

VIRTUAL MOUSE USING HAND GESTURE

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Abstract

This project promotes an approach for the human computer interaction (HCI). Where we use real time camera for controlling the mouse function. Our proposed project is on hand gesture based system that allows users to control desktop mouse movements using hand gesture. To detect hand gesture movements, our system makes use of a desktop webcam. The goal is to control mouse cursor functions with a simple camera or webcam rather than a traditional or standard devices. Using only a camera, the Virtual Mouse provides an infrastructure between the user and the machine. It enables the user to interact with a machine without the need for any mechanical or physical devices, and even allows to control mouse functions. The domain of the project is AI/ML. The programming language we used in this project is python. This AI virtual mouse project is based on the concept of computer vision.

Key Words: Open CV, Hand-gestures, Virtual mouse, Image processing.

1. INTRODUCTION

With the development technologies in the areas of augmented reality and devices that we use in our daily life, these devices are becoming compact in the form of Bluetooth or wireless technologies. This paper proposes an AI virtual mouse system that makes use of the hand gestures and hand tip detection for performing mouse functions in the computer using computer vision. The main objective of the proposed system is to perform computer mouse cursor functions and scroll function using a web camera or a built-in camera in the computer instead of using a traditional mouse device. Hand gesture and hand tip detection by using computer vision is used as a HCI with the computer. With the use of the AI virtual mouse system, we can track the fingertip of the hand gesture by using a built-in camera or web camera and perform the mouse cursor operations and scrolling function and also move the cursor with it.

While using a wireless or a Bluetooth mouse, some devices such as the mouse, the dongle to connect to the PC, and also, a battery to power the mouse to operate are used, but in this paper, the user uses his/her built-in camera or a webcam and uses his/her hand gestures to control the computer mouse operations. In the proposed system, the web camera captures and then processes the frames that have been captured and then recognizes the various hand gestures and hand tip gestures and then performs the particular

mouse function. Python programming language is used for developing the AI virtual mouse system, and also, OpenCV which is the library for computer vision is used in the AI virtual mouse system. In the proposed AI virtual mouse system, the model makes use of the MediaPipe package for the tracking of the hands and for tracking of the tip of the hands, and also, some packages were used for moving around the window screen of the computer for performing functions such as left click, right click, and scrolling functions. The results of the proposed model showed very high accuracy level, and the proposed model can work very well in real-world application with the use of a CPU without the use of a GPU..

1.1. Problem Description and Overview

The proposed AI virtual mouse system can be used to overcome problems in the real world such as situations where there is no space to use a physical mouse and also for the persons who have problems in their hands and are not able to control a physical mouse. Also, amidst of the COVID-19 situation, it is not safe to use the devices by touching them because it may result in a possible situation of spread of the virus by touching the devices, so the proposed AI virtual mouse can be used to overcome these problems since hand gesture and hand Tip detection is used to control the PC mouse functions by using a webcam or a built-in camera.

1.2. Objective.

The main objective of the proposed AI virtual mouse system is to develop an alternative to the regular and traditional mouse system to perform and control the mouse functions, and this can be achieved with the help of a web camera that captures the hand gestures and hand tip and then processes these frames to perform the particular mouse function such as left click, right click, and scrolling function.

Hardware requirement:

1. Webcam

To get an image, a webcam is required. Mouse sensitivity is constant with digicam clarity. The excellent consumer information is demonstrated whilst the digicam configuration is high enough. The camera is used for real-time images at any time the pc is on. The system will pick out the suitable movement primarily based on the contact and finger movement.

