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MOUSE FUNCTIONALITIES USING HAND GESTURE RECOGNITION

DEEKSHA R - 20MIS1142

A project report submitted to
Dr. S. GEETHA

SCHOOL OF COMPUTER SCIENCE ENGINEERING

in partial fulfillment of the requirements for the course of

SWE1010- DIGITAL IMAGE PROCESSING

VANDALUR, KELAMBAKKAM ROAD
CHENNAI - 600127

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1.ABSTRACT

The mouse is one among-st the terrific inventions of Human-Computer Interaction (HCI) technology. Currently, wireless mouse or a Bluetooth mouse still uses devices and isn't freed from devices utterly since it uses a battery for power and a electronic device to attach it to the computer. within the projected AI virtual mouse system, this limitation is overcome by using digital camera or a integral camera for capturing of hand gestures and hand tip detection mistreatment laptop vision. The formula utilized in the system makes use of the machine learning formula. supported the hand gestures, the PC is controlled just about and might perform left click, right click, scrolling functions, and laptop pointer operate while not the utilization of the physical mouse. The formula is predicated on deep learning for police investigation the hands. Hence, the projected system can avoid COVID-19 unfold by eliminating the human intervention and dependency of devices to regulate the PC.

2.INTRODUCTION

With the event technologies within the areas of increased reality and devices that we have a tendency to use in our existence, these devices are getting compact within the variety of Bluetooth or wireless technologies. This paper proposes Associate in Nursing AI virtual mouse system that produces use of the hand gestures and hand tip detection for acting mouse functions within the laptop mistreatment laptop vision. the most objective of the projected system is to perform mouse pointer operates and scroll function employing a internet camera or a integral camera within the laptop rather than employing a ancient mouse device. Hand gesture and hand tip detection by mistreatment laptop vision is employed as a HCI with the PC. With the utilization of the AI virtual mouse system, we are able to track the tip of the hand gesture by employing a integral camera or internet camera and perform the mouse pointer operations and scrolling operate and additionally move the pointer with it.

OBJECTIVE

The main objective of the projected AI virtual mouse system is to develop an alternate to the regular and ancient mouse system to perform and management the mouse functions, and this may be achieved with the assistance of an internet camera that captures the hand gestures and hand tip then processes these frames to perform the actual mouse operate like left click, right click, and scrolling function.

3.PROBLEM STATEMENT

The projected AI virtual mouse victimization hand signal structure might in like manner be conversant in beat problems within the spot like things wherever there is not any house to use a real mouse and started for people who have problems in their grip and do not seem, apparently, to be ready to manage a true mouse. Moreover, the COVID circumstance, it's not safeguarded to incorporate the devices by reaching them as an ultimate outcomes of it's desiring to come through what's happening of opened up of the illness by reaching the contraptions, that the projected AI virtual mouse might in like manner be adjusted vanquished these problems since hand sign and hand Tip speech act is employed to manage the device mouse

limits by employing a camera or a characteristic camera like digital camera.

While employing a remote or a Bluetooth mouse, one or two of devices particularly just like the mouse, the contrivance to attach with the laptop, and besides, battery to drive the mouse to regulate a second user, therefore throughout this, the consumer uses his/her natural camera or visual camera and usages his/her hand movements to manage the laptop mouse action.

4.EXISTING SYSTEM

There are some connected works role out on virtual mouse mistreatment hand gesture detection by carrying a glove within the hand and additionally mistreatment color tips within the hands for gesture recognition, however they're no a lot of correct in mouse functions. the popularity isn't therefore correct attributable to carrying gloves; additionally, the gloves also are not fitted to some users, and in some cases, the popularity isn't therefore correct attributable to the failure of detection of color tips. Some efforts are created for camera-based detection of the hand gesture interface.

5.PROPOSED SOLUTION

The following describes the overall objectives of this project:

- To design to operate with the help of a webcam. The Virtual Mouse application will be operational with the help of a webcam, as the webcam are responsible to capture the images in real time. The application would not work if there are no webcam detected.
- To design a virtual input that can operate on all surface. The Virtual Mouse application will be operational on all surface and indoor environment, as long the users are facing the webcam while doing the motion gesture.
- To program the camera to continuously capturing the images, which the images will be analyzed, by using various image processing techniques. As stated above, the Virtual Mouse application will be continuously capturing the images in real time, where the images will be undergo a series of process, this includes **HSV conversion, Binary Image conversion, salt and pepper noise filtering, and more.**
- To convert hand gesture/motion into mouse input that will be set to a particular screen position.

