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Virtual Mouse Using Hand Gesture

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ABSTRACT: The emergence of the pandemic has caused a technological paradigm shift, leading to the development of a virtual mouse in place of a real mouse. This system takes frames using a webcam or built-in camera, analyses them to make them trackable using computer vision, and then detects and performs mouse functions based on gestures performed by users. It is not device-free, as it requires a battery and a connected dongle. However, it eliminates the need for a device. The development and use of a virtual mouse in place of a real mouse is a field of research. This system takes frames using a webcam or built-in camera, analyses them to make them trackable, and then detects and performs mouse functions based on gestures performed by users. It eliminates the need for a device. This system captures images with a video or built-in camera, processes them so they can be tracked, and then recognises and executes mouse functions based on user movements.

KEYWORDS: Virtual mouse, Real mouse, Built-in-camera, Webcam, Computer Vision, Capture images or video, Virtual development.

I.INTRODUCTION

Gesture Driven Virtual Cursor creates hand gestures for easy human-computer contact. It makes use of models like CNN implemented by MediaPipe running on top of pybind11 to identify hand motions, as well as cutting-edge Machine Learning and Computer Vision algorithms. It consists of two modules, one of which uses gloves of any uniform hue and the other of which acts immediately on the hands. It currently runs on the Windows operating system.

II.LITERATURE SURVEY

A. Development of a Learning-aid tool using Hand Gesture Based Human Computer Interaction System

In [1] Boruah et al. showed that a hand motion detection system is an easy and natural method to communicate in the modern world. One of the main goals of the use of technology-dependent useful items in education is to improve dialogue and interaction between the instructor and the pupil. A component of modern e-learning. In this article, we suggest a vision-based hand motion detection system-based interactive learning assistance. For hand motion detection, the system makes use of MediaPipe.The virtual mouse-based object controlling system uses known hand movements to handle a variety of Unity-created virtual objects. Six hand movements were used to test the system, and it was discovered that the system can be used successfully to operate a variety of virtual items.

B. Virtual Mouse Implementation using Open CV

In [2]. Varun et al. showed that Human-computer relations rely heavily on Hand Gesture Detection. The authors demonstrated the numerous technological advancements that are currently taking place, such as biometric authentication, which is frequently seen in smart phones. Hand gesture recognition is another contemporary method of human-computer interaction, allowing us to operate our systems by waving our hands in front of a webcam. This Page 5/14 work is based on this concept. The methods and approaches for color recognition and the simulated mouse are thoroughly explained in this article.

C. Virtual Mouse Control Using Colored Finger Tips and Hand Gesture Recognition

In [3] Reddy et al. proposed that using hand motion detection and fingertip identifying to operate a virtual mouse.The two finger tracking techniques used in this research are hand motion recognition and using colored caps. There are three major stages in this process: tracking hand gestures, finger recognition using color identity, and cursor implementation. In this research, a convex hull is formed around the contour that is detected to produce hand motion tracking. With the area ratio of the made body and contour, hand features are taken. To evaluate this algorithm in real-world situations, thorough experiments are run.

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D. Cursor Control System Using Hand Gesture Recognition

In [4] Patil et al. developed a user interface that uses basic computer vision and multimedia methods to perform hand gesture recognition. However, a significant restriction is that skin pixel detection and hand segmentation from saved frames must be completed before working with motion comparison methods.

E. A Real Time Hand Gesture Recognition System Using Motion History Image

In [5] ChenChiung Hsieh et al. used a motion history image-based hand movement direction detection technique and an adaptive skin tone model. The paper's main shortcoming is its inability to recognize hand motions with greater complexity.

III.PROBLEM STATEMENT

The conventional computer mouse device needs physical movement and takes up work space, which can be restrictive for users who have physical limitations or who need a more user-friendly, touchless interface. Furthermore, carrying a real cursor around can be awkward, especially when using mobile devices.

Therefore, a more efficient and natural method of computer engagement is required, one that enables users to control their devices with hand movements. In order to give users a convenient and touchless way to engage with their devices, this project seeks to create a virtual mouse system that can precisely recognise and interpret hand motions in real-time. Clicks, slides, and swipes should all be recognised by the system, and it should be flexible.

To various screen dimensions and specifications. Additionally, the system must be simple to use and straightforward so that users can rapidly become accustomed to the new interaction model.

IV.PROPOSED ALGORITHM

Step 1: The webcam Used in the Hand Gesture Based Virtual Mouse System.

