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VIRTUAL MOUSE CONTROL USING HAND GESTURES RECOGNITION

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ABSTRACT

The mouse is one of the amazing inventions of human-computer interaction (HCI). Currently, the device still uses a wireless or Bluetooth mouse and is not completely device-free, as it uses a battery for power and a dongle to connect to a computer. In the proposed artificial intelligence virtual mouse system, this limitation can be overcome by using a web camera or a built-in camera to capture hand gestures and hand tip detection using CV. The algorithm used in the system uses a machine learning algorithm. Based on hand gestures, the computer can be controlled virtually and can perform left-click, right-click, scroll, and computer cursor functions without using a physical mouse. The algorithm is based on deep learning for hand detection. Thus, the proposed system avoids the spread of COVID-19 by removing human intervention and the device's dependence on computer control.

Keywords: HCI, webcam, left-click, right-click, scrolling, intervention, eliminating

I. INTRODUCTION

From the point of view of computer technology, a mouse is a pointing device that detects two-dimensional movements relative to a surface. This movement is translated into the movement of a pointer on the display, which allows controlling the graphical user interface (GUI) on the computer platform. There are many different types of mice that already exist in modern technology, there is a mechanical mouse that determines the movements with a hard rubber ball that rolls when the mouse changes its position. A few years later, an optical mouse was introduced that replaced the hard rubber ball with an LED sensor that detects the movement of the table top and then sends the information to the computer for processing. The most effective and expressive way of human communication is hand gesture, which is a universally accepted language. In general, a gesture is a symbol of physical or emotional behavior. It consists of body and hand gestures. Gestures can be used to communicate between humans and computers. Human-Computer Interaction (HCI) began in the early 1980s as a field of study and practice. The name "virtual mouse" expresses a clear idea of our project. Graphical User Interface (GUI) on Personal Computers (PC) is a fairly developed, well-defined and efficient interface for users to interact with the computer and easily access various applications using a mouse, trackpad, etc. Now a day's scenario, most of the mobile phones use touch technology screens for user interaction. But this technology is still not cheap for use in desktops and laptops. A virtual mouse establishes a virtual connection between the user and the machine without the use of any hardware.

II. METHODOLOGY

In the Methodology, the method used for each component of the system is explained separately. They are as explained in the following subsections:

Camera Setup

A pre-recorded video or a real time vision over a camera is given as the input for our model which is captured by considering one frame after the other. We can add an additional camera just to monitor the mouse events and capture them.

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Capturing frames

The infinite loop is used so that the web camera captures the frames in every instance and is open during the entire course of the program. We capture the live feed stream, by taking one frame after the other. The camera is set up so that it captures each and every instance and is open during the entire course of the program.

Masking technique

A mask basically creates a certain specific area of the image according to certain rules. Here, a certain area of the image is selected through several conditions that are used to indicate the virtual mouse events performed.

Display the captured frames

This is an optional module that allows the user to look at the objects being monitored by the camera.

Mouse Movement

First, we need to calculate the center of both detected objects, which can be easily done by taking the average of the maximum and minimum points of the bounding boxes. Now we have 2 coordinates from the center of the 2 objects, find their diameter and get the red point. We convert the detected coordinate from the camera resolution to the actual screen resolution. Then we set the location as the mouse position. But it will take some time to move the mouse pointer. So, we have to wait until the mouse pointer reaches that point. So, we've started a loop and we're not doing anything there, just waiting to see if the current mouse location is the same as the assigned mouse location. This is for an open gesture.

Clicking

The next step is implementing the close gesture. The operation is performed by clicking on the object and dragging it. It's similar to the open gesture, but the difference is that here we only have one object, so we only need to calculate its center. And that will be placed where we place the mouse pointer. A mouse press operation is performed instead of a mouse release operation. The mouse click will be captured over the gesture that will be defined. This is a closed gesture that looks similar to an actual mouse click.

Drag

Based on the mouse being clicked earlier drag operation is performed otherwise the mouse move operation is performed. The objects selected will be based on the average of the mouse pointing to the object which we use to calculate the position of the mouse pointer. The object will be placed where we place the mouse pointer. A mouse press operation is performed instead of a mouse release operation.

Scroll

The scroll is determined over a gesture that gets triggered by an operation similar to drag but performs scroll.

