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Virtual Mouse Controlling using Hand Gestures

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ABSTRACT

There have been many developments towards the Human-Computer Interaction. Most existing approaches involve changing mouse parts such as adding more buttons or changing the position of the tracking ball. Our proposed system serves a new approach for controlling mouse movement using hand tracking modules. The project mainly aims at mouse cursor movements and click events using hand gestures. We will be using a camera for computer vision technology, such as image segmentation and gesture recognition, to oversee mouse tasks and show how it can perform everything that the current mouse devices can. The software will be developed in Python Language, OpenCV and PyAutoGUI for mouse functions. This method mainly focuses on the use of a Web Camera to develop a virtual Human-Computer Interaction device. This is a step forward in the of HMI (Human-Machine Interaction). Even if wireless or Bluetooth mouse technology has yet to be established, it is not device-free. A Bluetooth mouse necessitates the usage of a battery and a connected dongle. The system takes frames using a webcam or built-in camera, analyses them to make them trackable, and the detects and performs mouse functions based on the gestures performed by users. As a result, the suggested mouse system eliminates the need for a device.

KEYWORDS: Virtual Mouse, Hand Gestures, Open cv, Media pipe, Pyautogui.

INTRODUCTION

It has been generations since we have been using hand gestures for communicating in human society. The shaking of hands, thumbs up and thumbs down signs have been ever existing in the environment. It is believed that gestures are the easiest way to interact with anyone. So then why not apply it to the machines that we are using. In this work we are demonstrating real gesture. The initial set up includes a low-cost USB web camera that can be used for providing the input to the system. The complete process is divided into 4 steps which are frame capturing, image processing, region extraction and feature matching. The conventional human-machine interaction has evolved because of virtualization and the longterm shift towards immersive technologies like the metaverse. With the advancement of technology, devices are becoming smaller and smaller. Some devices have gone wireless, while others have gone unnoticed. This study offers a method that, in the future, could render some devices latent, which is the future of HCI (Human-Computer Interaction). The proposal is to create a virtual mouse that recognizes gestures. The goal is to use a simple camera instead of a classic or regular mouse to control mouse cursor functions. The Virtual Mouse works as a medium of the user and the machine only using a camera. It helps the user to interact with a machine without any mechanical or physical devices and control mouse functions. In this gesture recognition

system, it is very possible to capture & track the fingertip of hand with a webcam or built-in cam which is bearing a color cap or colors sticky note paper and the system track the color and movement of the hand & move cursor with it.

RELATED WORK

The existing system consists of a mouse that can be either wireless or wired to control the cursor, we can use hand gestures to monitor the system. The existing virtual mouse control system allows the user to wear color caps or data gloves to perform mouse operations using the colored tips for detection which are captured by webcam. Hence these colored fingers act as an object which the web-cam sense color like red, green, blue color to monitor the system. In the existing system we use static hand recognition like fingertip identification, hand shape, Number of fingers to defined action explicitly which makes a system more complex to understand and difficult to use.

In 2012, Ram Rajesh proposed remotely controlled power point presentation navigation using hand gestures.

In 2012, a system was proposed which uses three various modules which are used to recognize various hand gestures. Signals by MEMS 3-axis accelerometer sensor were been given as input to the system. The gesture of the hand in three perpendicular directions is been detected by 3 accelerometers and been transmitted to the system by Bluetooth.

In 2015, Chong Wang proposed the system which uses Kinect depth camera, the cost of the system is very high.

In 2014, Swapnil D. Badgujar proposed the system which recognize the unknown input gestures by using hand tracking and extraction method. This system only control mouse with the finger using it on webcam.

METHDOLOGY

In the proposed architecture, the real-time hand gesture input from the user through the integrated webcam is used by the hand gesture recognition system for controlling system.

- This model offers the fundamental controls for the mouse including left and right click, double click, drag and drop etc.
- To develop this project, we employ a variety of Python tools and modules including PyAutoGUI, OpenCV.
- The architecture diagram of a proposed model is that we have used PyAutoGUI to control the keys, map gestures to keys. i.e., to automatically press the keys according to conditions.

