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INTERACTIVE CURSOR CONTROL WITH HAND GESTURES

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ABSTRACT

Virtual reality, though first introduced centuries ago, has gained enormous interest only in recent decades. This can be mainly because new technologies develop fast, and virtual things now form a part and parcel of our lives, in our everyday activities. Devices are very much in vogue wherein these hand gestures can control many functions. This is widely called as the leap motion. This paper will present a method to control the cursor manually, with no dependency on any electronic input device. The most common activities like click and drag can be accomplished by several hand gestures. However, the system uses only a webcam—either integrated or externally connected to the device—to function as an input device. The system can be developed with the use of OpenCV and Python. The output of the webcam will be shown on the screen for real-time adjustment. The system development will also include Python dependencies, such as NumPy, math, wx, and mouse.

Keywords– Virtuality,OpenCV,NumPy, Gesture Control.

1. INTRODUCTION

Image processing, a branch of signal processing used to recognise gestures and now commonly used for tracking, takes in and outputs images or videos.Over the course of the proposed, a wide range of gesture recognition techniques have been developed. Human-computer interaction, motion capture, and human behavioural research are just some of the many applications for hand tracking. There are also a wide variety of sensor types and purposes for which gloves that track hand movements are used. Web cameras don't require expensive sensors to recognise gestures and track movement, saving you money.

In order to avoid using a physical mouse or trackpad, it is essential to find a way to accurately track a user's fingers in the real world. A physical mouse may be difficult to use in most situations. One can control the pointer without touching the mouse by using a webcam and some algorithms.This research details the creation and analysis of real-time finger tracking for use with a mouse, allowing for the utilisation of gestures for a wide range of mouse applications, such as movement, single click, double click, right click, and scrolling.

You can tell people's fingers apart in essentially two ways. Fingertips of one colour are used in one method, while the other makes use of hand gestures and bare fingers in the other. Neural

networks are capable of recognising gestures. Tracking and identifying colours with the help of algorithms like neural networks is a lot more difficult. For this purpose, we first use a finger with a coloured tip to identify individual hues, and then we use background subtraction to identify colour change. Improvements have been made to this method whereby a single finger can be used to track gestures. Processing a running video in this way allows us to track the fingers using image processing techniques. What follows is an outline of the essay: Detailed descriptions of the system as a whole, colour recognition, and gesture recognition are provided in Section II. Part III demonstrates the system's functionality and the experimental results. The final section of this essay discusses the implications of the arguments made.

2. LITERATURE SURVEY

In order to finish each module of this project, we researched several earlier works, including:AnadiMishra,SultanFaiji,PragatiVerma,ShyamDwivedi,RitaPal,"virtualmouse using hand gesture",,JETIR,vol 9, april 9, 2010;

AnadiMishra,SultanFaiji,PragatiVerma,ShyamDwivedi Using just a webcam, this setup can transform video into easily processed images. The next step is to pull the fingertips out of the converted images, which will have many different varieties of fingertips in them. Once the data has been extracted, the system will enter a mode called detection, during which it will look for specific fingertip types to identify points on the screen. Once the points have been identified, the system will track their movement on the screen, allowing us to use the mouse to perform a task.

AbhilashSS,LishoThomas,NaveenWilson,Chaithanya C," virtual mouse using hand gesture",IRJET,vol5,april 2018 using the current systems, even though there are a number of quick access methods for the hand and mouse gestures for laptops, we could use the laptop and webcam to control the mouse and perform basic operations like mouse pointer controlling select and deselect using left click and a quick access features for file transfers between the systems

HritikJoshi,NitinWaybhase,RatneshLitoriya,Dharm endraMngal,"design of a virtual mouse using gestures recognition and machine learning ",research square,june 2022,this project provides an overview of hand gesture recognition. Background subtraction is used to detect the hand, and the resulting binary image is then segmented into palm and fingers to facilitate finger recognition. Finally,the system operates on the frame captured by thecomputer's webcam to recognise hand gestures using a simple rule classifier.

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3. PROBLEM STATEMENT

Current systems rely on static hand recognition methods, such as fingertip identification, hand shape, and number of fingers to explicitly define an action, which can make them difficult to learn and use.The algorithm detects the user's hand colour and uses that information to determine the cursor's location. However, it faces challenges in the real world due to the following factors.

- It's noisy outside.
- The environment is brightening up.
- A wide variety of skin types.
- A background object that shares the colour of the user's finger tips.

Fig 3: Disadvantages in existing system

4. PROPOSED SYSTEM

To get around these issues, it's essential that the algorithm used to choose colours is as precise as possible.The proposed system eliminates the need for a mouse entirely, as it can be operated with the user's hands alone.Users of all skin tones and lighting conditions can benefit from the proposed system's click-by-making-an-15-degree-angle-with-two-fingers method.

The proposed setup can be used in place of both the standard mouse and the color-coded-tapes-operating-the-mouse algorithm. The project can be made at no cost and easily integrates with the existing system..

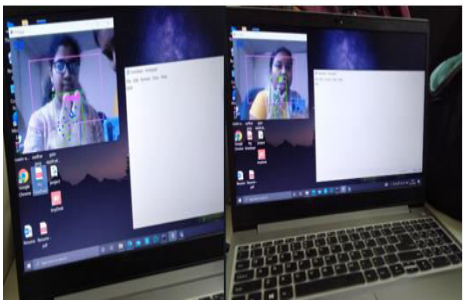

Fig 4:Hand-cursor interaction

5. METHODOLOGY

The algorithm development process involves the following steps: - I The first thing to do is to take a picture using the camera.
(ii) After analysing the input image, the camera isolates and identifies the human hand.