6.COMPONENTS

Hardware Components-

- Computer System.
- Web Camera.

Software Components-

- Anaconda Application.

7.BLOCK DIAGRAM

The block diagram for this project is;

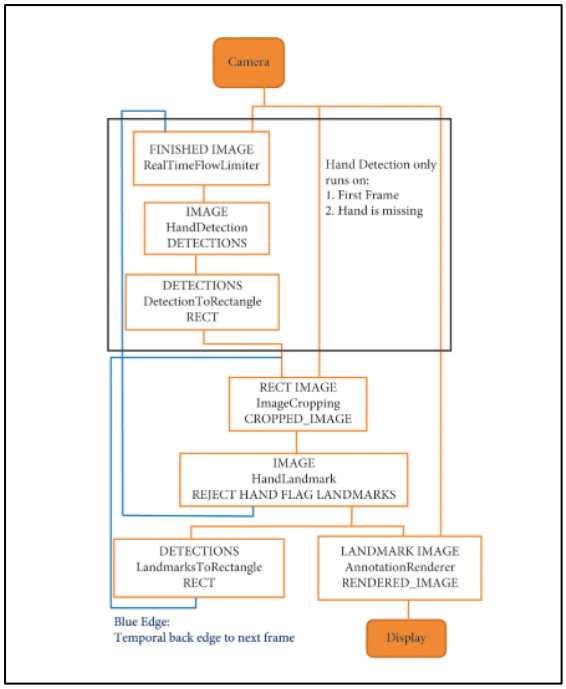


Fig 1. Block Diagram

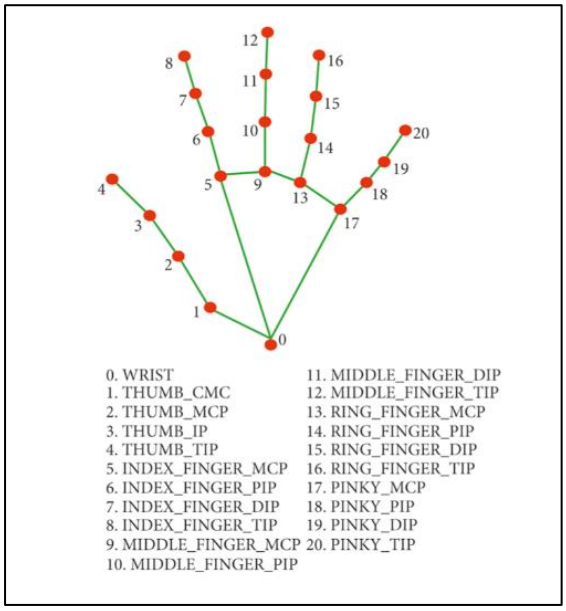


Fig 2. Co-ordinates or land marks within the hand.

8.WORKING MECHANISM

Algorithm:

a. Start

b. Import pyhon OpenCV 3- input section define the normal value for ‘A’ ‘A’ value to be divided by 500 define the edge algorithm parameters - picture and intensity

c. define height X and width Y of an picture define the edge

d. Recognizing section for all height X and width Y pixels in range extract pixel values

- top and bottom

- left and right

- top_left and top_right bottom_left and bottom_right extract differences

- difference I = top minus bottom difference II = left minus right

- extract total diff

total diff. = diff. I + diff. II

total diff. = normal (total diff.) * intensity extract pixels of the image

picture_pix = image [X , Y] extract edge_image

edge_picture [X , Y] = picture_pix * total diff

e. Output

Display input picture

Display input picture converted to

gray scale Display edge

f. End

The planned AI virtual mouse system is predicated on the frames that are captured by the digital camera during a laptop computer or laptop. By victimization the Python pc vision library OpenCV, the video capture object is made and also the net camera can begin capturing video, as shown in Figure four. the online camera captures and passes the frames to the AI virtual system.

