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OPERATING VIRTUAL MOUSE AND KEYBOARD USING GESTURE RECOGNITION

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Abstract : In this Paper, computer vision has advanced to the point where a machine can recognize its owner by running a straightforward picture processing application. People are employing this in this period of growth because of vision in a variety of everyday activities, including Face Recognition, Colour Detection, Autopilot Cars, etc. In this paper, computer vision, or a camera, will be utilized to recognize hand gestures to create a virtual mouse and keyboard. The computer's camera will scan the image of various hand gestures made by a user, and the computer's mouse cursor will move and even carry out various functions using various movements under the gestures. Similar to how some other motions can be used to access keyboard features. Without a wire or other external devices, it will function as a virtual mouse and keyboard. The laptop webcam is its sole piece of hardware, and Python is used for development. This project will use cutting-edge Machine Learning and Computer Vision algorithms to recognize hand movements, and it operates without the need for any additional hardware

IndexTerms **- Face Recognition, Machine Learning, Virtual Mouse And Keyboard Anaconda Platform**

I. Introduction

II.

Human-computer interaction will make simple by using only hand gestures with the help of a virtual mouse and keyboard developed from hand gestures. The amount of direct contact with the computer will minimal. Static and dynamic hand gestures can be used to virtually control many of the input and output activities. When using wireless devices, such as a wireless mouse or keyboard, a battery will be needed to power the device while it will be in use. However, in this project, the user manipulates the computer's mouse and keyboard using hand gestures and either a built-in camera or a webcam.

It has been suggested that the recognition of hand gestures will a key to the industry development technology for HCI. Without even physically touching objects like a mouse or a keyboard, they enable computers to record hand motions and carry out given directions.

II.Motivation

- To use the devices in the COVID-19 situation which are used by the public in offices or internet cafes. It is not safe to touch them because it may result in a possible situation of virus spread.
- To create a system that can replace the conventional mouse and keyboard for performing and controlling mouse and keyboard functions. This can be done with the use of a web camera that records hand movements and then processes the frames to carry out the specific mouse and keyboard functions.
- To Gives a wide scope in developing a unique way of human-Machine Interaction

III.Problem Definition

To proposed Hand Gestures based virtual mouse and keyboard system can be used to solve real- world issues like when there will be no power backup for a wireless mouse and keyboard to operate and situations where there is no room for a physical mouse or keyboard to use. A person can easily control his or her computer within a greater range wireless without any powered backup device, i.e., only using hands, but in a situation like COVID-19 it is not safe to use the devices which are used by the public in offices or internet cafes by touching them it may result in a possible situation of virus spread. The proposed Hand Gestures based virtual mouse and keyboard system can be used to overcome this problem.

III. Objective

- To solve real-world issues like when there is no power backup for a wireless mouse and keyboard to operate and situations where there is no room for a physical mouse or keyboard to use
- To create a replacement for the conventional mouse and keyboard system to perform and control the mouse and keyboard functions
- To develop a system for specially abled people.

V.Related Work

Today, computer vision has advanced to the point where a machine can recognize its owner by running a straightforward picture-processing application. People use this vision in many parts of daily life at this stage of development, including face recognition, colour detection, automatic cars, etc. 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 by the movement of the movements.

Users can even conduct right and left clicks using various gestures. Similarly, 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 develop 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 can recognize the user's motion and respond appropriately.[1]

Using a simple picture processing method, a computer can now recognize its user thanks to advancements in computer vision. At this stage of development, people use this vision for many aspects of daily living, including face identification, colour recognition, autonomous vehicles, and others. This study employs computer vision to develop an optical mouse and keyboard that recognize hand motions. The computer's camera will scan the image of different hand gestures, and the mouse or pointer will move by the movement of the gestures, including performing right and left clicks utilizing separate gestures. The keyboard can also be operated with a variety of gestures, such as a one-finger gesture to select an alphabet and a four-figure gesture to swipe left and right. It will work as a virtual mouse and keyboard in the absence of any wires or other devices [2].

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.[3]

One study in the field of human-computer interaction uses a virtual mouse with fingertip recognition and hand motion tracking based on the 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.[4]

Today, computer vision has advanced to the point where a machine can recognize its owner by running a straightforward picture-processing application. People use this vision in many parts of daily life in the current technological age, including face recognition, colour detection, autonomous vehicles, etc. In this project, computer vision, or a camera, is utilized to recognize hand gestures to create a virtual mouse and keyboard.[5]

In this project, we suggest using a body gesture as an interface to traverse the displayed multimedia video content rather than a mouse and keyboard. To build the instructions of inter-activities for real applications, we have established several control modes that are based on human natural movements.[6]

3.1 Theoretical framework

Algorithm:

