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IJIEMR Transactions, online available on 26th Apr 2022. Link
:http://www.ijiemr.org/downloads.php?vol=Volume-11&issue= Spl Issue 05

**DOI: 10.48047/IJIEMR/V11/SPL ISSUE 05/01**

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Volume 11, SPL ISSUE 05, Pages: 1-6

Paper Authors
**Dr. V Suryanarayana, Kola Yuvaraja Manohar, Kona Anandini Suseela,**
**Vegireddy Prathyusha, Katumala Vamsi Vara Prasad, Gudiwada Yateendra Sai Pavan**


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# HANDS-FREE CURSOR CONTROL USING INTUITIVE HEAD MOVEMENTS

Dr. V Suryanarayana[1], Kola Yuvaraja Manohar[2], Kona Anandini Suseela[3], Vegireddy Prathyusha[4], Katumala VamsiVara Prasad[5], Gudiwada Yateendra Sai Pavan[6]

[1]Head Of Department CSE, [2]18ME1A0546, [3]18ME1A0547, [4]18ME1A0560, [5]18ME1A0544, [6]18ME1A0537

Ramachandra College of Engineering, Eluru, A.P., India
vs@rcee.ac.in , yuvarajamanoharkola27@gmail.com, anandinisuseela1001@gmail.com
prathyushavegireddy@gmail.com, vamsikatuamala539@gmail.com,
yateendragudiwada2229@gmail.com

## ABSTRACT:

Computers have progressed since their inception to the point that we can now operate them remotely. Human laptop interference systems used the mouse and keyboard as an APN device in the past. Those who are suffering froma contagious disease or are otherwise unfit cannot use computers. People with physical disabilities require a different strategy to make computers more accessible and comfortable. We've devised a technique that replaces the standard methodology of pointer movement victimization mouse with eyeball movement to create an Associate in Nursing environment that is true to everything the UN agency is capable of. The camera is used to capture the image of eye movement in order to put the project into operational mode. It will first detect attention, then the pupil center location of the eye, and finally, completely distinct variations of pupil positions. The command can set the pointer to go forward, left, right, up and down, and so on, depending on the pupil's position. Eyeball movement isused to control the laptop using OpenCV.

Keywords: Human Computer Interface, Eyeball Movement, OpenCV

## I. INTRODUCTION:

### 1.1 ABOUT THE PROJECT:

Personal computer systems play an increasingly important role in our daily lives since they are employed in places like the workplace. These programmes all have one thing in common: the operation of personal computers is heavily reliant on data input techniques like the mouse. However, while this is not a problem for a healthy person, it may be a problem for people who have limited range of motion in their limbs. In such circumstances, using input techniques that support the region's skills, such as eye movements, may be preferable. To make such an inputmethod a viable alternative, a system is being developed that uses a low-cost way to operate the pointer on a computer system without the use of a mouse.

The eyeball movement is used to control the cursor movement of the computer system in the suggested system. It is connected to an IP camera that detects eyeball movements and allows the cursor to be manipulated based on these motions, which are processed using OpenCV. Some people with disabilities are unable to use computers. Eye movement control is mostly employed by

people with disabilities. By incorporating this eye-control technique into computers, they will be able to work without the assistance of others. A Human-Computer Interface (HCI) is concerned with the use of computer technology to establish a human-computer interface.

There is a need to find appropriate technology that allows for effective communication between humans and computers. The importance of human-computer interaction cannot be overstated. As a result, there is a need to develop a method that disseminates an alternate method of communicating between humans and computers to individuals with disabilities and provides them with an equal opportunity to be a part of the Information Society. Human computer interfaces have piqued the interest of many researchers around the world in recent years. Human computer interface is an implementation of a vision-based system for detecting eye movement in disabled people.

**1.2 PURPOSE OF THE SYSTEM:**

The main goal of this system is to manage the device's cursor movement with eye gestures rather than by moving the mouse and directly touching the display. to allow people with severe disabilities to control a computer by moving their eyes.

**1.3 SCOPE OF THE PROJECT:**

This project's scope is that this system can be used to improve the quality of life of people with disabilities.

Simple-to-use application. This is a real time

application.

## II. LITERATURE SURVEY:

According to Khare, Vandana, S. Gopala Krishna, and Sai Kalyan Sanisetty, "Cursor Control Using EyeBall Movement." (2019). Personal computers have become an indispensable part of our daily lives, and the freedom to use a computer by anyone is limited by their physical abilities. To overcome such differences, they used a Raspberry Pi and OpenCV with an external camera to obtain images and used them to detect facial features, which is a fairly simple method.It graphs eyeball movement to cursor movement, and it's also quite pricey due to the additional hardware.

