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Gesture Recognition Based Virtual Mouse and Keyboard

Naresh Thoutam
Computer Engineering
Sandip Institute of Technology and Research Centre, Nashik
naresh.thoutam@sitrc.org

Bhumi chavan
Computer Engineering
Sandip Institute of Technology and Research Centre, Nashik
Bhumichauhan4321@gmail.com

Kabir Patole
Computer Engineering
Sandip Institute of Technology and Research Centre, Nashik
Patole1719@gmail.com

Sakshi Jadhav
Computer Engineering
Sandip Institute of Technology and Research Centre, Nashik
sakshi608104@gmail.com

Vidhya Bagal
Computer Engineering
Sandip Institute of Technology and Research Centre, Nashik
vidhyabagal19@gmail.com

Abstract **- In this project, an optical mouse and keyboard are created utilizing hand motions and computer vision. The computer's camera will scan the image of various hand gestures made by a user, and the computer's mouse or pointer will move in accordance with the movements of the Users can even conduct right and left clicks using various gestures. Similar to this, several gestures can be used to operate the keyboard, such as the one-finger gesture for selecting an alphabet and the four-figure motion for swiping left and right. Without a wire or other external devices, it will function as a virtual mouse and keyboard. The project's webcam is its sole piece of hardware, and Python is used to code on the Anaconda platform. Here, the Convex hull defects are first constructed, and then an algorithm is generated and maps the mouse and keyboard functions to the defects using the defect calculations. By mapping a few of them with the mouse and keyboard, the computer will recognise the user's gesture and respond appropriately.**

Index Terms - Optical Mouse, Face Recognition, Virtual Mouse And Keyboard, Anaconda Platform

I. INTRODUCTION

A small green box will appear in the centre of the screen while the computer webcam records video of the person using it while they are seated in front of it. The objects displayed there will be processed by the code and compared with it in that green box. If they match, a red border will appear, indicating that the computer has located the object. The mouse pointer can then be moved by dragging the object. This will contribute to the computer's security as well as the creation of a virtual computing environment. Using hand gestures, the cursor will be moved here in place of various objects. A different gesture will be used for a right click and a different gesture for a left click. In a similar manner, keyboard functions that would typically be performed on a physical keyboard can be emulated using a single gesture. When the recognised gesture is detected, a red border will appear if the gesture does not match the box, which will only display a green box otherwise.

A. Motivation

The goal is to develop a virtual human computer interface and an object tracking application for computer interaction. Develop such an AI-related application.

B. Problem Definition

In PCs and laptops, we often use physical mouse or touchpads for personal use. However, in this project, the need for external hardware is completely eliminated by employing HCI technology, which detects hand and eye gestures as well as mouse movements and events.

II. RELATED WORK

Paper 1: Research on Deep Learning-Based Hand Gesture Recognition"
Authors: Shu-Bin Zhang, Ting-Ting Ji, and Jing-Hao Sun
The need for interaction between humans and machines is growing as computer vision technology advances quickly. Hand gesture recognition is frequently utilised in robot control, intelligent furniture, and other areas because hand motions can represent enhanced information. The segmentation of hand gestures is accomplished in this study by developing a skin colour model and an AdaBoost classifier based on haar to account for the specificities of skin colour for hand motions. Additionally, hand movements are denaturized with one frame of video being cut for analysis.In this sense, the human hand is separated from the complex background, and the CamShift algorithm also makes it possible to track hand gestures in real-time. Convolutional neural network then recognises the area of hand motions that have been detected in real-time in order to achieve the recognition of 10 common digits. Research indicates 98.3% accuracy.
Paper 2: Personalized and Dynamic Keyboard for Eye Tracker Typing
Authors: Kadir Akdeniz and Zehra C. ataltepe
Stroke and Amyotrophic lateral sclerosis (ALS) patients are unable to speak or convey their daily necessities. Since they can still move their heads and use their eyes, they can converse via eye trackers. This study offers fresh ideas for enhancing the speed and usability of eye tracking software. First, letter prediction is used to increase speed, and second, a novel design eliminates the need for blinking while using eye

trackers, allowing for more comfortable and extended writing sessions.

"Paper 3: Visual gesture decoding algorithm for an assisted virtual keyboard"

Authors:Rafael Augusto Da Silva, an IEEE member, and Antonio Claudio Paschoarelli Veiga, an IEEE member,

One of the most common computer tasks is creating text, a simple task that can be difficult for those with severe neuromotor illnesses like Amyotrophic Lateral Sclerosis, which can cause Locked-in syndrome. Since these people may only be able to communicate and engage with the outside world through eye movements, they require augmentative and alternative communication tools. This study explores eye movement-based interaction techniques and introduces a virtual keyboard that accepts text input via gaze detection.

Paper 4: "Using Colored Finger Tips and Hand Gesture Recognition, Virtual Mouse Control,"

Authors: Galla Vamsi Krishna, Thumma Dhyanchand, and Vantukala VishnuTeja Reddy

One study in the field of human-computer interaction uses a virtual mouse with finger tip recognition and hand motion tracking based on image in a live video.

