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HAND GESTURE CONTROLLED MOUSE

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Abstract - *This paper proposes a virtually controlled mouse system that uses machine learning technology. The software will allow the user to manage the mouse using hand gestures. The system requires a webcam as an device. The tools required are Python and its various in-built libraries such as OpenCv, NumPy, math, etc. The actual hand gestures made by the user are analyzed by the system to perform a particular task. Thus, we are proposing the simplest way to make human machine interactions easier.*

Key Words: Human-machine interactions, Hand Gestures, Hand Tracking, Python, Gesture Recognition.

1.INTRODUCTION

In the past few years, human-machine interaction has become very significant. In a exceeding world where machines play a necessary role in almost every aspect of our lives, it is important to cutback manual machine handling the maximum amount of making human-machine interactions simple and less laborious. Since there's a drastic difference between human and machine language, it's crucial to search out a common ground to interact with machines. One such way is by using hand gestures. Hand gestures are an efficient way of communication among humans and sometimes even animals. Thus, to search out a way to use them to communicate with machines is merely logical. Gesture Recognition System provides a natural way, innovative and modern way of non-verbal communication. It has a wide area of applications in human-machine interaction and sign language. The setup consists of a single camera to capture the gesture formed by the user and take this as input. The primary goal of gesture recognition is to create a system which can identify specific human gestures and use them to convey information for machine control. Thus, the system can be operated using hand gestures without using keyboard or mouse. The first step is frame-capture followed by which, the hand gestures made by the user are processed and accordingly the task is performed by the System PC The range of tasks that may be performed using the proposed software varies from dragging the mouse to draw on the screen using hand gestures. Other functions include, right click, left click, volume control, etc.

2. LITERATURE SURVEY

The current virtually controlled mouse systems use colour recognition technique. The present virtual mouse control system consists of easy mouse operations employing a hand recognition system, within which we are able to control the mouse pointer, left click, right click, and drag, and so on.

Abhilash S , Lisho Thomas, Naveen Wilson, Chaithanya C have proposed in their paper, a system that uses nothing more than a low resolution webcam that acts as a sensor and it is able to track the users hand bearing color caps in two dimensions.

Vijay Kumar Sharma, Vimal Kumar, Md. Iqbal, Sachin Tawara, Vishal Jayaswal have created a system that controls the cursor movement using two fingers. They have proposed a model which can control the movements of the mouse using the two fingers and the gestures made by them.

In the paper , "Fusion of Information From Data Glove and a Camera for Hand Gesture Recognition" by Ramakant , the author proposed a model which uses an algorithm for hand gesture recognition based on the information received from data-glove and camera for all static hand gesture recognition.

3. METHODOLOGY

The software is divided into 4 modules:

A. Hand-tracking Module: We first enable the webcam for video capturing.The webcam captures one frame per second so as to not miss anything. The system reads the frame and then converts the frame from one colour to another. Then the coordinates of the hand landmarks are calculated in terms of width and height. The coordinates are then further converted into pixels. Thus, showing the hand landmarks with the help of coloured counters.

B. Volume Control: The function of this module is to control the volume of the computer using hand gestures. We first import Hand-Tracking Module to enable the system to capture, analyse and decipher the hand gestures made by the user and then calculate the coordinates of the hand landmarks. We then set the minimum and maximum range of the volume of the system. Then we set the landmark coordinates in proportion with the volume range previously declared. Thus the gap between the thumb and the forefinger of the user's hand will determine the volume of the computer.

C. Virtual Painter: This module enables the user to draw on the screen using their fingers. Again, we first import the hand-tracking module. We use some header files in order to make it more interactive. We used some previously

defined functions from hand tracking module. Then we define two modes one is selection mode and other is drawing mode. In selection mode the user gets to select the color of the brush and in drawing mode the user gets to draw on the board.

D. Mouse Control: With this module, we can control the mouse of the computer and perform basic mouse functions using just our first two fingers. In this module, we use "autopy", which is an in-built library of Python language. This library enables the user to use the mouse operations with ease and in an efficient way. Using this module, the user can control basic mouse operations such as movement, scrolling and clicking using hand gestures.

4. DESIGN

4.1. Video Capturing : To decipher hand gestures, we first have to capture live images of the hand gestures made by the user. This is done by using a Web Cam which continuously provides a sequence of images in a particular speed of FPS(Frames per second).

4.2. Calculation of coordinates of hand landmarks: After capturing the gestures, the system analyses the images and then calculates the coordinates of hand landmarks.

4.3. Tracking the Cursor: After determining the coordinates, the mouse driver is accessed and the coordinates are sent to the cursor. The cursor positions itself in the required position using these coordinates. As a result, the mouse moves proportionally across the screen as the user moves his hands across the camera's field of view.

5. RESULTS AND DISCUSSIONS

5.1 Hand Tracking Module: We can observe that the video is being captured and shown in a separate window. The video highlights the hand above wrist with 21 points and a line joining all the points. The points are highlighted with different colors and the line joining them is highlighted with different color.

