International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 21 No. 3 (1) 2025

ijerst.editor@gmail.com

editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 21, No. 3(1), 2025

Research Paper

HUMAN COMPUTER INTERACTION BASED EYE CONTROLLED MOUSE

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ABSTRACT

It's critical to recognize and protect against deceptive internet attacks due to the rise in online dangers. With advanced technologies in this digital era, there is always scope for development in the field of computing. Hands-free computing is in demand as of today it addresses the needs of quadriplegics. This paper presents a Human-computer interaction (HCI) system that is of great importance to amputees and those who have issues with using their hands. The system built is an eye-based interface that acts as a computer mouse to translate eye movements such as blinking, gazing and squinting towards the mouse cursor actions. The system in discussion makes use of a simple webcam and its software requirements are Python, Open Cv, NumPy and a few other packages which are necessary for face recognition. The face detector can be built using the HOG (Histogram of Oriented Gradients) feature along with a linear classifier,and the sliding window technique. It is hands-free and no external hardware or sensors are required.

Keywords: Python (3.6), OpenCv, Human-computer interaction, numpy, face recognition, Histogram of Oriented Gradients (HOG), SVM.

Received: 10-7-2025 Accepted: 18-8-2025 Published: 25-8-2025

I. INTRODUCTION

The computer mouse or moving the finger has been a very common approach to move the cursor along the screen in the current technology. The system detects any movement in the mouse or the finger to map it to the movement of the cursor. Some people who do not have their arms to be operational, called as 'amputees' will not be able to make use of the current technology to use the mouse. Hence, if the movement of their eyeball can be tracked and if the direction towards which the eye is looking at can be determined, the movement of the eyeball can be mapped to the cursor and the amputee will be able to move the cursor at will. An 'eye tracking mouse' will be of a lot of use to an amputee Currently, the eye tracking mouse is not available at a large scale, and only a few companies have developed this technology and have made it available. We intend to prepare an eye tracking mouse where most of the functions of the mouse will be available, so that the user can move the cursor using his eye. We try to estimate the 'gaze' direction of the user and move the cursor along the direction along which his eye is trying to focus. The pointing and clicking action of the mouse has remained a standard for quite some time. However, due to some reasons one may find them uncomfortable or in case of those who are unable to moves their hands, there arises a need for using these hands free mouse. Usually, eye movements and facial movements are the basis for hands free mouse.

MOTIVATION

The movements of the user are tracked using a camera and these can be mapped to the movements of the mouse pointer which is visible on the screen. that the movements of the eye can be read as an input and used to help the user access the interfaces without using any other hardware device such as a

mouse or a keyboard. This can be achieved by using image processing algorithms and computer vision. One way to detect the eyes is, by using the Haar cascade feature. The eyes can be detected by matching it with templates which would already be stored as suggested. To get an accurate image of iris an IR sensor can be used. A gyroscope can be used for the orientation of the head. The click operation can be implemented by 'gazing' or staring at the screen. Also, by gazing at a fraction of any portion of the screen (upper or lower), the scroll function can be implemented. Along with eye and movements, it becomes easier if we incorporate some subtle movements of the face and it's the parts as well. A real-time eye blink detection using facial landmarks brings out how the blink action can be detected using facial landmarks. This is a major aspect as blinking actions are necessary for translating it into clicking actions. Detecting eyes and other facial parts can be done using open CV and Python with dlib. Similarly even blink can be detected. With advanced technologies in this digital era, there is always scope for development in the field of computing. Hands free computing is in demand as of today it addresses the needs of quadriplegics. This paper presents a Human computer interaction (HCI) system that is of great importance to amputees and those who have issues with using their hands. The system built is an eye based interface that acts as a computer mouse to translate eye movements such as blinking, gazing and squinting towards the mouse cursor actions. The system in discussion makes use of a simple webcam and its software requirements are python (3.6), OpenCv, numpy and a few other packages which are necessary for face recognition. The face detector can be built using the HOG (Histogram of oriented Gradients) feature along with a linear classifier, and the sliding window technique. It is hands free and no external hardware or sensors are required. The face detector can be built using the HOG (Histogram of oriented Gradients) feature along with a linear classifier, and the sliding window technique. It is hands free and no external hardware or sensors are required with advanced technologies in this digital era, there is always scope for development in the field of computing. Hands free computing is in demand as of today it addresses the needs of quadriplegics. This paper presents a Human computer interaction (HCI) system that is of great importance to amputees and those. With advanced technologies in this digital era, there is always scope for development in the field of computing. Hands free computing is in demand as of today it addresses the needs of quadriplegics. This paper presents a Human computer interaction (HCI) system that is of great importance to amputees and those.

