AI VIRTUAL MOUSE

[1]Project Guide: Prof. Namrata Khade

[1]Miss. Sharayu Aswale, [2]Miss. Nisha Kushwaha, [3]Miss. Yukta Bisen, [4]Miss. Reena Chaudhari, [5]Miss. Trupti Ramteke

Computer Science and Engineering Department,

Priyadarshini College of Engineering
RTMNU, Nagpur, Maharashtra, India

Abstract:

This projects promotes an approach for the human computer interaction(HCL). 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 projects is python.This ai virtual mouse project is based on the concept of computer vision.

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.

2. COMPONENTS

The components used in this venture cannot be   detailed, as this assignment is an example for all computer systems. So, for positive The requirements are as follows:

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:
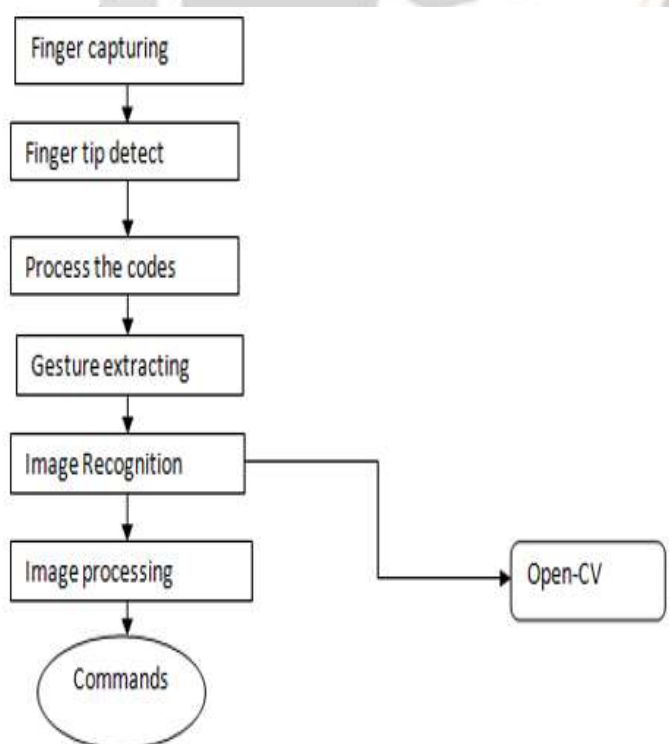
## A. Camera Used in the Virtual Gesture Mouse project

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. Pictures can be conveyed in

concealing layered with 3 channels , Grayscale with pixel values fluctuating from 0 (dull) to 255 (white), and twofold portraying dim or white characteristics (0 or 1) specifically.
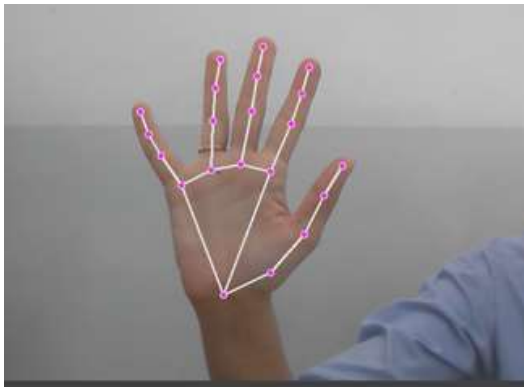
B. Moving Hand through the Window using Rectangular Area

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.
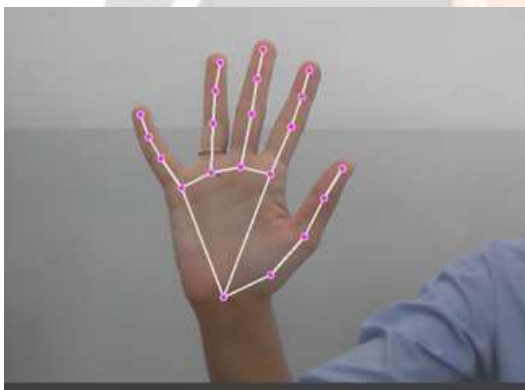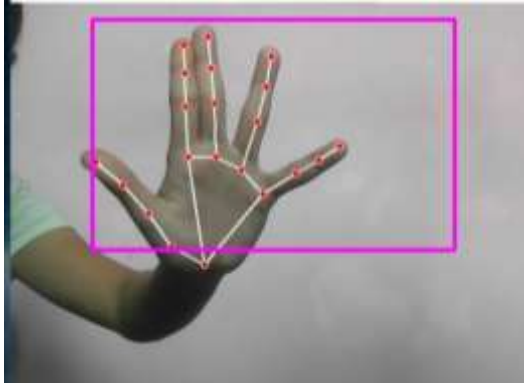