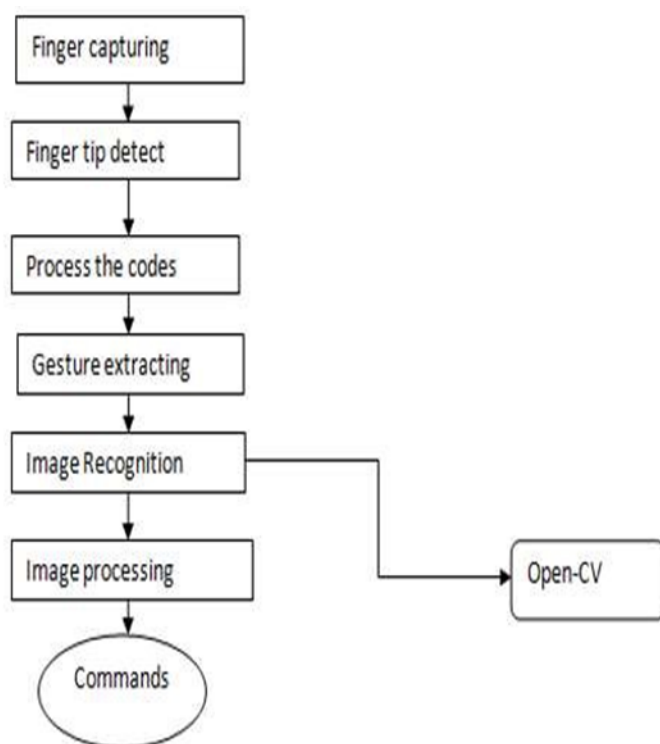
Software Requirement:

1. OpenCV

OpenCV is a massive open-source library of computer imagination and prescient, machine mastering, and picture processing and now performs a primary function. in real-time performance is the maximum important in current systems. with the aid of the usage of it, one could system images and motion pictures to peer matters, face, or even human handwriting.

2. METHODOLOGY

Within the methodology, the technique utilized in every issue of the system might be defined one at a time. They are the following subsections:



A. Camera Used in the Virtual Gesture Mouse project

Open-CV is python vision library that contains Associate in the organized AI virtual mouse system depends upon the edges that are gotten by the camera in Associate in nursing passing PC. In a virtual mouse project using hand gestures, various camera options can be utilized. This includes webcams, depth-sensing camera, infrared cameras and smartphone cameras. The choice depends on factors such

as cost, tracking accuracy, availability, and project requirements. Each camera type has its advantages and limitations, and the selection should be based on the specific needs of the virtual mouse implementation.

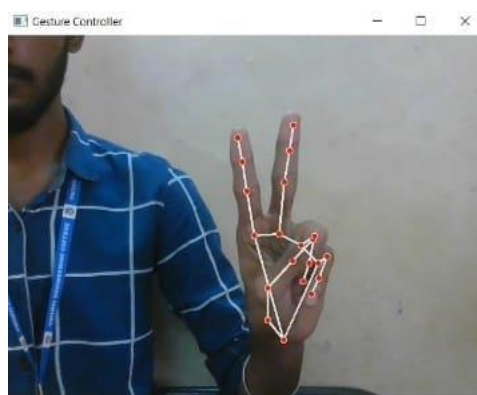
B. Palm For No Movement

The AI virtual mouse framework utilizes the instructive algorithmic rule, and it changes over the co-ordinates of tip from the camera screen to the pc window full screen for the mouse. Whenever the hands unit saw and keeping in mind that we've missing to see that finger is up for topic the specific mouse perform, Associate in Nursing rectangular box is attracted concerning the pc window at ranges the camera locale any spot we've a penchant to will every now and again move all through the window plan the mouse pointer, as displayed fig.



C. Moving cursor

The hand gesture movements are captured by a camera or sensor-based technology. Machine learning algorithms recognize the gestures performed by the hand. The recognized gestures are then mapped to corresponding cursor movements. The system generates signals or commands to control the cursor's position on the screen



D. For the Mouse to Perform Left Button Click.

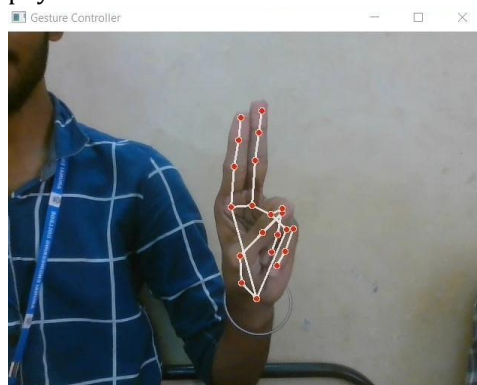
Closing the left finger, such as the index finger, can be recognized as a gesture to perform a left click action. When

the system detects this gesture, it generates a command or signal to simulate a left click event. This command is then sent to the operating system or application, triggering the desired action, such as selecting an object or executing a function. By closing the left finger, users can easily perform left click actions without the need for a physical mouse button.