EXISTING SYSTEM

Eye trackers are the devices which are used to track the eye movement and the position of eye. There are mainly two types of eye trackers, devices are connected to the human body, and devices have no contact with the body. Currently, the eye tracking mouse is not available at a large scale, and only a few companies have developed this technology and have made it available. The hardware based equipment used for the eye gaze tracking caused discomfort to the people who were physically disabled. Because some devices need a physical contact with the user.

Problems in Existing System

- Complicated hardware required
- Expensive system
- Few eye trackers required physical contact causing discomfort
- Intrusive technique

PROPOSED SYSTEM

The system proposed in this paper works based on the following actions:

a) Squinting your eyes
b) Winking
c) Moving of head around (pitch and yaw)
d) Opening the mouth

Problem Definition

In today's digital age, where online transactions and interactions have become the norm, ensuring consumer trust and protection is paramount. The proliferation of ecommerce

platforms, social media networks, and online marketplaces has presented both opportunities and challenges for consumers. On one hand, there is unparalleled convenience and accessibility to a wide array of products and services. On the other hand, there is an increasing risk of encountering fraudulent practices such as fake reviews, counterfeit products, fraudulent payments, and malicious URLs.

Recognizing the need to address these challenges, a proposed solution aims to simplify the process of protecting customers from dishonest practices across various internet platforms. This solution revolves around centralizing the detection of fraudulent activities, specifically focusing on fake reviews, products, payments, and URLs. By consolidating detection processes, the solution seeks to streamline the effort required by users to uncover crucial information scattered across the web.

At its core, the solution aims to significantly reduce the time and effort consumers typically spend scouring the internet for important information related to the authenticity and trustworthiness of online content. By leveraging advanced detection algorithms and data analytics, the solution promises to deliver timely and accurate results, enabling consumers to make informed decisions with confidence.

Imagine a scenario where a consumer is considering purchasing a product online. In the past, they may have had to sift through countless reviews, cross-reference product details, and verify payment methods to ensure authenticity and reliability. However, with the proposed solution in place, this process becomes much simpler and more efficient Upon entering the product details or URL into the centralized detection system, the solution. Whether it's identifying fake reviews generated by bots, detecting counterfeit products, flagging suspicious payment methods, or warning against malicious URLs, the solution provides quick insights into the authenticity and trustworthiness of the online content.

OBJECTIVE

In an era where digital information is infinite, the primary difficulty is discerning the real thing from a fake. This research aims to comprehend the mysterious maze of reviews while navigating the perilous terrain of online landscapes, where it must contend with the constant threat of bogus URLs, deceitful websites, questionable payments, phony businesses, and counterfeit items. The goal is to equip users with a reliable compass to separate the real from the false, paving the way for wise choices in a virtual environment full of pretense. Online fraud is a growing problem that can harm both consumers and businesses. Existing fraud detection systems are often siloed, which means they only focus on one type of fraud such as fraudulent reviews or payments. This makes it difficult to get a complete picture of fraudulent activity and can lead to missed detection. Additionally, existing system can be time consuming as they need to search for information about potential fraud from multiple sources. Overall, the proposed system would be a more comprehensive and user-friendly solution for detecting online fraud.

SCOPE

The scope of our website is to prevent harmful or phony URLs, products, reviews, and payment links. a variety of harmful items will be detect by this website. The internet's exponential expansion has resulted in an increase in dishonest acts in the digital space. These tactics include phony websites, fraudulent payment schemes, bogus URLs, and phony online storefronts. We explore strategies including domain research, URL validation, and online content examination to solve the problem of bogus URLs and websites. The study also clarifies how to recognize and evaluate fraudulent reviews by using sentiment analysis and natural language processing to discern between authentic and fabricated comments. The article also covers techniques for identifying phony payment attempts, with a focus on anomaly detection,

encryption, and transaction monitoring. Our study emphasizes the significance of ecommerce platform monitoring, consumer awareness campaigns, and cooperation with law enforcement authorities in dismantling fraudulent networks in the context of phony online stores.

II. LITERATURE SURVEY

Generally, eye tracking measures the eyeball position and determines gaze direction of a person, and the movements of the eye can be tracked using different technologies. It can be categorized into four categories: infrared-oculography (IROG), scleral search coil method (SSC), electrooculography (EOG), and video-oculography (VOG). Currently, most of the eye tracking researches for HCI are based on VOG, because the VOG technique has minimized the invasiveness to user in some degree.

