Eyeball Movement Tracker

Pragya Pandey[1], Shivam Tiwari[2], Siddhant, Shwetank[3]
[1,2,3]*Computer Science and Engineering, Raj Kumar Goel Institute of Technology, Ghaziabad*

Abstract **- Controlling the movement of pointer of a monitor mistreatment the user' eye and mouth for human-computer interaction conjointly beliefs also thought of serving to medium specially for individuals with physical disability. The algorithm enables physically handicapped persons to handle computer cursor movement to the left, right, up-down, and scrolling by correctly identifying the location of the user's face, mouth, and eye and mapping that to a specific point on the display screen. The algorithm also allows the user to open and close folders, files, or programmes using a clicking method. The algorithm also allows the user to open and close folders, files, or programmes using a clicking method. The suggested system is designed to provide a simple and convenient interaction mode by utilising the user's face, namely the eye. The suggested system's use flow is intended to fully mimic human natural behaviours.**

Index Terms **- Eyeball Movement, PyAutoGUI, OpenCV, Shape Predictor.**

I.INTRODUCTION

At present scenario, those who are paralysed require instruction in order to attempt to accomplish any task. Even when it comes to eating, they have the assistance of another person to feed them. They have support in their daily tasks. Currently, handicapped individuals type on computer keyboards while holding lengthy sticks in their mouths. The approach we propose will assist handicapped people in becoming more self-sufficient in their daily lives. They will be able to entertain, mingle, and work independently.

Computers are meant to be easily accessible to the general public. Individuals with significant physical impairments, such as cerebral palsy or amyotrophic lateral sclerosis, may find it difficult to use computers. Many studies on human computer interface (HCI) have been conducted in order to enhance the connection between the user and the computer system. The majority of these are only applicable to average people. Touch sensitive displays, speech recognition techniques, and a variety of other interface technologies are examples of these approaches. Despite their success, the approaches were not appropriate for physically handicapped people.

Using Raspberry pi and OpenCV [1], several academics have attempted to build techniques to aid the handicapped in interacting with computers. Other techniques include limbus, pupil, and eye/eyelid tracking [2], which uses signals from the brain such as electroencephalography (EEG), facial muscle signals (EMG), and electro-oculogram (EOG) [3-4]. A group at MIT [5] has developed a technology called "The sixth sense," which attempts to improve human-computer interaction by utilising hand and eye motions A watch tracking algorithm that supports the Hough transform was created in 2018 [6]. This technique identifies an individual's face and eyes. It detects the user's face and eyes using a camera. MATLAB is used to power the system. The challenge with this technology is the question of real-time tracking and time-speed.

The approach described in this study is unique in that, unlike previous methods, we did not track the eyes using electrodes, infrared, or any other source of illumination. Because the only hardware necessary is a PC or laptop and a camera, it is both practical and viable.

II.METHODOLOGY

The first step is to locate the face on an image frame recorded by a typical webcam using a face detection algorithm. The picture will now be processed. The user's face coordinates will be retrieved from the picture and used to navigate the pointer. The eye-to-mouse ratio will aid in cursor clicking, and the mouth-to-mouse ratio will aid in activating/deactivating the mouse system.

As per the above calculated points mouse action will get executed.

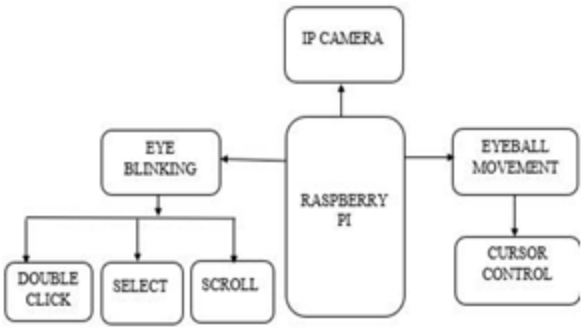

Fig 1. Methodology of the Eyeball controlled camera

A. LIBRARY USED
1. Dlib
2. PyAutoGUI
3. NumPy
4. OpenCV
5. Shape Predictor

III.WORKING MODE

Click (blink)
To use the clicking or choose operate of the generic mouse, the user can have to be compelled to blink each his/her. we are going to be victimisation the blink detection techniques in. To avoid unintentional inputs from motions likes unconditioned reflex and occasional blinking, the blink duration for a left-click shall be a minimum of one second. The user may also opt to vary this length in step with convenience. Any blink that's shorter or longer than the intended set length by quite zero.2 seconds shall be ignored.

Double Click (blink twice)
In order to double click, the user gets to blink double, each blink being of constant length similar to the set period. The interval between the 2 blinks shall be less than 0.2 seconds too.

Right Click (wink)
In order to right click, the user needs to wink victimisation either eye. The wink length shall work just like the mechanism followed by blink for single clicking. Winking shall open any properties of the chosen or hovered over space, similar to the function of a generic mouse at its right click.

Scroll
The user shall be in a position scroll through the pages once victimisation this option from the task bar.

Drag
The user is going to get all the features like drag and drop things with the choice on the task bar. Then they will be able to drag and drop even multiple items that are hand-picked.

Multiselect
This function is similar to the drag perform once used with a generic physical mouse; however, the rationale for having a separate possibility here is to avoid discrepancies wherever the user accidently drags any multi-selected things accidentally.

Keyboard
By choosing this feature, the user is going to be supplied with an onscreen keyboard, which can have the Swype feature for quick typewriting of words. The Swype technique is employed for touchscreen devices for quick typewriting and this feature shall prove extremely effective with gazing. Once victimisation this feature, the user can still have access to different taskbar choices while not hiding the keyboard. The user can need to gaze back at the keyboard so as to cover it from being read.

