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Virtual Mouse Control using Hand Gesture

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Abstract— This research proposes a way for controlling the cursor's placement using only one's hands and no electronic equipment. While movements like clicking and dragging things will be done using various hand gestures. The suggested system will just require a webcam as an input device. OpenCV and Python, as well as additional tools, will be required for the suggested system.

I. INTRODUCTION

Hand gestures haven't been used for communication in human society for generations[1]. Handshaking, thumbs up and thumbs down signs have always been present in the surroundings. Gestures are seen to be the most natural manner of interacting with others. So why don't we apply it to the machines that we use? We are presenting real-hand gestures in this work. A low-cost USB web camera is included in the initial setup and can be used to provide input to the system. Frame-capturing, image-processing, region-extraction, and feature-matching are the four processes that make up the entire procedure. Because it uses a camera to track hands, it can also be referred to as hardware. [5].

The research work's goal and target are as fol lows:

- The touchpad on most laptops isn't the most comfortable or convenient.
- The main goal of pre-processing is to describe the data in such a way that the system can simply read and analyse it.
- Reduce hardware costs [2].

It focuses on extracting features from human hands and then matching those features in order to recognise hand movement.

Project key features-

- Friendliness to users.
- Portable.
- Handle simple left-click dragging and minimising operations.
- No need of hardware [3].

With the use of webcam support, we want to produce completely free hand recognition software for laptops and PCs with this article. The project focuses on developing software that allows users to move the cursor with their hands and perform actions such as clicking. In the current system, static hand recognition such as fingertip identification, hand form, and number of fingers are used.

II. EXISTING SYSTEM

The current system uses a mouse that can be wireless or tethered to operate the pointer, but we can now monitor the system using hand gestures. The current virtual mouse control system consists of simple mouse operations using coloured tips for detection which are captured by web-cam, thus coloured fingers act as an object which the web-cam sense colour like red, green, blue colour to monitor the system, whereas could perform basic mouse operations like minimise, drag, scroll up, scroll down, left-click right-click using hand gestures without any coloured finger because skin colour recognition system is more accurate.

In the current system, static hand recognition such as fingertip identification, hand form, and number of fingers are used to describe actions explicitly, making the system more difficult to learn and operate.

III. PROPOSED SYSTEM

The technology detects the colour of the hand and calculates the cursor's position accordingly., however there are a variety of variables and scenarios that make it impossible for the algorithm to run in the actual world, as illustrated in Fig.

- Noises in the environment.
- Lighting condition in the environment
- Different textures of skin.
- Background object in the same colour of skin.

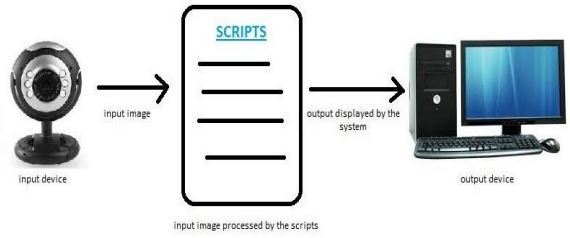

Fig. 1 Input Processing

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As a result, it's critical that the colour deciding The algorithm is precise. The proposed system is feasible. for any skin tone, as well as being able to work effectively in For the purpose of clicking the picture, any lighting condition as well as the algorithm that necessitates the use of coloured tapes The study paper can be a pioneer in the field of mouse control. Its field and can serve as a starting point for additional research field that corresponds The project can be constructed for "no money" and integrated into the existing system with ease.

IV. WORKING OF PROPOSED WORK

This work can readily replace the long-established mouse mechanism. The user can control the mouse without using any other hardware by employing this strategy. Hand motion detection and webcam inputs are used to accomplish this.

