



AI Virtual Mouse Using Hand Gestures

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Abstract: This paper is all about an unheard method for controlling mouse movements and features with the usage of a webcam or inbuilt camera through hand gestures. Current strategies contain changing mouse elements which include constructing buttons or converting the location of the tracking ball. Without the usage of a physical mouse, the computer carries out left click, right click, scrolling, and cursor function depending on the hand gestures. Here, we are using motion detection technology and image comparison technology. The algorithm used for this system utilizes a machine learning algorithm. Using detection of color, shape and position information about the hand gestures will be gathered. So, this may keep away from covid 19 unfold with the aid of using stamping out human involvement and leaning on devices to control the computer.

KEYWORDS: AI virtual mouse, Hand Gestures, Click, Web camera or web cam

1.INTRODUCTION

As the generation is growing day to day, people choose convenient and latest devices to use constantly. There is a need for new interfaces designed especially for use with devices. Nowadays, we are admitting the importance of Human-Computer Interaction and in particular Vision-Based Gesture and Object Recognition. This paper put forward an AI Virtual Mouse system that makes use of hand gestures and hand tip detection to carry out mouse functions in computers using vision. The intent of the proposed system is to perform computer mouse cursor functions and scroll functions using a web camera or a built-in camera in the computer replacement of an old(traditional) mouse device. We can tune the fingertip of the hand gesture through the usage of an integrated camera or web camera and execute the mouse cursor operations, scrolling function, and additionally move the cursor with it using AI Virtual Mouse System.

While using a wireless or a Bluetooth mouse, some devices along with a dongle to connect to the PC, mouse, and also battery to operate are used. But, right here we use hand gestures to control. Simple interfaces already exist, such as embedded keyboard, folder keyboard, and mini keyboard. However, these interfaces require a few quantity of area to apply and can't be used while moving. Nowadays, the touchscreen is used globally in lot of applications and it is also a good control interface however it can't be implemented to desktop systems owing to cost and other hardware limitations. On other hand, using vision technology and controlling the mouse by hand gestures, we are able to limit the workspace required.

Python programming language is used for developing the AI virtual mouse system and also OpenCV which is the library for computer vision is used in this system. The model applies Media pipe for monitoring the hands and for monitoring the tip of the hands. The pynput, autopy, pyauto GUI packages is for moving around the window screen on the computer for executing functions like left click, right click, and scrolling functions. The final results of the proposed version can work supremely in real-world application with the use of CPU. The system we are enforcing is been written in python code be a extra responsive and is effortlessly carried out since python is a easy language and is platform independent with a flexibility and is portable which is desirable in developing a program that's focused for developing a virtual mouse and hand recognition system. The system be much more extendable by defining actions for the hand movement for doing specific actions. It could be further changed to any similarly quantity by implementing such moves fir the set of hand gestures, the scope is limited with the aid of using your imagination.

1.1. Problem Description and Overview

The proposed AI virtual mouse system can be used to defeat difficulties in the real world such as situations where there is minimum or no space to use a physical mouse and also for the people who have problems in their hands and are unable to use physical mouse. Also, among the covid 19 situation, it is risky to use the devices by physical contact, so the proposed AI virtual mouse can be used to overcome these difficulties.

2. RELATED WORK

2.1. Mouse Free

Vision-Based Human Computer Interaction through Real Time Hand Tracking and Gesture Recognition vision-based interaction is an appealing choice for replacing primitive Human-Computer Interaction (HCI) using a mouse. Here, the proposed AI virtual mouse system uses webcam, to track gestures to start off specific interactions. Many researches in the human computer interaction and robotics fields have tried to control mouse movement using video devices. However, all of them used various methods.

2.1.1. Models That Proposed Earlier

Quam introduced an early hardware based system in 1990. In this system, the user must wear a data glove. Then in 2010, Dung-Hua Liou, Chenchung Hsieh and David Lee developed a study on “A Real-Time Hand Gesture Recognition system using Motion History Image”. In this model there are more complicated hand gestures.

“Cursor control system using Hand Gesture Recognition” was proposed by Monica B. Gandhi, Sneha U Dudhane and Ashwin M. Patil in 2013. In this Method, Handraces are stored frames which are needed for hand Segmentation and skin pixel detection. “Cursor control using hand gestures” is proposed by Vinay KR. Pasi, Saurabh Singh and Pooja Kumari in 2016. The difficulty faced in the system depends on various colours to perform mouse functions. In 2018, “Virtual Mouse using Hand Gestures” was proposed by Chaitanya C, Lesho Thomas, Navin Wilson and Abilash SS where few mouse functions only performed here.

2.2. A Method of Controlling Mouse Movements Using Real Time Camera

This is a recently developed method for controlling mouse movements with the usage of real time camera. Most approaches involve replacing the mouse parts which include adding more buttons on changing the location of the tracking ball. As an alternative, we proposed to extrude the hardware design. Our model is to use camera and computer vision technology, such as image segmentation and gesture recognition, to control mouse functions like left click, right click, double click and scrolling functions. This paper presents how to build the mouse control system.