8.1 Capturing the Video and process

The AI virtual mouse system uses the digital camera wherever every frame is captured until the termination of the program. The video frames area unit processed from BGR to RGB color house to seek out the hands within the video frame by frame as shown within the following code:

```
def findHands(self, img, draw = True):

imgRGB = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)

self.results = self.hands.process(imgRGB)
```

8.2 (Virtual Screen Matching) Rectangular Region for Moving through the Window

The AI virtual mouse system makes use of the transformation-al rule, and it converts the co-ordinates of tip from the digital camera screen to the pc window full screen for dominant the mouse. once the hands area unit detected and once we notice that finger is up for acting the precise mouse perform, an oblong box is drawn with relation to the pc window within the digital camera region wherever we have a tendency to move throughout the window victimization the mouse pointer.

8.3 Detective work that Finger Is Up and acting the actual Mouse perform

In this stage, we have a tendency to area unit detective work that finger is up victimization the tip Id of the various finger that we have a tendency to found victimization the MediaPipe and also the various co-ordinates of the fingers that area unit up, the actual mouse perform is performed.

8.4 For the Mouse pointer traveling the pc Window

If the finger is up with tip Id = 1 or each the finger with tip Id = 1 and also the finger with tip Id = 2 area unit up, the mouse pointer is formed to maneuver round the window of the pc victimization the AutoPy package of Python.

8.5 For the Mouse to Perform Left Button Click

If each the finger with tip Id = 1 and also the thumb finger with tip Id = 0 area unit up and also the distance between the 2 fingers is lesser than 30px, the pc is formed to perform the left button click victimization the pynput Python package.

8.6 For the Mouse to Perform Right Button Click

If each the finger with tip Id = 1 and also the finger with tip Id = 2 area unit up and also the distance between the 2 fingers is lesser than 40 px, the pc is formed to perform the proper button click victimization the pynput Python package.

8.7 For the Mouse to Perform Scroll up perform

If each the finger with tip Id = 1 and also the finger with tip Id = 2 area unit up and also the distance between the 2 fingers is larger is larger and if the 2 fingers area unit emotional up the page, the pc is formed to perform the scroll up mouse

perform victimization the PyAutoGUI Python package.

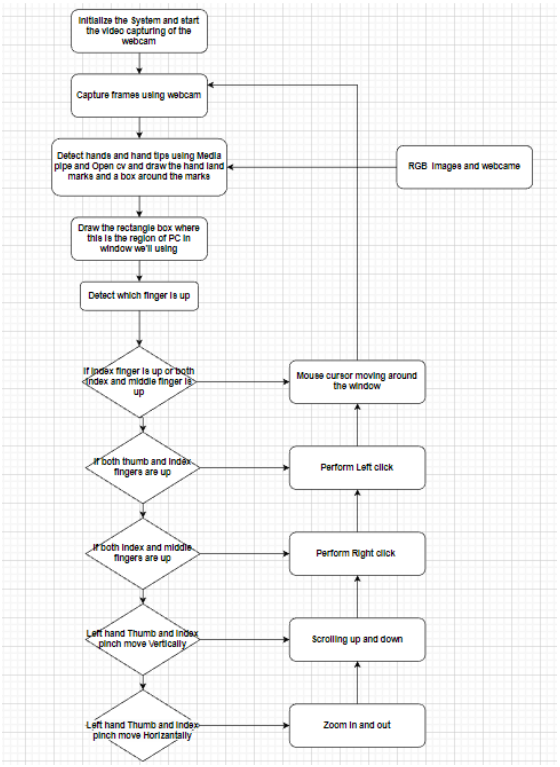
8.8 For the Mouse to Perform Scroll down perform

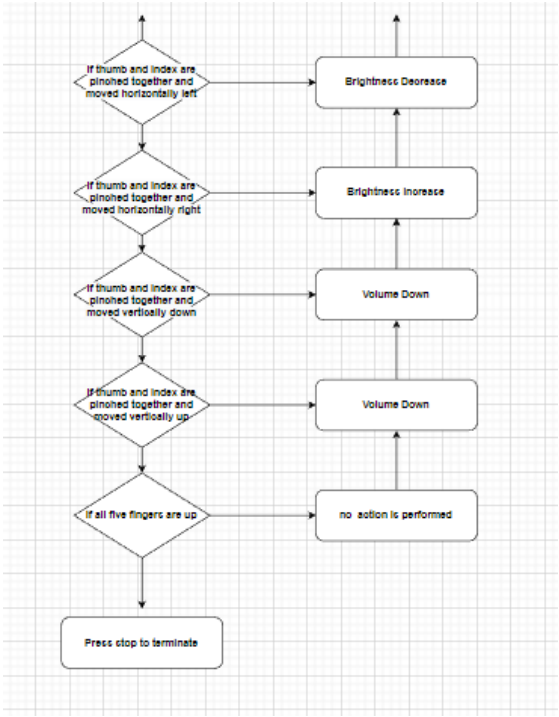
If each the finger with tip Id = 1 and also the finger with tip Id = 2 area unit up and also the distance between the 2 fingers is larger than 40px and if the 2 fingers area unit emotional down the page, the pc is formed to perform the scroll down mouse perform victimization the PyAutoGUI Python package.