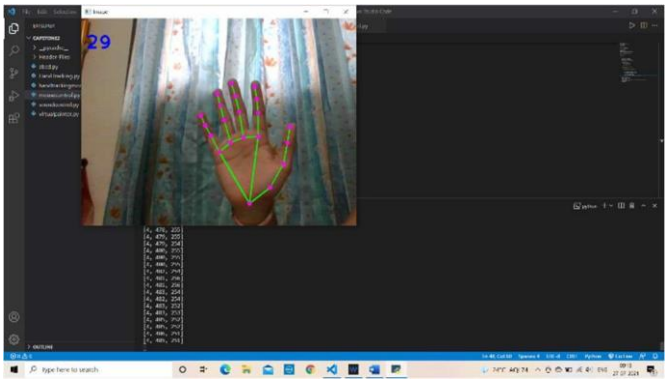

Fig-1: Hand Tracking using the algorithm.

5.2 Volume Control Module: We can observe that the software is making use of hand tracking module to detect the 21 points on the hand. After that it is focusing more on index finger and thumb and highlighting them with a white line joining both the points. There is also one more point in the middle of this white line whose color changes when there is a change in volume. It shows the maximum, optimum and minimum volume range by changing its color to red, green and blue respectively.

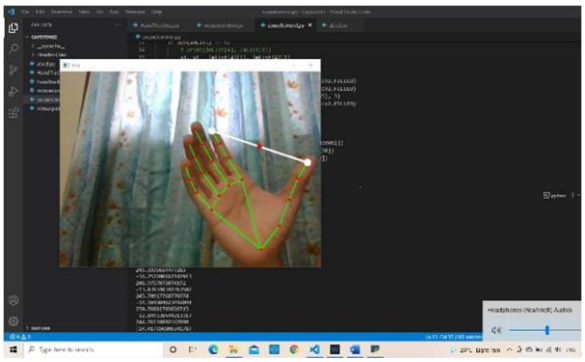

Fig-2 : Volume Control using the algorithm

5.3 Virtual Painter Module: We can observe that , here too the software uses hand tracking module and tracks the 21 points of our hand. Here we can also observe the header file which we used to make it more interactive and also the canvas used to draw or write something. The mode which we are using like the Drawing mode or Selection mode is printed on the terminal automatically.

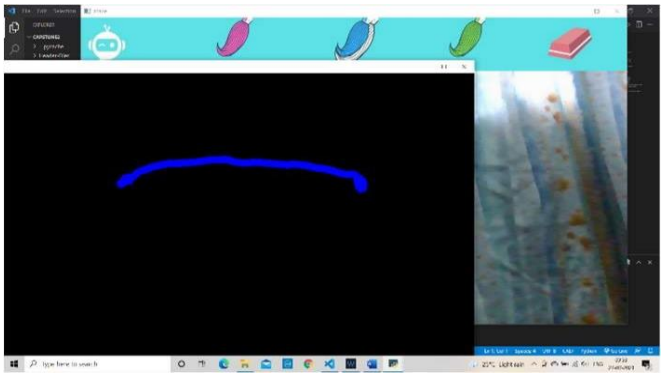

Fig-3 : Virtual paint on screen using the algorithm

5.4 Mouse Control Module: We can observe that in this module ,the working and the display window is very much similar to the hand tracking module but , as we move our index finger the cursor on the screen also shows movement . This proves that we can control the cursor as per the movement of the index finger.

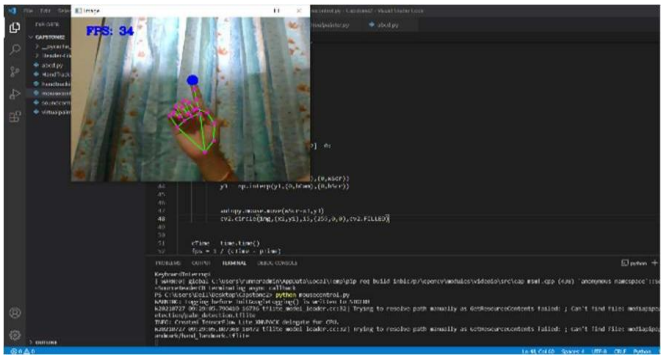

Fig-4 : Mouse cursor control using the algorithm.

6. LIMITATION

The user has to give some time to get adopted t this type of system since at the beginning there will be a little difficulty in controlling the cursor. Hence, it takes some time to get familiar with the system. The module can track only one hand so there might be a problem when there is more than one hand in the frame.The hand tracking software requires optimum level of light and brightness which limits the use of the software in places with low light.

7. FUTURE SCOPE

The Virtual Mouse control software can be used in various ways in the coming future. The virtual painter module can be useful to teachers and professors to elaborate their teaching in an interactive way to their students. It can be also used by professionals to make presentations more understandable. The Mouse control module can take Human-Computer Interaction to a next step. People with diseases like paralysis who were unable to use computers can now use it since they can control the operations using just their fingers.

8. CONCLUSION

The main purpose of this paper is to implement the idea of virtual mouse. The main tasks performed and controlled by the virtual mouse are clicking, double clicking, adjusting volume controls, and virtual painters. From all the above discussion it can be concluded that virtual mouse plays an important role in interacting with computer as a virtual machine and also reduces the hardware cost by eliminating use of mouse which further helps to reduce and avoid wrist related damages such as CTS(carpal tunnel syndrome).

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