E. For the Mouse to Perform Double Click

Joining two fingers, such as the index and middle fingers, can be recognized as a gesture to perform a double-click action. When the system detects this gesture, it generates a command or signal to simulate a double-click event. This command is then sent to the operating system or application, triggering the desired action, such as opening a file or selecting text. By joining two fingers, users can easily perform double-click actions without the need for a physical mouse button.



F. For the Mouse to Perform Right Button Click

Closing the center finger, such as the middle finger, can be recognized as a gesture to perform a right click action. When the system detects this gesture, it generates a command or signal to simulate a right click event. This command is then sent to the operating system or application, triggering the desired action, such as accessing context menus or performing secondary functions. By

closing the center finger, users can easily perform right click actions without the need for a physical mouse button.



G. DRAG AND DROP

Closing the hand or making a fist gesture can be recognized as a gesture to initiate a drag and drop operation. When the system detects this gesture, it marks the start of the drag action. The user can then move their hand while maintaining the closed position to simulate dragging an object. Releasing the hand or opening the fist gesture signals the drop action, completing the drag and drop operation. This allows users to interact with objects on the screen and manipulate them using intuitive hand gestures without the need for a physical mouse.



H. STOP PROGRAM

Joining the thumb finger and index finger can be recognized as a gesture to stop the hand gesture program. When the system detects this gesture, it interprets it as a command to halt the recognition and processing of hand gestures. This action allows the user to pause or deactivate the virtual mouse functionality and revert to regular mouse control or other modes of interaction. By joining the thumb finger and index finger, users can easily stop the hand gesture program and switch to alternative methods of input if needed.



3. APPLICATIONS

The AI virtual mouse system is useful for many applications; it can be used to reduce the space for using the physical mouse, and it can be used in situations where we cannot use the physical mouse. The system eliminates the usage of devices, and it improves the human-computer interaction. Major applications:

- (i) The proposed model has a greater accuracy of 99% which is far greater than the that of other proposed models for virtual mouse, and it has many applications.
- (ii) Amidst the COVID-19 situation, it is not safe to use the devices by touching them because it may result in a possible situation of spread of the virus by touching the devices, so the proposed AI virtual mouse can be used to control the PC mouse functions without using the physical mouse.
- (iii) Persons with problems in their hands can use this system to control the mouse functions in the computer.

4. FUTURE SCOPE:

The proposed AI virtual mouse has some limitations such as small decrease in accuracy of the right click mouse function and also the model has some difficulties in executing clicking and dragging to select the text. These are some of the limitations of the proposed AI virtual mouse system, and these limitations will be overcome in our future work. Furthermore, the proposed method can be developed to handle the keyboard functionalities along with the mouse functionalities virtually which is another future scope of Human-Computer Interaction (HCI).

5. CONCLUSIONS

The main objective of the AI virtual mouse system is to control the mouse cursor functions by using the hand gestures instead of using a physical mouse. The proposed system can be achieved by using a webcam or a builtin camera which detects the hand gestures and hand tip and processes these frames to perform the particular mouse functions. From the results of the model, we can come to a conclusion that the proposed AI virtual mouse system has performed very well and has a greater accuracy compared to the existing models and also the model overcomes most of the limitations of the existing systems. Since the proposed model has greater accuracy, the AI virtual mouse can be used for real-world applications, and also, it can be used to reduce the spread of COVID-19, since the proposed mouse system can be used virtually using hand gestures without using the traditional physical mouse. The model has some limitations such as small decrease in accuracy in right click mouse function and some difficulties in clicking and dragging to select the text. Hence, we will work next to overcome these limitations by improving the finger tip detection algorithm to produce more accurate results.

6. REFERENCE

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