The following steps are for mouse controlling using hand gestures:

1. Capture the frames continuously from camera using OpenCV.
2. Convert the BGR image into RGB image and make predictions using initialized media pipe holistic model.
3. The predictions made by the holistic model are saved in the results variables from which we can access the landmarks using results. right_hand_landmarks, results. left_hand_landmarks.
4. Draw the detected landmarks on the image using the draw landmark's function.
5. Display the results.
6. The following image represents the hand landmarks and their indices.

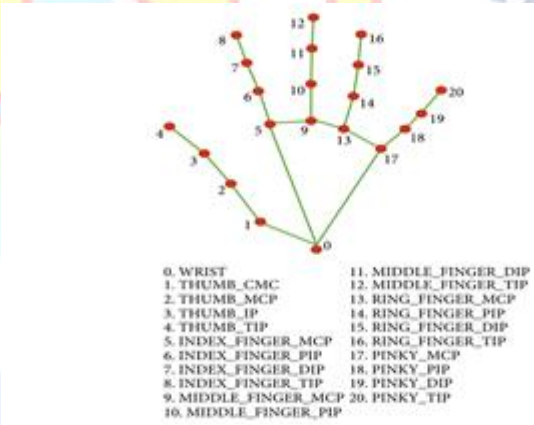

Fig-1: Hand landmarks and their indices

a. Gesture Recognition- The first step is to recognize the user's hand gestures using computer vision techniques. This involves analyzing the images captured by the camera to identify the position, shape, and movement of the user's hand.

b. Mapping gestures to cursor movements-

Once the user's hand gestures are recognized, the system maps them to specific cursor movements. For example, a fist gesture might be mapped to a left-click or right-click, while a waving gesture might be mapped to cursor movement.

c. Cursor movement-

After the gestures are mapped to cursor movements, the system updates the cursor position on the screen based on the user's hand movements' Co-ordinate axes for computer screen:

- Land marking results in dividing the computer screen into x and y axis which helps in detecting the number of fingers raised in the frame.