This work proposes finger tip identification and hand motion detection for virtual mouse control. The two finger tracking techniques used in this study are hand gesture detection and employing coloured caps.

III. SYSTEM DESIGN

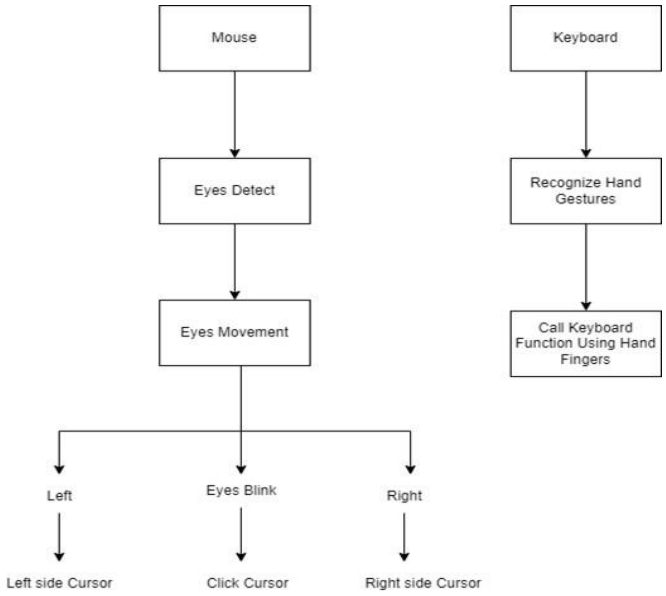

Fig.1 System Architecture

Python was used to design the mouse system, and the following Python modules were imported to make the system operate. A Python extension module is called Numpy.

It offers quick and effective actions on collections of related data. Scipy is a Python library that is open-source and used in technical and scientific computing. A library of programming tools with a primary focus on real-time computer vision is called OpenCV. A Python-based, cross-platform GUI automation module is called PyautoGUI. This allows you to automate computer chores by controlling the mouse and keyboard as well as performing simple picture recognition. The device uses the webcam to identify a person's pupil. Students discovered that a person can now move the mouse cursor by moving his eyes.

On the computer's home screen, the cursor movement is visible. We followed these steps to type on the virtual keyboard using our fingertip:

Step 1: Using the computer's webcam to record live video

Step 2: Processing each every image frame from the recorded video

Step 3: Image frame conversion

Step 4: Virtual Keyboard

Step 5: Hand landmarks are used to recognise hand gestures.

Step 6: Find the object's position over the virtual keyboard and flip the input device.

Step7.The character Convolutional Neural Network identification techniques should be printed.

The machine then finds the face. After the system identifies and captures the eyes, advantages of gesture recognition The system then finds the pupils. The system used to improve a number of fields, including starting to move the mouse cursor by tracking pupil movements, is described in the final module.

Module 1 GUI: We have designed our GUI in TKinter.Tkinter is a Python binding to the Tk GUI toolkit. It is the standard Python interface to the Tk GUI toolkit, and is Python's de facto standard GUI.

Module 2: Registration/Login System: User need to Register before using the application. User’s data will get store into the database and while user login to the system database will be get fetch.If user is registered then only they can login to the system.

Module 3: Database Module: Database is used to store data of user. We have used DBsqlite database.

Module 5: Mouse Functioning:The system is a mouse-like eye-based interface that converts eye movements like blinking, staring, and squinting into mouse cursor actions. The software requirements for this technique include Python, OpenCV, NumPy, and a few more facial recognition Harr Cascade algorithm, as well as a basic camera.

Module 6:keyboard Functioning: Keyboard functioning will be managed by gesture methods. We are using forefinger and mid finger for gestures. We are locating coordinates as top, mid and base. As a finger moves we will manage using keyboard.

CONCLUSION

This proposal suggests a system that would recognise hand gestures and take the place of the keyboard and mouse. This covers mouse cursor movement, keyboard drag-and-click actions, and other keyboard functionality like printing alphabets. The skin segmentation technique is used to isolate the hand's colour and picture from the background. The full body being taken into the camera can be resolved using the remove arm technique. The suggested method can generally detect and understand hand gestures, allowing it to control keyboard and mouse functions and produce a real-world user interface. 3D printing, architectural renderings, and even performing medical procedures remotely.

This project is simple to construct, and it has a wide range of potential applications in the field of medicine where computing is necessary but has not yet been completely realised due to a lack of human-computer connection.

FUTURE WORK

The technique will work well in the future for fundamental pointing and pinching. Nonetheless, there are still a lot of things that can be done better. Currently The system's background is static, but the deployment of this hand tracking device would be highly advantageous and essential. setting up the augmented reality environment so that a user could use a head-mounted display to interact with virtual 3D environments while wearing real-world objects. Since there is a layer of capturing capability needed in this case, multiple multidimensional camera angles are needed to capture the hand motions.

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