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Survey on Eye Gaze Tracking to Control Cursor Movement

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Abstract: *In Controlling the mouse by a physically challenged person is really a tough one. To find a solution for the people who cannot use the Mouse physically, we have proposed this mouse cursor control using Eye Movements. Eye gaze is an alternative way of accessing a computer using eye movements to control the mouse. For someone who fine touch screens, mouse inaccessible, eye gaze is an alternative method to allow a user to operate their computer, using the movement of their eyes. Eye movement can be regarded as a pivotal real-time input medium for human-computer communication, which is especially important for people with physical disability. In order to improve the reliability, mobility, and usability of eye tracking technique in user-computer dialogue, a novel eye control system is proposed in this system using Webcam and without using any extra hardware. The proposed system focuses on providing a simple and convenient interactive mode by only using user's eye. The usage flow of the proposed system is designed to perfectly follow human natural habits. The proposed system describes the implementation of both iris and movement of cursor according to iris position which can be used to control the cursor on the screen using webcam and implemented using Python*

Keywords: Vulnerability, Web Application, Virtual Mouse, Human-Computer interaction

I. INTRODUCTION

The increasing demand for intuitive and immersive human-computer interaction has led to the development of novel input methods. Traditional mouse based interaction may not always be feasible or convenient, especially in virtual reality environments or for individuals with physical impairments.

To address these challenges, researchers have explored the use of machine learning techniques to develop human-controlled virtual mouse systems. These systems aim to interpret human gestures and translate them into corresponding mouse commands, enabling users to interact with digital interfaces in a more natural and flexible manner.

Eye-controlled virtual mouse technology allows users to interact with their computers using only their eyes. The technology is particularly useful for individuals with physical disabilities or motor impairments that make traditional computer input methods difficult or impossible. The system works by using an eye tracker to detect the movements of the user's eyes. This information is then translated into mouse movements, allowing the user to move the mouse pointer and click on items on the screen simply by looking at them.

Eye-controlled virtual mouse technology has the potential to significantly improve the quality of life for individuals with disabilities, allowing them to interact with computers in a way that was previously impossible.

II. RELATED WORK

Understanding Eye gaze Tracking to control cursor movement

The increasing reliance on web applications and online platforms has accentuated the critical need for robust cyber security measures. However, the pervasive nature of cyber threats poses a formidable challenge, necessitating the development and deployment of advanced tools to fortify digital assets. The problem at hand lies in the persistent vulnerabilities inherent in web applications, making them susceptible to a myriad of cyber-attacks that can compromise sensitive data, disrupt services, and inflict irreparable damage to an organization's reputation.

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As organizations deploy complex web applications to facilitate their operations and engage with customers, the risk landscape expands exponentially. Despite efforts to implement security best practices, the dynamic and evolving nature of cyber threats requires a proactive approach to identify and address vulnerabilities effectively.

Limitations and Challenges

Personal computer were initially used for solving mathematical problems processing. In recent years, however, computers have become necessary for every aspect of our daily activities. These activities range from professional application to personal uses such as internet browsing, shopping, socializing and entertainment. Computers are designed to be readily accessible for normal individuals. However, for individuals with severe physical disabilities such as cerebral palsy or amyotrophic lateral sclerosis, usage of computers is a very challenging task. There have been many research studies on human computer interface to improve the interaction between the user and the computer system. Most of these are applicable only to normal individuals. These interfacing methods include a touch sensitive screens, speech recognition methods and many others. Despite the success of these techniques, they were not suitable for the physically disabled individuals. Many researchers have tried to develop methods to help the disabled to interact with computers by using signals such as electroencephalography (EEG) from the brain, facial muscles signals (EMG) and electro-oculogram (EOG). Other methods include limbus, pupil and eye/eyelid tracking, contact lens method, corneal, pupil reflection relationship and head movement measurement. These methods require the use of attachments and electrodes to the head, which makes them impractical. Other high end techniques [8] that are based on infrared tracking of the eye movements to control computers were exceptionally expensive and were not affordable for those who need them.

III. METHEDOLOGY

Developing a methodology for a Flask web application incorporating features like user authentication, video streaming with computer vision capabilities for eye-controlled virtual mouse interaction, machine learning model integration, and MySQL database operations.

The application allows users to log in, register, and interact with a dynamic web interface that streams video from the user's camera.