C. For the Mouse to Perform Left Button Click. If both the index finger with tip Id = 1 and the thumb finger with tip Id= 0 are up and the distance between the two fingers is lesser than 30px and like both the tips gets attached, the computer is made to perform the left mouse butto
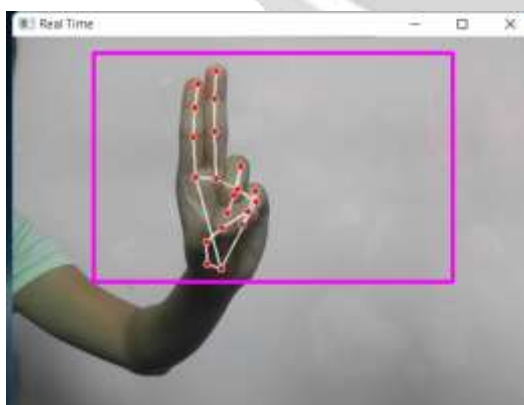
D. For the Mouse to Perform Double Click
If the index finger with tip Id =1 and the middle finger with tip Id = 2 are up and the distance between the two fingers is lesser than 40px , and other finger are also in upward direction but the distance between them is greater than 40px, the computer is made to perform the double click.

E. For the Mouse to Perform Right Button Click
If the index finger with tip Id =1 and the thumb finger with tip Id = 0 are up and the distance between the two fingers is greater than 40px ,rest of the finger are in downward direction, the computer is made to perform the right mouse button click.

F. For the Mouse to Perform Scroll up Function
If both the index finger with tip Id =1 and the middle finger with tip Id = 2 are up and the distance between the two fingers is lesser than 40 px and if the two fingers are moved up the page, the computer is made to perform the scroll up mouse function.


G. For the Mouse to Perform Scroll down Function
If both the index finger with tip Id = 1 and the middle finger with tip Id = 2 are down and the distance between the two fingers is lesser than 40px, the two fingers are moved down the page,the computer is made to perform the scroll down mouse function.

H. To Perform Refresh Function

If all the finger are in downward direction. The Finger are like wrist .When the fingers gets wristed and the wrist gets open immediately. This wrist function of finger performs the refresh function.
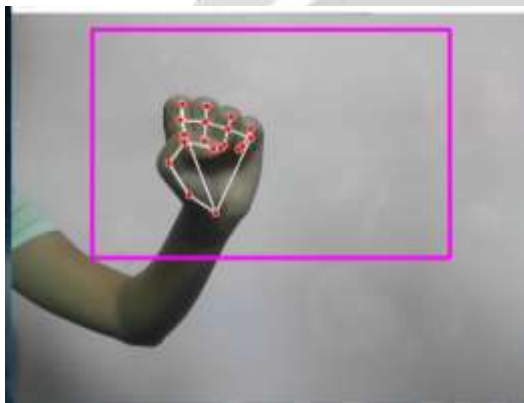
3. APPLICATIONS

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.

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).

4. CONCLUSIONS

Th 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 built-in 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.

5. Reference

1] J. Katona, "A review of human–computer interaction and virtual reality research fields in cognitive InfoCommunications," Applied Sciences, vol. 11, no. 6, p. 2646, 2021.

[2] D. L. Quam, "Gesture recognition with a DataGlove," IEEE Conference on Aerospace and Electronics, vol. 2, pp. 755–760, 1990.

[3] D.-H. Liou, D. Lee, and C.-C. Hsieh, "A real time hand gesture recognition system using motion history image," in Proceedings of the 2010 2nd International Conference on Signal Processing Systems, July 2010.

[4] S. U. Dudhane, "Cursor control system using hand gesture recognition," IJARCCE, vol. 2, no. 5, 2013.

[5] K. P. Vinay, "Cursor control using hand gestures," International Journal of Critical Accounting, vol. 0975–8887, 2016.

[6] L. $omas, "Virtual mouse using hand gesture," International Research Journal of Engineering and Technology (IRJET, vol. 5, no. 4, 2018.

[7] P. Nandhini, J. Jaya, and J. George, "Computer vision system for food quality evaluation—a review," in Proceedings of the 2013 International Conference on Current Trends in Engineering and Technology (ICCTET), pp. 85–87, Coimbatore, India, July 2013.

[8] J. Jaya and K. $anushkodi, "Implementation of certain system for medical image diagnosis," European Journal of Scientific Research, vol. 53, no. 4, pp. 561–567, 2011.

[9] P. Nandhini and J. Jaya, "Image segmentation for food quality evaluation using computer vision system," International Journal of Engineering Research and Applications, vol. 4, no. 2, pp. 1–3, 2014.

[10] J. Jaya and K. $anushkodi, "Implementation of classification system for medical images," European Journal of Scientific Research, vol. 53, no. 4, pp. 561–569, 2011. [11] J. T. Camillo Lugaresi, "MediaPipe: A Framework for Building Perception Pipelines," 2019, https://arxiv.org/abs/1906.08172.

[12]Google,MP,https://ai.googleblog.com/2019/08/on-devicereal-time-hand-tracking with.html.

[13] V. Bazarevsky and G. R. Fan Zhang. On-Device, MediaPipe for Real-Time Hand Tracking.

[14] K. Pulli, A. Baksheev, K. Kornyakov, and V. Eruhimov, "Realtime computer vision with openCV," Queue, vol. 10, no.4, pp. 40–56, 2012.