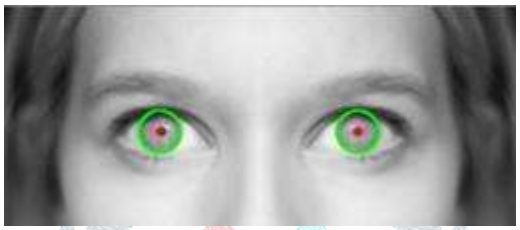
The algorithm's objectives are to detect movements quickly in real-time, eliminate interference, and make it harder to capture accidental gestures. In this project, static gesture controls such as on, off, rising, and decreasing are used. The area of artificial intelligence and image processing that is expanding most quickly is gesture recognition. To control computers and other electronic appliances, gesture recognition is a process that identifies the movements or postures of various human body parts.

Understanding of Hand Gestures. A straightforward rule classifier may be used to identify the hand motion once the fingers have been observed and identified. The rule classifier predicts the hand motion based on the number and distribution of fingers found. What fingers are detected depends on the content of the fingers.

Haar Cascade:

No matter where they are in the image or how big they are, objects can be found using the process known as the Haar cascade. This algorithm can operate in real time and is not overly complex. A haar-cascade detector can be trained to recognize a variety of items, including automobiles, bikes, structures, fruits, etc. The cascading window is used by Haar cascade, which tries to compute features in each window and determine whether it might be an object.

All well-known haar cascades are maintained in a repository by the OpenCV library and can be used for:



- Detect eyes
- Detection of human faces
- Eye recognition
- Mouth/nose detection

3.2 RESEARCH METHODOLOGY

The mouse system will be created in Python, and for it to work, the following Python modules have to be loaded:
Numpy is a Python extension module. The Open-source Python library Scipy is utilized in technical and scientific computing. OpenCV is a collection of programming tools with a main interest in real-time computer vision. PyautoGUI is a Python-based, cross-platform GUI automation module. This enables to automation of computer tasks by managing the mouse and keyboard in addition to carrying out basic image recognition. The device recognizes a person's pupil using the webcam. We will learn that one can now control the mouse cursor by eye movement.

The pointer movement can be seen on the computer's home screen. To type using our fingertip on the virtual keyboard, we will take the following actions:

Step 1: Use the webcam of the PC to capture live video

Step 2: Processing every image frame from the recorded video Step 3:frame-to-image conversion
Step 4: Virtual Keyboard

Step 5: Hand gesture recognition relies on hand landmarks.

Step 6: Position the item over the simulated keyboard, which turns on the input device. Step7.Convolutional Neural Network character identification methods should be printed

System architecture

The computer then locates the face. The benefits of gesture recognition begin after the system recognizes and captures the eyes. Then the system locates the person. The last module will describe the method used to advance some fields, such as beginning to move the mouse cursor by observing pupil movements.
Module 1 GUI: Our GUI will create in Tkinter. The Python binding for the tk GUI toolkit is called Tkinter. It serves as the default GUI for Python and is the official Python interface to the tk GUI toolkit.
Module 2: System for Registration and Login: Before using the application, users must register. Users' data will be stored in the database, which will then be fetched when they login to the system. Only those who have registered may log in to the system.

Module 3 Database Module: User data will be stored in databases.

Module 4: Mouse-like eye-based interface that translates eye motions like blinking, gazing, and squinting into movements of the mouse cursor. This method requires a basic camera in addition to Python, OpenCV, NumPy, and a few more facial recognition algorithms using the Harr Cascade algorithm.

Module 5 Keyboard Usage: Gesture-based controls will be used to control keyboard usage. For gestures, we use the forefinger and middle finger. We will use the top, mid, and base as our locating coordinates. We will use a keyboard to manage finger movement

Acknowledgment

The basic goal of the hand gestures-based virtual mouse and keyboard system is to utilize hand gestures rather than a physical mouse or keyboard to operate the mouse pointer and keyboard functionalities. The suggested system can be implemented by utilizing a webcam or an integrated camera that recognizes hand motions and hand tips and processes these frames to carry out certain mouse and keyboard activities. We may infer from the model's results that the suggested Hand gestures virtual mouse and keyboard system has performed admirably, has better precision than the existing models, and also effectively gets around the majority of the drawbacks of the latter. Since the proposed mouse and keyboard system can be utilized virtually using hand gestures instead of the conventional physical mouse or keyboard, it may be used for real-world applications and can also be used to stop the spread of COVID-19 because it has more accuracy. The model has certain drawbacks, including a slight loss of precision in the scrolling mouse function, some challenges with clicking and dragging to pick text, and the inability to select all of the keyboard's keys with a pinch gesture. As a result, we will seek to address these issues by enhancing the fingertip detection algorithm to deliver more accurate results and expanding the implementation of keyboard keys.

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