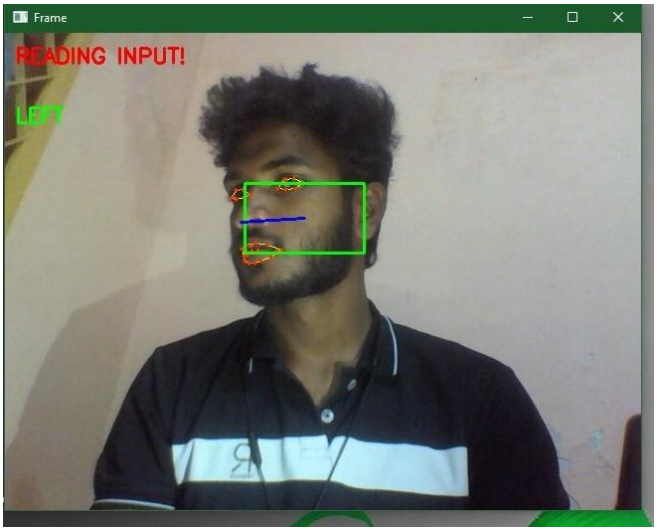

Fig No: 9. Detecting Eye movement in the left direction

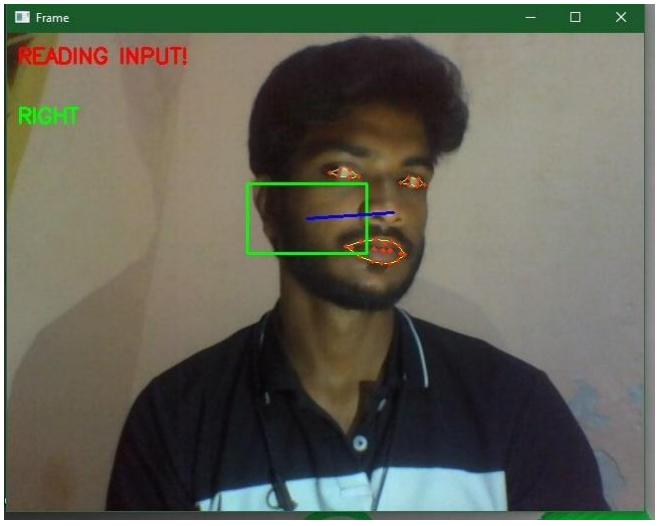

Fig No: 10. Detecting Eye movement in the right direction

X. CONCLUSION

In this project, we have proposed a computer-assisted mouse movement to move the mouse cursor by touching the face using Eye-aspect-ratio, Mouth-aspect-ratio and dlib with predictive shape. Without delay in realizing some work we were able to meet the requirement successfully. This app can be continuously modified with tensor flow to reduce delays and this app provides a free hand experience of using any level of the system with basic settings rather than wasting an

expensive sensor to scan the eyes to perform the same function.

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