Multi-Key
This option can solely be seen within the taskbar once the onscreen keyboard is chosen. It'll permit the user to pick combination keys, e.g., Alt+F4, so as to access any of those
features from the taskbar, the user will need to initially stare upon the selected space on the screen, then stare upon the choice on the task bar then back at the chosen icon or area; except with the keyboard.

We find the landmark of face using Dlib library and Dlib model shape predictor After that We have to find two things
1.EAR (Eye Aspect Ratio)
2.MAR (Mouth Aspect Ratio)

EAR
This is the important step because in this step we are detect the closing and opening of eyes to perform different operations like:
1.Right click

2.Left click
3.Scrolling

EAR is implemented by shape predictor and by using PyAutoGUI library we perform mouse operations click and scrolling.

If the face is moved towards left then using threshold value, we calculate distance of eye from the screen and moved mouse cursor in the same direction.

Left wink of eye is used to perform left click and Right wink of eye is used to perform right click using EAR, the blink of eye up to some time limit is used to trigger on and off the scrolling.

MAR

It stands for mouth aspect ratio works on the principal of facial landmark detection if the mouth ratio is greater than the limit, we defined then the mouse controlling using eye is open as well as closed. It is act as a on or off the program using MAR.

IV. RESULTS AND DISCUSSION

Run the python software and the requirements should match all the prerequisite conditions. We need to install IP Webcam app on our system. After starting the video stream thread, the frame starts and the EAR and MAR are detected.

Fig 2. EAR and MAR are represented

In the next figure, we can see that the cursor moves down as we move our face down and as we move our face up the cursor will drag upwards, according to the face position and tilt.

Fig 3. Scroll mode is down as the head position goes down

Fig 4. Scroll mode is up as the position of head goes up

Similarly, when we move our head left or right, the cursor works accordingly and it also moves as per the head.

Fig 5. As we move our head right, the cursor moves right

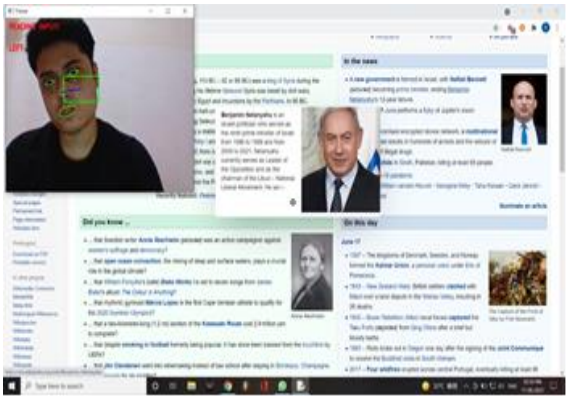

Fig 6. As we move our head left, the cursor moves left

VI. CONCLUSION

The goal of this project is to help disabled people to operate computer without the help of others. This technique can be implemented in their personal computers and other places also so that they can operate without an extra person. The developed technology is a base for the various applications which are to be developed for the disabled people.

REFERENCES

[1] J. Sreedevi, M. Shreya Reddy, B. Satyanarayana "Eyeball Movement based Cursor Control using Raspberry Pi and OpenCV" 2020

[2] Sivasangari.A, Deepa.D, Anandhi.T, Anitha Ponraj, Roobini.M.S "Eyeball based Cursor Movement Control" 2020

[3] Mohamed Nasor, K K Mujeeb Rahman, Maryam Mohamed Zubair, Haya Ansari, Farida Mohamed. "Eye-controlled mouse cursor for physically disabled individual", 2018 Advances in Science and Engineering Technology International Conferences (ASET), 2018

[4] Syed Muhammad Tahir Saleem, Sammat Fareed, Farzana Bibi, Arsalan Khan, Shahzad Gohar, Hafiz Hamza. "IMouse: Eyes Gesture Control System", International Journal of Advanced Computer Science and Applications, 2018

[5] Neil Castellino and Michelle Alva, "An image-based eye controlled assistive system for paralytic patients", IEEE Conference Publications, 2017.

[6] Xuebai Zhang Shu-Fan Lin"Eye Tracking Based Control System for Natural Human-Computer Interaction" Article ID 5739301 | https://doi.org/10.1155/2017/5739301 Volume 2017.

[7] A Wearable Gestural Interface: www. pranavmistry.com/projects/sixthsense/(05.04. 2017)

[8] Shu-Fan Lin, Xuebai Zhang, Shyan-Ming Yuan, "Eye Tracking Based Control System for Natural Human-Computer Interaction", Computational Intelligence and Neuroscience, 2017.

[9] Čech and Soukupová, "Real-Time Eye Blink Detection using Facial Landmarks", Center for Machine Perception, February 2016.

[10] Suree Pumrin and Chairat kraichan, "Face and eye tracking for controlling computer functions", IEEE Conference Publications, 2014.

AUTHORS

First Author – Pragya Pandey, pursuing B.Tech. in Computer Science and Engineering from Raj Kumar Goel Institute of Technology, Ghaziabad.

Second Author – Shivam Tiwari, pursuing B.Tech. in Computer Science and Engineering from Raj Kumar Goel Institute of Technology, Ghaziabad.

Third Author – Siddhant, pursuing B.Tech. in Computer Science and Engineering from Raj Kumar Goel Institute of Technology, Ghaziabad.

Fourth author – Shwetank Rai, pursuing B.Tech. in Computer Science and Engineering from Raj Kumar Goel Institute of Technology, Ghaziabad.