8.9 For No Action to be Performed on the Screen

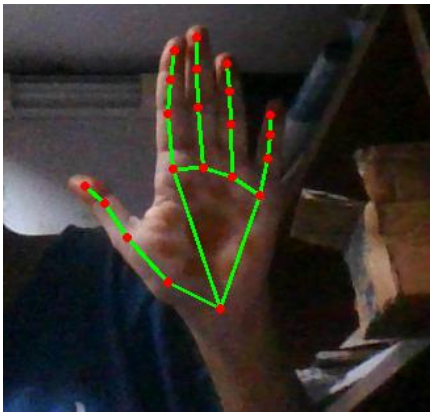
If all the fingers area unit up with tip Id = 0, 1, 2, 3, and 4, the pc is formed to not perform any mouse events within the screen.

9.FLOW DIAGRAM



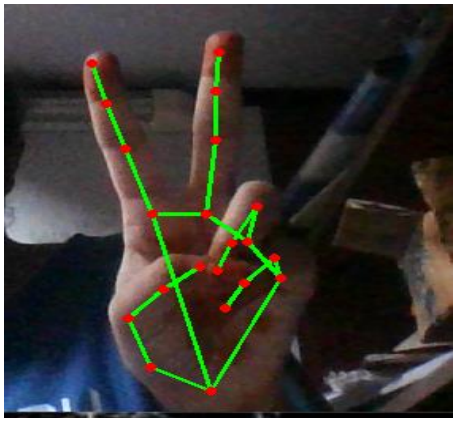


10.EXECUTION AND OUTPUT

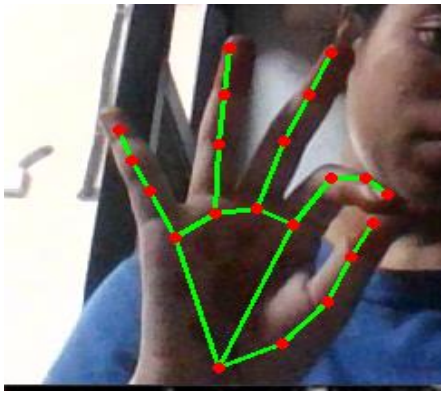


If all the fingers are up with tip Id = 0, 1, 2, 3, and 4, the computer is made to not perform any mouse events in the screen. Open-CV is python vision library that contains Associate in the organized AI virtual mouse system depends upon the edges that are gotten by the camera in Associate in nursing passing PC. Pictures can be conveyed in concealing layered with 3 channels (Blue, Green, and Red), Grayscale with pixel values fluctuating from 0 (dull) to 255 (white), and twofold

portraying dim or white characteristics (0 or 1) specifically**.**



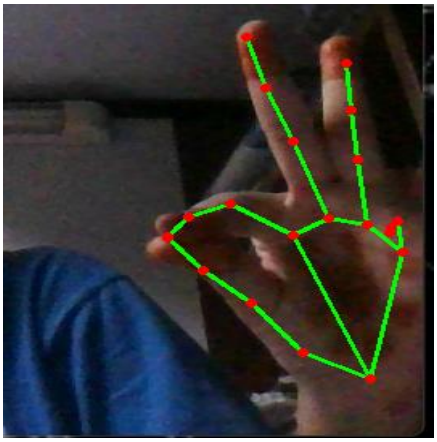
Index finger and Middle finger: If both of these fingers are up then the mouse is in clicking mode. When the distance between these two fingers is short, the clicking function will be performed. This gesture is used to control the mouse and also for right and left click. When they are closed together it is referred as double click.