Volume

The Volume up and down action performed by folding the ring finger(volume up) and little finger(volume down).

III. MODELING AND ANALYSIS

The following steps are involved in the design of the proposed system:

- Real-time hand motion capture.
- Extracting the frames from the captured video.
- Finding the hands in frames.
- Marking a primary hand if many hands exist.
- Masking the hands.
- Returning the position of the hands.
- Gesture recognition.
- Performing the specific task based on the gestures performed.

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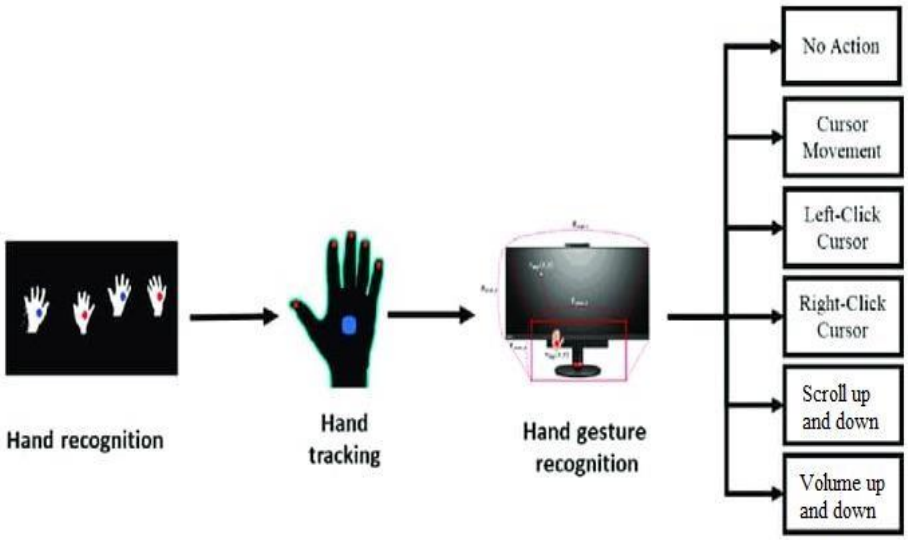

Figure 1: Overview of hand gesture recognition and actions performed.

IV. RESULTS AND DISCUSSION

Table 1. Test cases for hand movements

Sl No.	Movement	Given Input	Expected output	Actual output	Remark
1	To move the mouse cursor	i = 1	Movement of the cursor	Movement of the cursor	**Pass**
2	To perform left click operation as in mouse	i= 0,1	Left clicking operates successfully	Left clicking operates successfully	**Pass**
3	To perform right click operation as in mouse	i = 0	Right clicking operates successfully	Right clicking operates successfully	**Pass**
4	To perform scroll up operation as in mouse	i=0,2,3, 4	Scroll up operates successfully	Scroll up operates successfully	**Pass**
5	To perform scroll down operation as in mouse	i=0,1,3, 4	Scroll down operates successfully	Scroll down operates successfully	**Pass**
6	To perform volume up operation as in mouse	i=0,1,2, 4	Volume up operates successfully	Volume up operates successfully	**Pass**
7	To perform volume down operation as in mouse	i=0,1,2, 3	Volume down operates successfully	Volume down operates successfully	**Pass**

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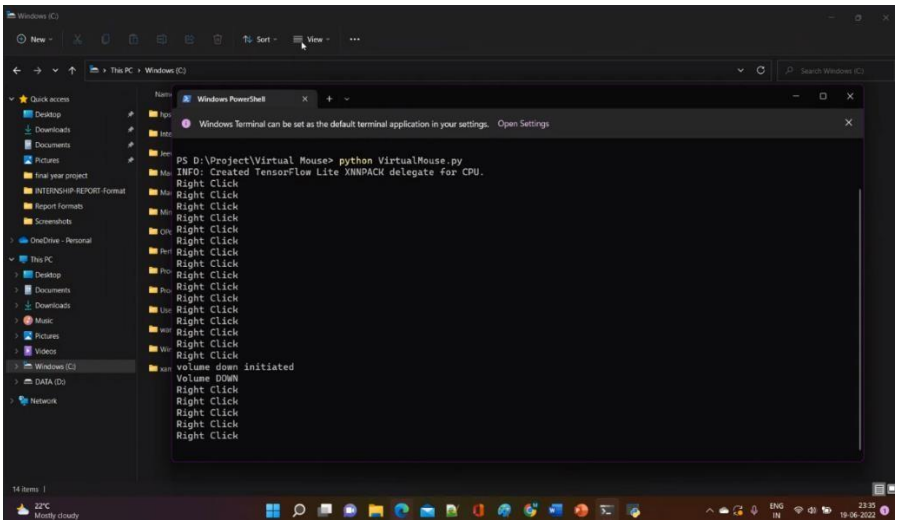