The same hardware requirements apply. However, it uses a simple local logarithm for face detection, resulting in low performance and limiting its functionalities, and they suggest growth in the field of Human Computer Interaction (HCI), which focuses onproviding an interface between human and computer and plays a vital role in technological development. Itstates that there is a need to develop an alternate approach to computer communication for people with physical impairments. Taking cost and convenience into account, we used the laptop camera itself to capture images and use them as a Haar cascade classifier algorithm, which is quite an accurate and advanced algorithm to find the facial vectors. Sivasangari, A., D. Deepa, T. Anandhi, and others proposed this. Bukhalov, Aleksei, and Viktoriia Chafonova contributed to this article. "Electronic version available at: https://ssrn.com/abstract=3884881"The Hough transform-based tracking algorithm (2018) captures images of the user with an infrared camera and a computer and uses a feature-based and model-based approach algorithm to detect the pupil radius. They used the circular hough transform and keyword technology in their proposed system to detect the pupil.Gupta, Akhil, Akash Rathi, and Dr. Y. Radhika's work(2020).

"Hands-free PC Control" refers to the use of

eye movement to control the mouse cursor. (2012) discusses the various approaches to detecting faces, such as the feature-based method and the image-based method. We can find the features of a face using a feature-based method. This system employs a six- segmented rectangular filter, which scans the image around a rectangle and stores the rectangle as six segments. It also employs SVM to detect the face; once the face has been identified using SSR and SVM, the integral image is tracked in the streaming video.

Venugopal, B. K., and D'souza (2016) use an Arduino Uno microcontroller and a zigbee wireless device.Initially, they capture a real-time image and use the Viola Jones algorithm to detect faces, followed by the hough transform to detect pupil movement, and these are fed into the hardware, which includes an Arduino uno microcontroller and a wireless zigbee device for data transmission.

A special case is paralysis, which is the loss of musclefunction in a portion of your body. It occurs when something goes wrong with the way messages between your brain and muscles are transmitted. When this occurs, the individual's ability to control movement is limited to the muscles around their eyes. They can only communicate by blinking and moving their eyes. The assistance provided to such communication defects is frequently intrusive, requiring special hardware or a device. Interfacing canalso be accomplished using a non-intrusive communication system, such as Eye Keys, which does not require any special lighting.If a person looks at the camera, the eye direction is detected, which can be used to control various applications based on the paper "Facial Feature Based Method For Real Time Face Detection and Tracking I CURSOR" by SunitaBarve, Dhaval Dholakia, Shashank Gupta, and DhananjayDhatrak.

## III. EXISTING SYSTEM:

Matlab recognises the iris and controls the cursor. An existing wheel chair that is controlled by monitoring eye movement is an eye movement-controlled wheel chair. It is difficult to predict the centroid of the eye inMatlab, so we use OpenCV. We instruct the mouse cursor to change its location based on eyeball movement. In this application, we will connect to a webcam and then extract each frame from the webcamand pass it to OPENCV to detect the location of the eyeball. Once the location of the eyeball is determined, we can extract the x and y coordinates of the eyeballs from OPENCV and then use the Python pyautogui API to instruct the mouse to change its current location to the given eyeball X and Y coordinates.

## IV. PROPOSED SYSTEM:

The computer cursor movement in our proposed system is controlled by eye movement using OpenCV. The camera detects eyeball movement, which is then processed by OpenCV. The cursor can be moved usingthis method.The user must sit in front of the display screen of a personal computer or PC, with a specialized video camera set up above the screen to study the user's eyes. The laptop is constantly analyzing the video image of the consumer's attention and determining wherein the consumer is calling attention. There is nothing attached to the consumer's head or body. To "pick out" a key, the user looks at it for a specific amount of time, and to "press" a key, the consumer simply blinks the eye. Calibration is not required for this device. Enter is the simplest eye for this system. There is no external hardware connected or required.The camera receives input from the eye. It will spoil into frames after receiving these streaming movies from the cameras. After receiving frames, it will check for lighting conditions because cameras require sufficient lighting fixtures from external sources; otherwise, an error message will appear on the screen.The captured frames,

which may already be in RGB mode, are converted to black and white. Five. Iris detection is performed on images (frames) from the enter supply focusing on the eye (middle of the eye).

### 4.1 CAPTURING THE VIDEO:

Python includes a number of image and video processing libraries. OpenCV is one of these. OpenCV is a large library that aids in the provision of various image and video operations. We can use OpenCV to capture video from the camera. It enables you to create a video capture object that is useful for capturing videos via webcam and then performing desired operations on that video.

### 4.2 IDENTIFYING THE FACE:

Face detection is a computer technology that identifies human faces in digital images and is used for a variety of applications. The proposed method detects features on the face. A simple face tracking system was created. Face images can be analysed without ever requiring interaction with the user/person. Facial recognition can be used to track attendance and time information. Human faces provide facial information that can be used for a variety of applications, such as emotion recognition and human computer interface. The local binary pattern algorithm can be used to extract features. The web camera can capture a 3x3 pixel image. Pixel values can be encoded and converted to binary values of 0 or 1.The image of the face is divided into N blocks.