The proposed hand gesture-based virtual mouse system is based on the frames that have been captured by the camera on a laptop or PC. We are using the Python computer vision library OpenCV, the video capture object is created and the webcam will start capturing video.

Step2: Capturing the Video and Processing.

The hand gesture-based virtual mouse system uses the system cam where each frame will capture till the termination of the program.

Step3: Rectangular Region for moving through the window.

The transformational formula is used by the AI virtual mouse system, to transfer the coordinates of the IP from the digital camera screen to the full-screen pc display for dominating the mouse. Once the area unit of the hand is identified, and once we realize that a finger is up for performing arts with the mouse, an oblong box is drawn about the computer window within the digital camera region, wherever we tend to move around at the window using the mouse indicator

Step4: Detecting the finger is up and performing.

The Mouse performs. We tend to detective work that finger is up misusing the tip Id of the several fingers that we tend to found misusing the MediaPipe and thus the several co-ordinates of the fingers that are up, and then the actual mouse performs.

Fig 1.1 MediaPipe Structure for Hand Recognition

Step5: For the mouse to perform Left Button Click

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If each the index with tip Id = one and therefore the thumb-finger with tip Id = zero square measure up and therefore the distance between the 2 fingers is lesser than 30px, the computer is created to conduct a left button click using the victimization the input

Step6: For the mouse to perform Right Button Click

If each the middle with tip Id = two (2) and therefore the thumb-finger with tip Id = zero square measure up and therefore the distance between the 2 fingers is lesser than 40px, the computer is created to conduct a right button click using the victimization the input

Step7: For the Mouse to Perform Scroll up and Down

If both the index finger with tip Id = 1 and the thumb finger with tip Id = 0 is up and the distance between the two fingers is lesser than 30px, the computer is made to perform the scrolling up and down.

Step8: For the Mouse to Control Brightness

If both the index finger with tip Id = 1 and the thumb finger with tip Id = 0 is up and the distance between the two fingers is lesser than 30px, the computer is made to perform the brightness less or more

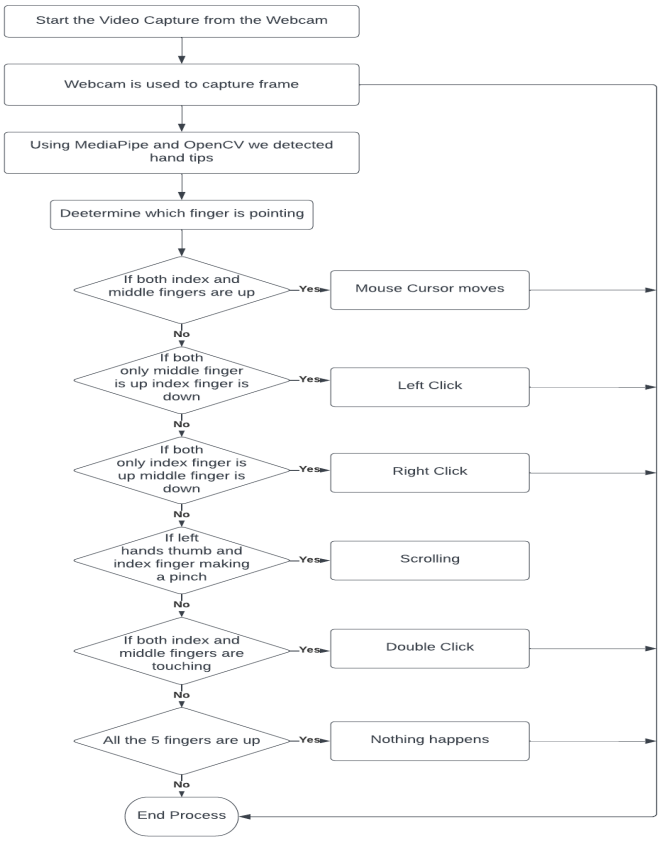

Fig. 1.2 Design and Procedure Architecture

V.PROJECT PURPOSE

Even though there are a number of quick access options for the hand and mouse gesture for laptops in the current system, with our project, we could use the laptop or webcam and by recognising the hand gesture, we could control the mouse and perform basic operations like mouse pointer control, select and deselect using the left click, and a quick access feature for file transfer between the systems connected via network LAN cable. A "Zero Cost" hand identification system for computers was developed. It employs straightforward methods to identify the hand, track hand motions, and give a response to each movement. However, we have primarily focused on mouse aiming and clicking actions as well as a file transmission action. movement and physical motion between interconnected devices. Since Python is a basic language, platform autonomous with freedom, and adaptable, the system we are developing will be much more flexible and easier to implement. This is desirable in creating a programme that is concentrated in such a goal for making a Virtual Mouse and Hand Recognition system. By specifying actions for the hand movement for