V. ALGORITHM

The following steps are included to develop the algorithm:-

(i) The initial is to capture the image using the web cam.
(ii) The web cam then capture and recognizes the human hand from the input image.
(iii) Then the position of the human hand is saved in the system through regular" coordinate-system".
(iv) Then when the second frame is captured. The position of the hand from the second frame is captured and is stored in the system.
(v) The cursor then travels in accordance with the comparison of both hands' positions.
(vi) The angle between the two hands of the finger is now measured for the clicking system, and if the angle is less than 15 degrees, the system replies with a left-click. In this method, the mouse can be operated entirely with one's hands.

With the use of webcam support, we want to produce completely free hand recognition software for laptops and PCs with this article. The project focuses on developing software that allows users to move the cursor with their hands and perform actions such as clicking.

A. Activating Camera

The first step is to turn on the camera so that it can offer input to the system. To do so, First, we must assign the camera's resources to a variable. Cam=cv2 is the command that will be used for Video capture (0) ,this command will turn on the camera that is linked to the system and allow the camera to take input.

Computer vision and machine learning technologies analyse the photos in real time, translating the hand gestures into instructions based on a prepared library of signals. The existing system are very complex and require powerful processors. Gesture recognition software commands are treated like any other sort of input, such as turning a dial, hitting a button. When the angle between the human fingers is less than 15 degrees, the technology recognises the human skin hand and continually monitors it for cursor movement.

B. Skin Color Extraction

We utilise the mask and kernel functions to identify the skin colour and separate it from the other colours in the background. The mask function uses RGB parameters ranging from [92, 56, 54] to [255,223,196] to identify the skin colour, after which the open kernels and close kernels are employed to remove noise from the input.

The open and close kernels operate on the assumption that if the pixilated noise bit is larger than the recorded value, it will be eliminated using the masking effect, leaving the system with just the right input for the computer process.

C. Cursor Movement

For moving the cursor the first step is to find the middle of the hand which can be determined using the following command.

Algorithm

The algorithm uses a mouse that can be wireless or tethered to operate the pointer, but we can now monitor the system using hand gestures. The current virtual mouse control system consists of simple mouse operations using coloured tips for detection that are captured by web-cam, thus coloured fingers act as an object that the web-cam senses colour like red, green, blue colour to monitor the system, whereas could perform basic mouse operations like minimise, drag, scroll up, scroll down, left-click right-click using hand gestures without any coloured finger because skin colour recognition system is more accurate. Static hand recognition, such as fingertip identification, hand shape, and number of fingers, are employed in this algorithm to clearly characterise activities, making the system more complex to learn and use.Gestures are seen to be the most natural manner of interacting with others. So why don't we apply it to the machines that we use? We are presenting real-hand gestures in this work. A low-cost USB web camera is included in the initial setup and can be used to provide input to the system. The above section of the code is responsible for locating the hand's middle point.

The coordinates of the hand's midway will be utilised to move the pointer in various directions based on the movement of the corresponding users.The project focuses on developing software that allows users to move the cursor with their hands and perform actions such as clicking. Gesture recognition is technology that uses sensors to read and interpret hand movements as commands. A gesture recognition system begins by taking frame-by-frame photos of hand placements and actions with a camera focused at a specified three-dimensional zone within the vehicle. This camera is usually positioned on the roof module or another unobstructed observation point. Even when there isn't much natural light, the system lights the region using infrared LEDs or lasers to

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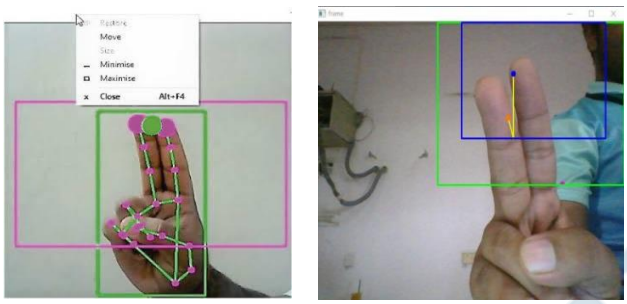
provide a crisp image. Computer vision and machine learning technologies analyse the photos in real time, translating the hand gestures into instructions based on a prepared library of signals.