The primary benefit of converting the image to the YCbCr domain is that the influence of luminosity can be removed during image processing. Each component of the image (red, green, and blue) has a different brightness in the RGB domain. However, in the YCbCr domain, the Y-component provides all information about brightness because the Cb (blue) and Cr (red) components are independent of luminosity. The RGB image is segmented into Y, Cb, and Cr components using the following conversions:

Y=0.257 R+0.504

G+0.098*B+16 Cb=0.148*R-

0.291*G+0.439*B+128

Cr=0.439*R-0.368*G-

0.071*B+128

### 4.3 DETECTION OF EYE:

Vertical integralprojection and horizontalprojection are used to determine the exact position of the pupil. These projections subdivide the entire image into homogeneous subsets. The proposed method employs an arbitrary threshold. The Gaussian filter can be used to remove noise. The minimum gradient point is used to calculate the strong pixel value. The lower threshold protects the contrast region from splitting edges. The circular Hough transform is used to determine inner and outer boundaries.

**ARCHITECTURE:**

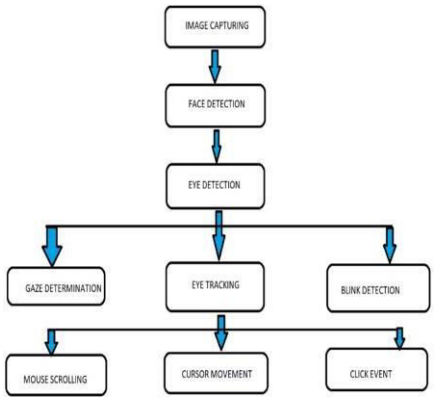


**Fig. SYSTEM DESIGN**

## V. IMPLEMENTATION:

This research is primarily focused on predicting eyeball movements. Before we can detect eyeball movements, we must first identify facial landmarks. We can

accomplish a lot with the help of these landmarks. We can detect eyeball movements, blinks, and predict emotions in video. Cursors based on eyeball movement How to Use the Dlibs Facial Landmark Finder: Dlib's model not only detects faces faster, but it also accurately predicts the 68 2D facial landmarks. The records of the 68 directions can be visualized in the figure.

Fig. Facial Landmark Detection

Only the eyes are used to detect eyeball movement. Six (x, y) coordinates are used to represent the eye, beginning in the upper left corner and moving clockwise to the right, covering the remaining area of the eye. This entry was published on August 1, 2010.

Based on the work of Soukupová and ech in the Real- Time Eye Blink Detection Using Facial Landmarks system

## VI. EVALUATION AND RESULTS:

The system is built with the features listed in the preceding table Fig. 6 and is used for cursor movement with an eyeball. The eyes and mouth region are traced and used to perform additional operations. This can beimproved by adding more features alongside the existing ones, increasing the model's efficiency. The novelty of this paper is that it saves money by replacing the use of external cameras or other electronic devices with the laptop camera and makes navigation simple and efficient.

Sample results of the project are

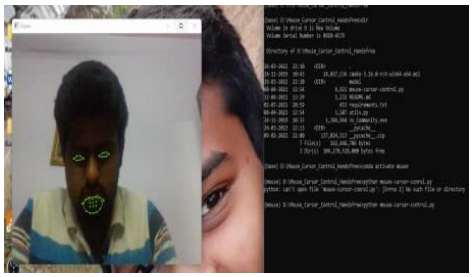

Fig: Detection of eyes

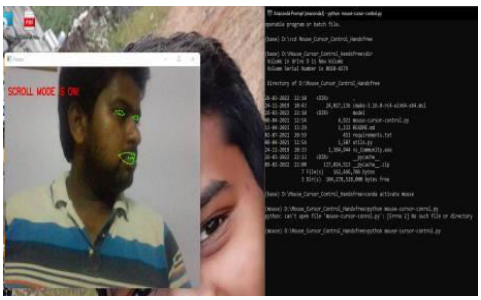


Fig: Right Scroll Mode

## VII. CONCLUSION:

The system includes features such as scrolling the mouse with your head movements, performing right and left clicks with right and left eye winking, and using eyeballs with OpenCV and dllib.

The eyes and mouth are traced and used to perform additional operations.

A system that moves the cursor using eyeball movement is inexpensive because it does not rely on expensive external hardware. This system is extremely useful. Deep learning is used to create a highly accurate system that allows people with limb disorders to use the system efficiently without the assistance of a third party. The mechanical mouse has been replaced by this system.

In the future, light effects will be and can be used in a variety of sectors, including gaming and others. This system, with further advancement, has the potential to be used in virtual gaming in the near future.

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