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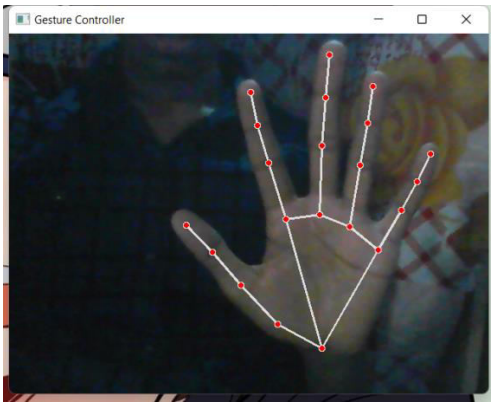
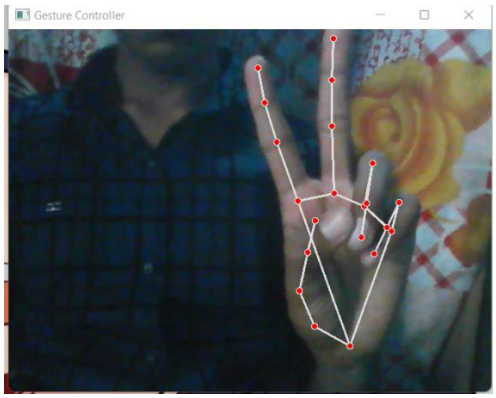
carrying out a particular action, the system can be expanded much further. By using such actions for the collection of hand motions, it could be altered to any further degree; your creativity is the only limit.

VI. RESULTS

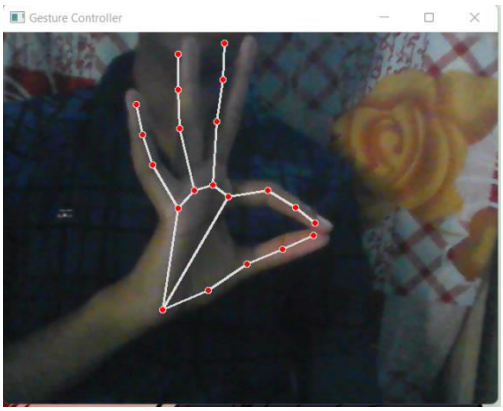
1) No Response



2) To Move Cursor



3) To Scroll



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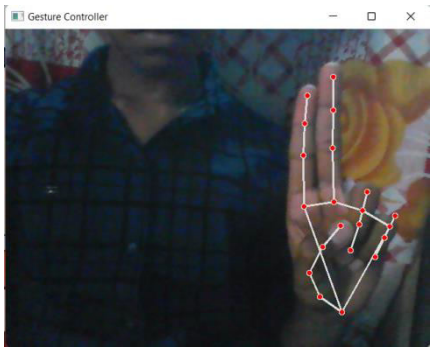
4) To Double Click



VI.CONCLUSION

From the foregoing talks, it can be inferred that a virtual motion control mouse is an effective system for directing the mouse cursor and carrying out its function while using a real-time camera. Though,the application's capabilities are limited to simple actions like choosing, navigating, and altering slides. It has been recommended to make an effort to lessen the dependence of the input options on user hand gestures.
The creation of a framework for an autonomous gesture language could be another crucial element for connected growth. If another coloured rubber object is in the webcam's viewing area, the colour recognition programmed may have trouble detecting it. Thus, the proposed work seeks to create an efficient yet straightforward virtual mouse design that can ultimately get around the constraints of the traditional hardware mouse.

VII.FUTURE ENHANCEMENT

The suggested AI virtual mouse has some drawbacks, including a slight reduction in right click accuracy and some issues with the model's ability to click and drag to pick text. These are some of the drawbacks of the suggested AI virtual mouse system, which we will strive to address in our upcoming research. Additionally, the suggested technique can be created to virtually manage both the keyboard and mouse functionalities, which is another potential future application of human-computer interaction (HCI).

VIII. ACKNOWLEDGMENT

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