Chinet al.proposed a cursor control system for computer users, which integrated the electromyogram signals from muscles in the face and point-of-gaze coordinates produced by an eye-gaze tracking system as inputs. Although it could facilitate a reliable click operation, it was slower than the control system that only used eye tracking and the accuracy was low. Missimer and Betke constructed a system that uses the head position to control the mouse cursor and simulates left-click and right-click of the mouse by blinking left or right monocular. This system relied on the position of user's head to control the mouse cursor position. The irregular movement of user's head would affect the accuracy of click function. Lupu et al. proposed a communication system for people with disabilities, which was based on a special designed device composed of a webcam mounted on glasses frame for image acquisition and processing. The eye movement is detected by the device and the voluntary eye blinking is correlated with a pictogram or keyword selection reflecting patient's needs. The drawback of this system is that the image processing algorithm could not accurately detect the acquired image with low quality and is not robust to light intensity. Later, to improve the reliability of the communication system they proposed an eye tracking mouse system using video glasses and a new robust eye tracking algorithm based on the adaptive binary segmentation threshold of the acquired images.

Lately, several similar systems were also developed by scholars, and the main concept of these systems is to capture images from a camera either mounted on head gear worn by the user or mounted remotely and extract the information from different eye features to determine the point of the gaze. Since the commercial eye trackers were prohibitively expensive to use in HCI, all of the eye tracking control systems mentioned above were proposed with self-designed hardware and software. These systems were hard to achieve a widespread adoption.

There are various methods using which this can be achieved. The camera mouse was proposed by Margrit Betke et. al.[1] for people who are quadriplegic and nonverbal . The movements of the user are tracked using a camera and these can be mapped to the movements of the mouse pointer which is visible on the screen. Yet another method was proposed by Robert Gabriel Lupu, et. al.[2] for human computer interaction that made use of head mounted device to track eye movement and to translate it on screen. Another technique by Prof. Prashant salunke et.al [3] presents a techniques of eye tracking using Hough transform.

A lot of work is being done to improve the characteristics of HCI.A paper by Muhammad Usman Ghani, et. al [4] suggests that the movements of the eye can be read as an input and used to help the user access the interfaces without using any other hardware device such as a mouse or a keyboard[5]. This can be achieved by using image processing algorithms and computer vision. One way to detect the eyes is, by using the Haar cascade feature.The eyes can be detected by matching it with templates which would already be stored as suggested by Vaibhav Nangare et. al

[6]. To get an accurate image of iris an IR sensor can be used. A gyroscope can be used for the orientation of the head as suggested by Anamika Mali et. al [7]. The click operation can be implemented by 'gazing' or staring at the screen. Also, by gazing at a fraction of any portion of the screen(upper or lower), the scroll function can be implemented as proposed by Zhang et. al [8]. Along with eye movements, it becomes easier if we incorporate some subtle movements of the face and its parts as well. A real-time eye blink detection using facial landmarks as suggested by Tereza Soukupova and Jan ´ Cech [9] brings out how the blink action can be detected using facial landmarks. This is a major aspect as blinking actions are necessary for translating it into clicking actions. Detecting eyes and other facial parts can be done using open Cv and Python with dlib [10].Similarly even blink can be detected..the paper by Christos Sagonas et.al discusses the challenges of facial landmark localisation. Akshay Chandra proposes the same by controlling the mouse cursor using facial movements.

III. SYSTEM ARCHITECTURE

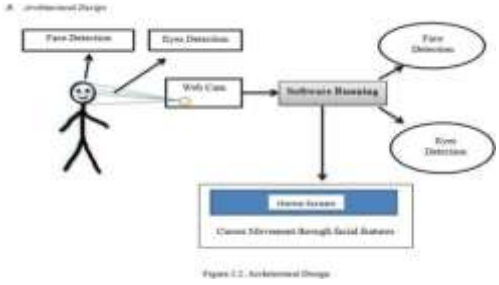

Fig: 5 :- System Architecture

IV. OUTPUT SCREENS

Activating the Mouse-Yawn

Fig 1 Activating the Mouse

Reading the input :

Fig – 2 Reading the input

Towards Left:

Fig 3: Dragging Cursor Towards Left

Towards Right:

Fig 4: Dragging Cursor Towards Right

Left Click:

Fig5: Left Click

V. CONCLUSION

In conclusion, This work can be extended to improve the speed of the system by using better trained models. Also, the system can be made more dynamic by making the change in the position of the cursor, proportional to the amount of rotation of the user's head, i.e., the user can decide, at what rate he wants the position of the cursor to change. Also, future research work can be done on making the ratio more accurate, since the range of the values are the result of the aspect ratios, which is usually small. Hence, to make the algorithm detect the actions more accurately, there can

be some modification in the formulae for the aspect ratios used. Also, to make the process of detection of the face more easy, some image processing techniques can be used before the model detects the face and features of the face.

Future Directions

In future, many people who are unable to operate a standard computer mouse or keyboard because of disabilities of their hands or arms, can get possible alternative in multimodal system, which allows controlling a computer without using standard mouse and keyboard. Using head movements to control the cursor across the computer screen and by using the speech for giving the control commands. Automatic speech recognition and head tracking in joint multimodal action are combined to operate the system.

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