It employs OpenCV, Mediapipe, and PyAutoGUI for facial landmark detection, eye movement interpretation, and mouse control. Machine learning models are used for gesture interpretation.

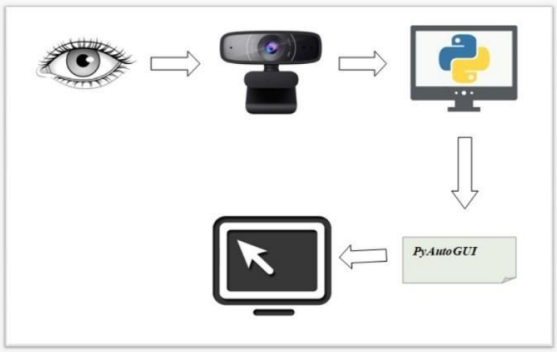

Fig.1 Block diagram

The System prototype uses camera input to identify and track the user's pupil in real-time. Computers or microcontrollers can use this "tracking" information to perform a variety of tasks. One of these tasks is to track the pupil-movement and then store that tracked eye movement to control a computer's mouse pointer, allowing someone with a disability like, say, Amyotrophic Lateral Sclerosis, to use it to communicate with others. It comes with a high resolution web camera that is strategically placed, as well as an open-platform software module that is simple to install and is compatible with all current laptops and desktop computers.

This system can be viewed as a seamless movement between the concept, design, and proof of concept phases.

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It involves implementing portions of research papers and collaborating with the open-source community to design and create a prototype, all while making sure that only open-source, affordable, easily accessible, and commercially off the shelf (COTS) items are used

IV. CONCLUSION

In conclusion, this project aims to develop a human-controlled virtual mouse system using machine learning techniques. By leveraging user gestures and corresponding mouse actions, the system will provide an intuitive and flexible input method for interacting with digital interfaces.

REFERENCES

[1]. K. Takemura, K. Takahashi, J. Takamatsu, and T. Ogasawara, "Estimating 3-D point-of-regard in a real environment using a head-mounted eye-tracking system," IEEE Transactions on Human-Machine Systems, vol. 44, no. 4, pp. 531–536, 2014.
[2]. R. J. K. Jacob and K. S. Karn, "Eye Tracking in human-computer interaction and usability research: ready to deliver the promises," Mind's Eye, vol. 2, no. 3, pp. 573–605, 2003.
[3]. O. Ferhat and F. Vilarino, "Low cost eye tracking: the current panorama," Computational Intelligence and Neuroscience, vol. 2016, Article ID 8680541, pp. 1–14, 2016.
[4]. M. A. Eid, N. Giakoumidis, and A. El Saddik, "A novel eye-gaze-controlled wheelchair system for navigating unknown environments: case study with a person with ALS," IEEE Access, vol. 4, pp. 558–573, 2016.
[5]. Huang, Yong, Ben Chen, and Daiming Qu, "LNSMM: Eye gaze estimation with local network share multiview multitask". arXiv preprint arXiv:2101.07116 (2021)
[6]. Tang, Yushou, and Jianhuan Su, "Eye movement prediction based on adaptive BP neural network". Scientific Programming (2021)
[7]. Ibrahim, Bishar R., et al., "Embedded system for eye blink detection using machine learning technique". 1st Babylon International Conference on Information Technology and Science (BICITS). IEEE, 2021.
[8]. Cazzato, Dario, et al., "Real-time gaze estimation via pupil centre tracking". Paladyn, Journal of Behavioural Robotics 9.1 (2018): 6-18.
[9]. Chandra, B., M. Rohit, and R. Sriram Vignesh, "Eyeball Movement Cursor Control Using OpenCV". ECS Transactions 107.1 (2022): 10005.
[10]. Q. Sun, J. Xia, N. Nadarajah, T. Falkmer, J. Foster, and H. Lee, "Assessing drivers' visual-motor coordination using eye tracking, GNSS and GIS: a spatial turn in driving psychology," Journal of Spatial Science, vol. 61, no. 2, pp. 299–316, 2016.
[11]. N. Scott, C. Green, and S. Fairley, "Investigation of the use of eye tracking to examine tourism advertising effectiveness," Current Issues in Tourism, vol. 19, no. 7, pp. 634–642, 2016.