Figure 2: Cursor movement logs (Font size-10)

V. CONCLUSION

The physical mouse will be replaced by a virtual non-physical mouse in Human-Computer Interactions (HCI), where every mouse movement can be performed by a quick finger movement anywhere and anytime without any environmental constraints. This project developed a color recognition program to replace the generic physical mouse without sacrificing accuracy and efficiency, it is able to recognize color movements, their combinations and translate them into a real mouse task. Since accuracy and efficiency play an important role in making the program as useful as a real physical mouse, several techniques had to be implemented.

The purpose of this implementation is to promote the convenience of operating the program without much difficulty. Thus, the actual functions of the mouse can be executed precisely with a minimum of trial and error. Overall, modern technology has advanced in improving social life in terms of productivity and lifestyle, not the other way around. Therefore, companies must not mix with past technologies and at the same time be reluctant to accept the changes of newer ones.

REFERENCES

[1] A. Mhetar, B. K. Sriroop, A. G. S. Kavya, R. Nayak, R. Javali and K. V. Suma, "Virtual mouse," International Conference on Circuits, Communication, Control and Computing, 2014, pp. 69-72, doi: 10.1109/CIMCA.2014.7057759.

[2] A. Erdem, E. Erdem, Y. Yardimci, V. Atalay and A. E. Cetin, "Computer vision based mouse," 2002 IEEE International Conference on Acoustics, Speech, and Signal Processing, 2002, pp. IV-4178-IV-4178, doi: 10.1109/ICASSP.2002.5745637

[3] Pattern Recognition & Machine Learning [Online], available at http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop%20%20Pattern%20Recognition%20And%20Machine%20Learning%20-%20Springer%20%202006.pdf, Accessed on- January 2021.

[4] Image Detection Recognition and image, available at https://medium.com/ai-techsystems/image-detectionrecognition-and-image-classification-with-machine-learning-92226ea5f595, Accessed on February 2021.

[5] https://www.researchgate.net/publication/318852610_Virtual_Mouse - Mhetar, Ashish & Sriroop, B & Ags, Kavya & Nayak, Ramanath & Javali, Ravikumar. (2014). Virtual Mouse. 10.1109/CIMCA.2014.7057759.

[6] R. Matlani, R. Dadlani, S. Dumbre, S. Mishra and A. Tewari, "Virtual Mouse using Hand Gestures," *2021 International Conference on Technological Advancements and Innovations (ICTAI)*, 2021, pp. 340-345, doi: 10.1109/ICTAI53825.2021.9673251.

[7] R. Ö. Doğan, H. Doğan and C. Köse, "Virtual mouse control with hand gesture information extraction and tracking," 2015 23nd Signal Processing and Communications Applications Conference (SIU), 2015, pp. 1893-1896, doi: 10.1109/SIU.2015.7130228.

[8] M. Shetty, C. A. Daniel, M. K. Bhatkar and O. P. Lopes, "Virtual Mouse Using Object Tracking," 2020 5th International Conference on Communication and Electronics Systems (ICCES), 2020, pp. 548-553, doi: 10.1109/ICCES48766.2020.9137854.

[9] V. V. Reddy, T. Dhyanchand, G. V. Krishna and S. Maheshwaram, "Virtual Mouse Control Using Colored Finger

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Tips and Hand Gesture Recognition," 2020 IEEE-HYDCON, 2020, pp. 1-5, doi: 10.1109/HYDCON48903.2020.9242677.

[10] K. S. Varun, I. Puneeth and T. P. Jacob, "Virtual Mouse using hand recognition with the help of gloves," 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), 2019, pp. 435-438, doi: 10.1109/ICOEI.2019.8862764.