2.3. Sixth Sense

Sixth Sense is the wearable gestural interface that augments the real world around us with digital information. Here we use natural hand gestures to interact with the information. The Sixth Sense prototype consists of a pocket projector, a mirror and a camera. The projector projects visual information enabling surfaces, walls and physical objects surrounding us to be used as an interface, while the camera recognizes and tracks the users hand gestures.

3. METHODOLOGY

The flowchart explains various functions and conditions used in the system.

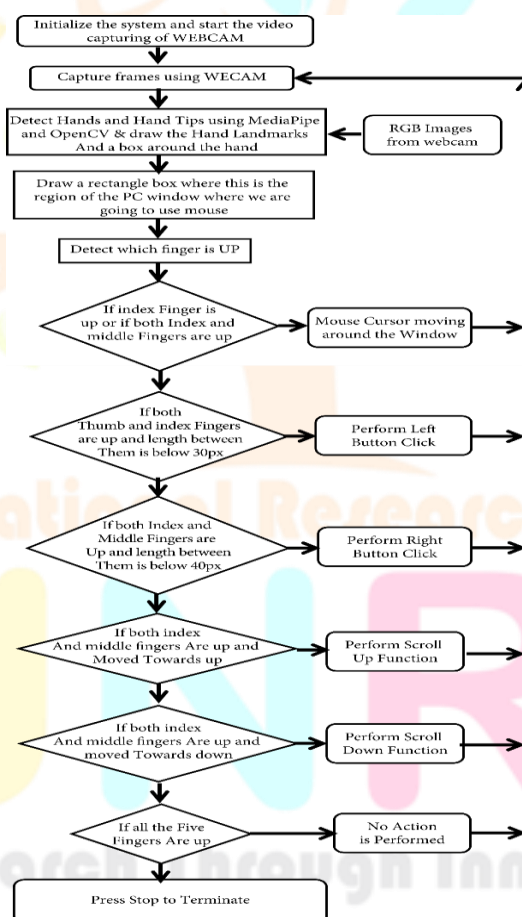


Figure1: Flow diagram of virtual mouse

3.1. Capturing The Video Processing

This system uses the webcam, to capture each frame till the end of the program. The video frames are worked from BGR to RGB color space to track the hands in the video frame by frame. The countless loop is used in order that the internet camera captures the frames in each example and is open for the duration of the complete path of the program. We seize the live feed stream, body with the aid of using the body. Then we process every captured body that's in RGB color space to HSV color space. There are more than 150 color space conversation strategies to be had in OpenCV.

3.2. Detecting Which Finger Is Up and Performing Mouse Functions

In this stage, we have a tendency to area unit detective work that finger is up makes use of the tip ID of the various finger that we have a tendency to found and make use of media pipe and also various coordinates of the fingers that area unit up and in keeping with that, the actual mouse perform is performed.

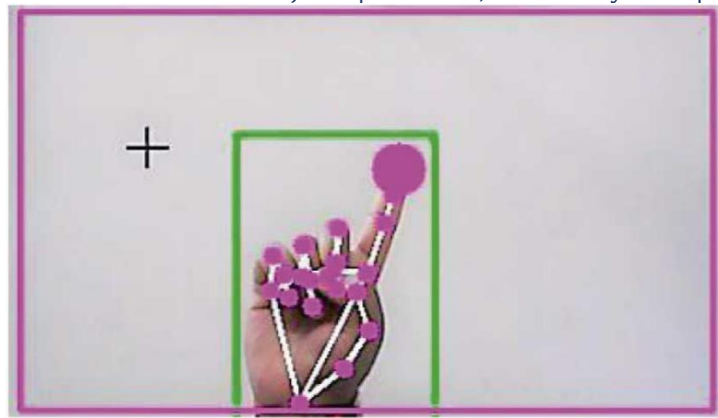


Figure2: Moving Mouse around the Window

3.3. For Mouse Cursor Moving Around The Computer Window

If the forefinger is up with tip Id=1 or each the forefinger with tip Id=1 and also the finger with tip Id = 2 area unit up, the mouse pointer is created to ruse round the window of the pc make use of the Autopy package of python.

3.4. For The Mouse To Perform Left Button Click

If each index with tip Id -1 and therefore the thumb finger with tip Id=0 are up and therefore the distance between 2 fingers is lesser than 30px, the pc is created to perform the left push click which makes use of the pynput python package.