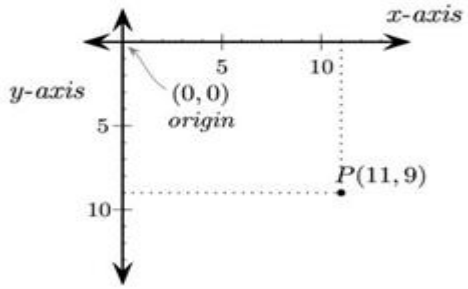

Fig-2: Coordinate axis for dividing computer screen

RESULTS AND ANALYSIS

1.NEUTRAL HAND GESTURE: -

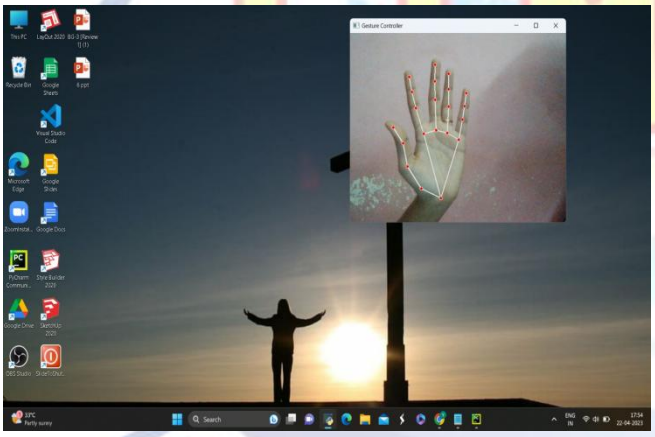

Fig-3: Neutral control using hand gesture

2. MOVING CURSOR HAND GESTURE: -

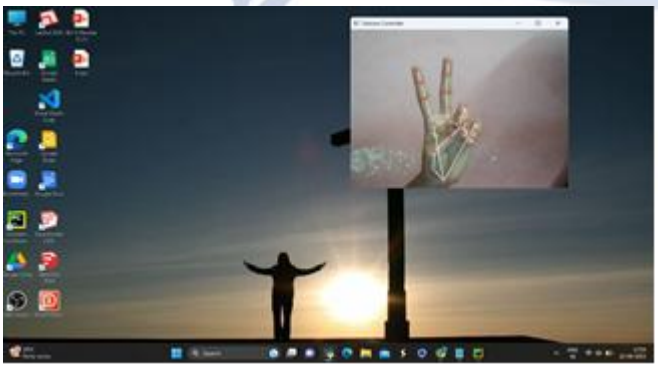

Fig-4: Moving cursor using hand gesture

3. DOUBLE CLICK HAND GESTURE: -

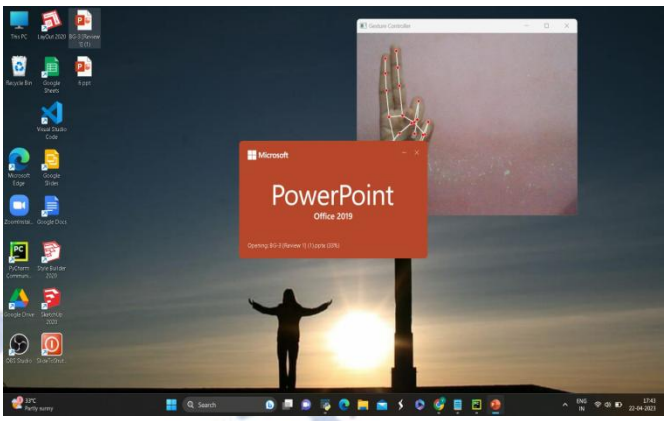

Fig-5: Double click using hand gesture

4. LEFT CLICK HAND GESTURE: -

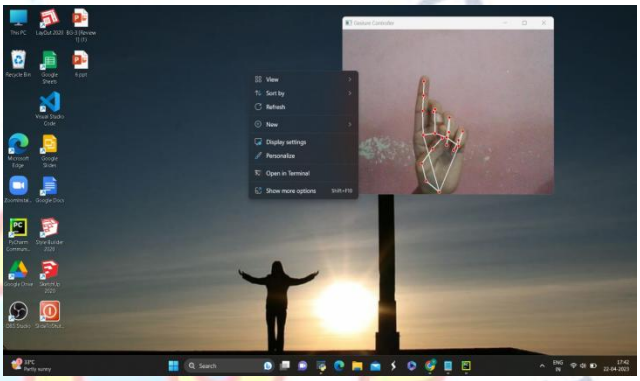

Fig-6: Left click using hand gesture

5. RIGHT CLICK HAND GESTURE: -

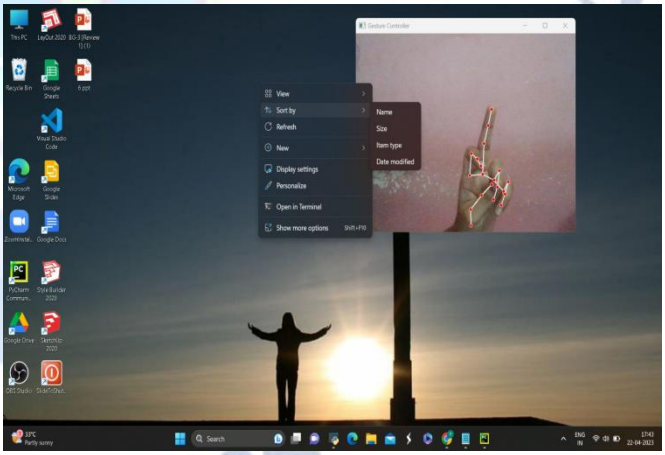

Fig-7: Right click using hand gesture

6.MULTI SELECTION HAND GESTURE: -

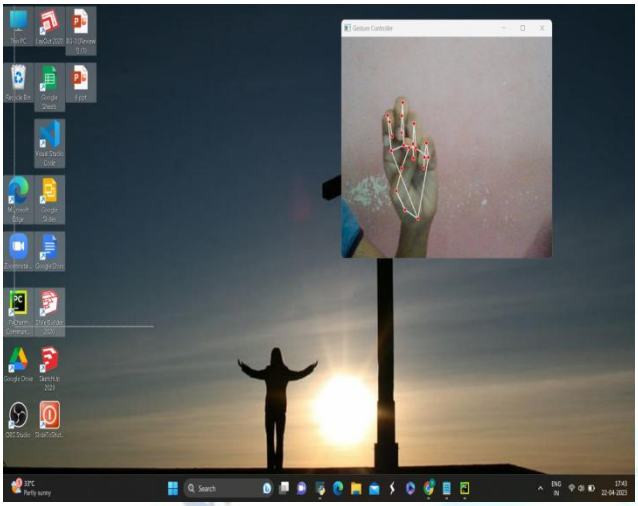

Fig-8: Multi selection using hand gesture

7.DRAG & DROP HAND GESTURE: -

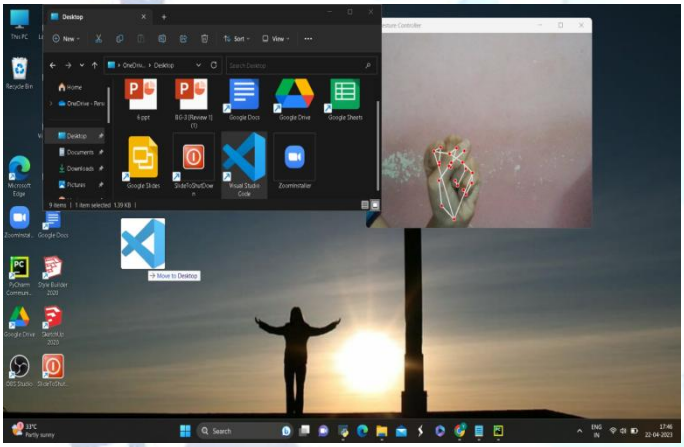

Fig-9: Drag & Drop using hand gesture

FUTURE ENHANCEMENT

The work is to make PC understanding projects that can deal with continuous issues and to achieve targets of the affiliations and regular daily existence as well as individuals. There is a degree in encouraging the machines games, talk affirmation machine, language revelation, PC vision, ace systems, progressed mechanics, etc. The more you learn about AI sciences, for instance material science or science, the better. For the normal ways of managing Artificial Intelligence, find out about mind science and the tangible framework. Get to know some Machine vernaculars. It is savvy to focus on one crucial machine language. Occupations are commonly to depend after getting the programming vernaculars. Calling decisions in AI where student can land positions at Occupation will be offered like: Game Programmer, Robotic, Scientist, Computer Scientist and data analyst.

CONCLUSION

This project will do away with the requirement for a mouse or any other physical device to control cursor movement. For the implementation of our proposed task, we will use OpenCV for object detection. The mouse can be moved with a great level of precision and accuracy. Better Human-Computer Interaction (HCI) is achieved. It is also useful in Augmented Reality, current gaming, and computer graphics. In the context of computer graphics and gaming, this technology has been implemented in modern gaming consoles to produce interactive game that detect and interpret a person's movements as orders. The major goal is to eliminate the usage of any physical device, such as a mouse, and instead rely on a webcam, which is readily available with the laptop. Although this initiative offers numerous benefits, it also has significant disadvantages. If the background picture clashes with the given image, it may offer an incorrect result and may not perform properly. As a result, it's best to use this technique
when the background light and the colour of the object don't combine. On PCs with poor resolution and computational capability, the system may run slower. If the camera has a high resolution, the system may be slow, but this problem can be rectified by lowering the image resolution.

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Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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