(iii) Next, the normal" coordinate-system" is used to record the location of the human hand. After that
(iv), the second still image is taken. The system records the hand's location in the second frame.
(v) After comparing the hands' locations, the cursor is then repositioned accordingly.
Now, the clicking mechanism takes into account the angle formed by the two hands of the finger and treats it as a left click if the angle is less than 15 degrees. All of the mouse's functions may be operated with this method.

With the use of webcams, we want to develop cost-free hand identification software for portable electronic devices.

The focus of the project is the development of software that allows the user to control the cursor and conduct actions such as clicking using just their hands.

A. Activating Camera

To begin gathering data for the system, we must first turn on the camera. To do this, we must first assign the camera's resources to a variable; the cam=cv2 command will be used for this purpose. Taking a Video Using this command, the system's attached camera will power up and begin receiving input.

B. Skin Colour Extraction

This is accomplished by using the mask and the kernel function to determine the colour of the skin and isolate it from the surrounding colors. After determining the skin tone with RGB values between [92, 56, 54] and [255,223,196], the mask function then employs open and close kernels to filter out unwanted noises.

If the pixelized noise bit is larger than the stored value, it is masked out by the open kernel and closed kernel, leaving only the correct input for the computer to process.

C. Cursor Movement

The first step in controlling the cursor is locating the hand's centre, which may be done using the

following command.

Algorithm

1.var_leftmost→min_argument[tuple(hull[hull[:,:,0].argmin()][0])]

2.var_rightmost→max_argument[tuple(my_con[my_con[:,:,0] .argmax()][0])

3.var_topmost→tuple assignment (hull [hull [:, :,1].argmin()][0])

4.var_bottommost→tupleassignment(my_con[my_con[:,:,1].argmax()][0])

5.var_Temp→bottommost[0]+30

6.cv2.line(roi,topmost,(topmost[0],h-280),(0,242,225),2)

7.cv2.line(roi,leftmost,(topmost[0],bottommost[1]- 80),(0,242,225),2);

The following section of code determines the hand's midpoint, and then uses those coordinates to send the cursor in the desired direction based on the users' wrist and finger movements.

D. Displaying Output

E. The command cv2.imshow('frame', frame) will display a window on the user's screen showing the user's hands and the subordinates' lines controlling the cursor; the user is also provided with additional information, such as additional and appropriate sources of light in the background, to aid in setting the scene properly.

F. Flow chart

[1] symbolise the process of webcam image capture. When you're done processing the webcam's image, make sure to convert it from HSV to RGB format.The process of

[2] making a skin-tone mask filter.If the user input from the camera is skin tone, then

[3] the middle of the image is used; otherwise, the frame from the webcam is processed.

[4] Left click if angle between points is less than 15 degrees; else, move cursor in the direction of the supplied picture.

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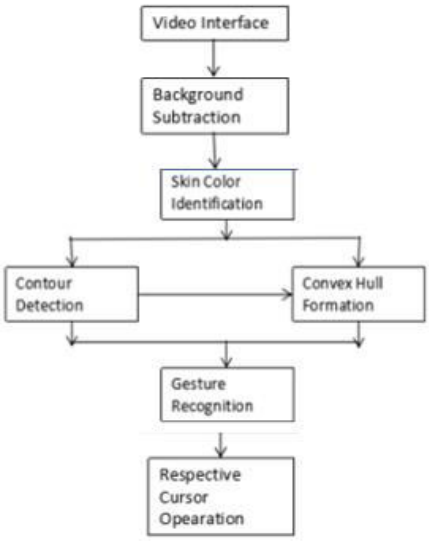

Fig 5: Flowchart

6. SYSTEM REQUIREMENTS

Input device specifications should include a webcam or computer with a built-in camera. OpenCV and python are the required software for implementing the proposed system..

Fig 6: Webcam (hardware requirement)

Fig 7: OpenCV-python (software requirement)

7. ADVANTAGES

- One major benefit of utilising hand gestures as a human computer input modality is that they eliminate the need for physical contact between the user and the device being controlled.
- To lessen electronic waste, please.
- In order to save money on hardware, you should do away with the mouse.
- It takes up less room.
- It's a great alternative for people who aren't used to using touchpads.
- The framework could be used to facilitate the management of a wide variety of games and other applications that rely on gesture control.

8. APPLICATIONS

The artificial intelligence virtual mouse system has several potential uses, such as reducing the required area for operating the actual mouse or being utilised in places where a real mouse would be impractical. Human-computer interaction is boosted, and there's no need for additional hardware thanks to this technology.

- Using the help of the AI virtual system, users may create both 2D and 3D drawings with simple hand motions.
- Without the need for a conventional mouse, users with an AI virtual mouse may enjoy AR/VR games.

9. RESULTS AND CONCLUSION

This paper's goal was to find ways to make machines more human-like in their interaction and reaction to people. With this paper, I set out to create a piece of technology that could be used by anyone, anywhere, and on any platform. The proposed system detects the user's hand and then manipulates the mouse pointer to correspond with the user's input. how the system The left mouse button, dragging, and moving the cursor are all under your control. When the angle between a user's fingers is less than 15 degrees, the process performs the left-click action by detecting the hand on the user's skin and tracking it continuously for the movement of the cursor.

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