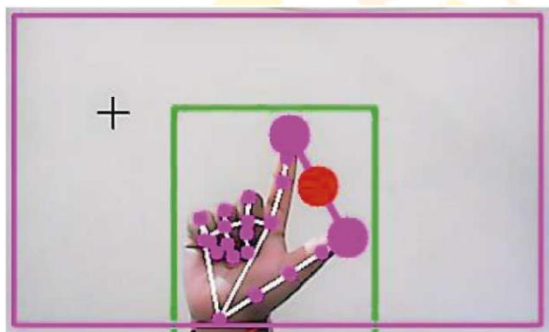


Figure3: To perform Left Button Click



Figure4: To perform Left Button Click

3.5. For The Mouse To Perform Right Button Click

If each the index with tip Id =1 and therefore the finger with tip Id =2 are up and therefore the distance between the 2 fingers is lesser than 40px, the pc is formed to perform the correct push click which makes use of the pynput package.

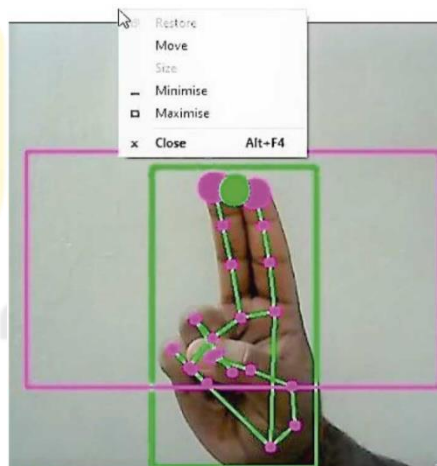


Figure5: To perform Right Button Click

3.6. For The Mouse To Perform Scroll Up Function

If each the fore finger with the tip Id=1 and therefore the finger with the tip Id=2 are up and therefore the distance between 2 fingers is larger and if the 2 fingers are moved up the page, the pc is formed to perform the scroll up mouse perform which makes use of the PyAutoGUI python package.

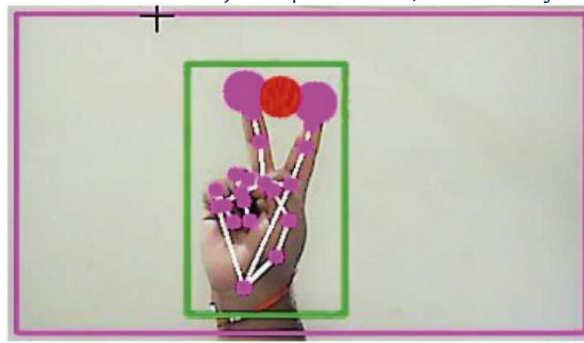


Figure6: To Perform scroll up function

3.7. For The Mouse To Perform Scroll Down Function

If each the index with tip Id = 1 and therefore the distance between the 2 fingers is larger then 40px and if the 2 fingers are stirred down the page, the pc is formed to perform the scroll down mouse perform which makes use of the PyAutoGUI python package.

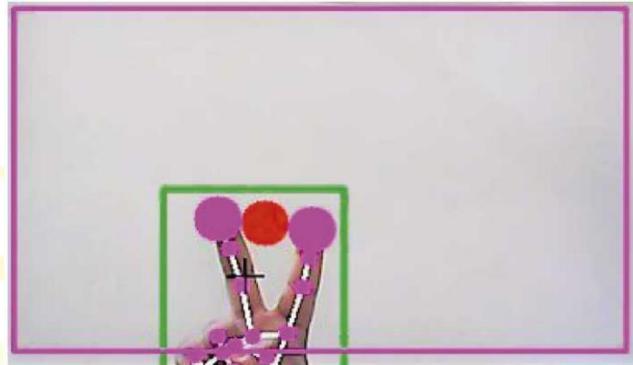


Figure7: To perform scroll down function

3.8. For No Action To Be Performed On The Screen

If all the fingers are up with tip Id=0,1,2,3 and 4, the pc is created to not carry out any mouse events within the screen.

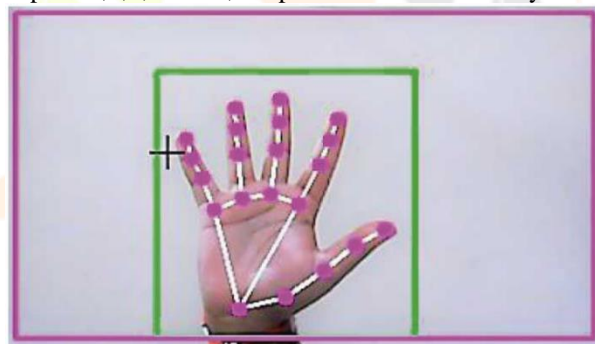


Figure8: To perform No action

4. CONCLUSION

From the outcome of the model, we can move to the conclusion that the proposed AI Virtual mouse system has performed acceptably and has a good accuracy compared to the existing systems and it can also be used for real-time application. This model has some limitations such as higher accuracy. hence, we will work together to overcome these limitations and improve the model to produce more accurate results. Not only did this project display the specific gesture operations that would be achieved by the user but it additionally verified the ability in simplifying user interactions with a personnel computer system and hardware system.

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