The AI virtual mouse framework utilizes the instructive algorithmic rule, and it changes over the co-ordinates of tip from the camera screen to the pc window full screen for the mouse. whenever the hands unit saw and keeping in mind that we've missing to see that finger is up for topic the specific mouse perform, Associate in Nursing rectangular box is attracted concerning the pc window at ranges the camera locale any spot we've a penchant to will every now and again move all through the window plan the mouse pointer. This is the major hand.

This gesture is used to control Brightness and Volume of your system.

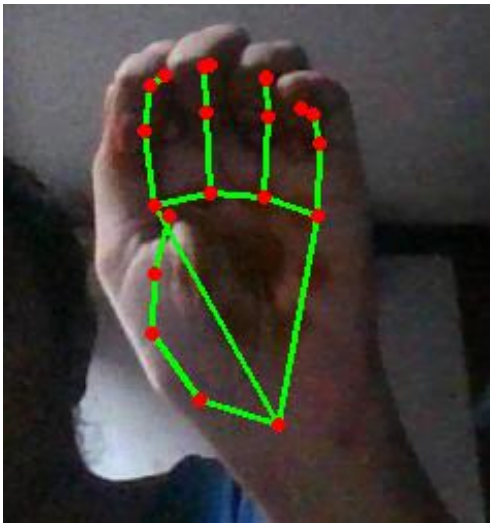
Moving it vertically up increases the volume and vice versa. Moving it horizontally right increases the brightness and to the left decreases the brightness.



This is the pinch gesture of minor hand i.e., the left hand.

This gesture is used to control Zoom in and zoom out and Scrolling of your system.

Moving it vertically up scrolls it up and vice versa. Moving it horizontally right zooms then screen in and to the left zooms out the screen.



This is the Grab gesture of major hand i.e., the right hand.

This gesture is used for the drag and drop of files, folders of your system.

11.CONCLUSION

From Table, it will be seen that the planned AI virtual mouse system had achieved associate degree accuracy of concerning ninety nine. From this ninety nine accuracy of the planned AI virtual mouse system, we have a tendency to come back to grasp that the system has performed well. As seen in Table, the accuracy is low for "Right Click" as this can be the toughest gesture for the pc to know. The accuracy for right click is low as a result of the gesture used for acting the actual mouse perform is tougher. Also, the accuracy is extremely smart and high for all the opposite gestures. Compared to previous approaches for virtual mouse, our model worked o.k. with ninety nine accuracy. The graph of accuracy is shown.

From Table a pair of, it's evident that the planned AI virtual mouse has performed o.k. in terms of accuracy compared to the opposite virtual mouse models. The novelty of the planned model is that it will perform most of the mouse functions like left click, right click, scroll up, scroll down, and mouse pointer movement victimization finger tip detection, and also, the model is useful in dominant the laptop sort of a physical mouse however within the virtual mode. Figure fifteen shows a graph of comparison between the models.

12.REFERENCES

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[2] https://www.hindawi.com/journals/jhe/2021/8133076/
[3] https://www.ijraset.com/research-paper/ai-virtual-mouse-using-hand-gesture-recognition
[4] https://app.diagrams.net
[5] https://github.com/xenon-19/Gesture-Controlled-Virtual-Mouse
https://youtu.be/ufm6tfgo-OA

10.2.RESULTS

Experimental results.

Hand tip gesture*	Mouse function performed	Success	Failure	Accuracy (%)
Tip ID 1 or both tip IDs 1 and 2 are up	Mouse movement	100	0	100
Tip IDs 0 and 1 are up and the distance between the fingers is <30	**Left button click**	99	1	99
Tip IDs 1 and 2 are up and the distance between the fingers is <40	**Right button click**	95	5	95
Tip IDs 1 and 2 are up and the distance between the fingers is >40 and both fingers are moved up the page	Scroll up function	100	0	100
Tip IDs 1 and 2 are up and the distancebetween the fingers is >40 and both fingers are moved down the page	Scroll down function	100	0	100
All five tip IDs 0, 1, 2, 3, and 4 are up	No action performed	100	0	100
Result		594	6	99

Comparison with existing models.

Existing models	Accuracy (%)
Virtual mouse system using RGB-D images and fingertip detection [16]	96.13
Palm and finger recognition based [17]	78
Hand gesture-based virtual mouse [18]	78
The proposed AI virtual mouse system	99