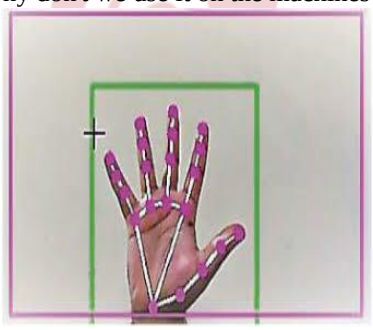
The above section of the code is responsible for locating the hand's middle point. The coordinates of the hand's midway will be utilised to move the pointer in various directions based on the movement of the corresponding users.

Detects the hand of the human skin and tracks it continuously for the movement of the cursor when the angle between the fingers of the human hand is less than 15 degree the process performs the task of the left-click.



D. Displaying Output

A window will emerge on the user's screen, revealing the user's hands as well as the cursor's subordinate lines. The output can be examined using the command cv2.imshow('frame', frame); in addition to the camera input window, The user will be provided additional information, such as additional and suitable light sources in the background, to assist them set up the scene successfully. The most natural way of interacting with others is through gestures. So why don't we use it on the machines we use?



[1] Represent the process of capturing a frame from a webcam.After processing the frame captured by the webcam, transform the image from HSV to RGB format..

[2] Creating a filter that creates a skin colour mask.

[3] If the user's input through the camera is skin colour, then calculate the image's midpoint; otherwise, process the frame provided by the webcam.

[4] If the angle between the two spots is less than 15 degrees, left click; otherwise, move the cursor in the direction of the supplied image.

VI. CONCLUSION

This paper's goal was to make machines more interactive and sensitive to human behaviour. The main purpose of this study was to create a technology that is both inexpensive and portable, and that can run on any standard operating system.

The suggested system detects the human hand and moves the mouse pointer in the direction indicated by the human hand. Simple mouse functions such as left-clicking, dragging, and cursor movement are controlled by the system.

When the angle between the human fingers is less than 15 degrees, the technology recognises the human skin hand and continually monitors it for cursor movement.

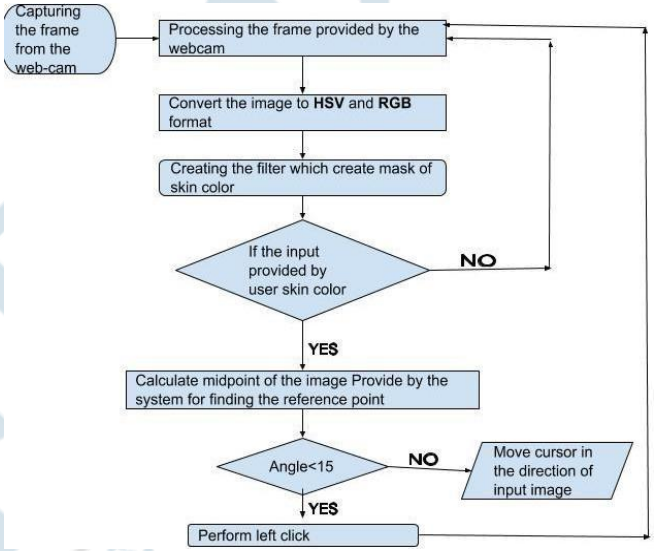


TABLE I: Comparison of Existing and Proposed System

Feature	Existing System	Proposed System
Stability	The Existing System is poor on stability front	The proposed system is very stable as compared to its predecessor
environment	The existing	The proposed system
	system is highly dependent on the environment in which the system is being used	has a very les dependency on the environmental factors.
Complexity	The existing system are very complex and require powerful processors	The proposed system is very simple and requires very basic processors
Practicality	The existing system in not a practically viable option in the real world	The proposed system is a practically viable option in the real world.
Future Perspective	The existing system does not integrate well with the existing technology	The existing system can integrate well with the other technologies

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