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AI VIRTUAL HAND MOUSE INTERFACE SYSTEM

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Abstract- The growing interest in mortal computer commerce has urged exploration in this area. In addition, exploration has been conducted on a natural stoner interface/ natural stoner experience (NUI/ NUX), which utilizes a stoner's gestures and voice. In the case of NUI/ NUX, a recognition algorithm is demanded gestures or voice. still, similar recognition algorithms have sinned because their perpetration is complex, and they bear a large quantum of time for training. In this paper, we designed and enforced a hand-mouse interface that introduces a new concept called a ''virtual examiner'', to prize a stoner's physical features through Kinect in real-time. This virtual examiner allows a virtual space to be controlled by our hands. Then, we're going to produce an AI- grounded Mouse Controller. We'll first describe the hand milestones and track and click grounded on these points. We'll also apply smooth ways to make it more usable. In this system AI virtual hand mouse interface system, the model makes use of the MediaPipe package for the shadowing of the hands and for shadowing of the tip of the hands, and also, Pynput, Autopy, and PyAutoGUI packages were used for moving around the window screen of the computer for performing functions similar as left click, right-click, volume functions

Keywords: Gesture recognition, Hand mouse, Kinect, NUI/NUX, Virtual monitor.

I. INTRODUCTION

Since the computer was developed, it has come a necessary part of our lives. With the growing significance of computers in day-to-day lives, peoples' studies have naturally concentrated on making their use easy and accessible. For this reason, studies on mortal-computer commerce (HCI) have been laboriously conducted. HCI aims at creating or perfecting calculating systems, including their functionality, trustability, usability, and effectiveness. From this standpoint, the stoner interface (UI) is an important part of HCI, leading to several studies on the same. UI has gradationally evolved from a command-line interface (CLI) used to communicate with a computer using simple commands, to a graphical stoner interface (GUI). Studies have been conducted on a natural stoner interface/ natural stoner experience (NUI/ NUX). GUI is presently the most extensively used type for communication between the stoner and computer, with input bias similar to a mouse and keyboard. On the other hand, NUI/ NUX is characterized by using a stoner's natural gestures, voice, etc., to communicate with the computer without any special input bias. To negotiate this, machine literacy, image processing, and signal processing algorithms are used for gesture and voice recognition. Still, because these algorithms are veritably delicate to apply and bear a large quantum of time for training to achieve recognition, it's delicate to realize a NUI/ NUX. Thus, as a volition, it's necessary to develop a UI with simple perpetration and excellent performance. AI virtual hand mouse interface system that makes use of hand gestures and hand tip discovery for performing mouse functions in the computer using computer vision. The main idea of the proposed system is to perform computer mouse cursor functions and volume functions using a web camera or an erected-in camera in the computer rather than using a traditional mouse device. Hand gesture and hand tip discovery by using computer vision is used as an HCI with the computer. With the use of the AI virtual hand mouse interface system, we can track the fingertip of the hand gesture by using an erected-in camera or web camera and perform the mouse cursor operations and volume function and also move the cursor with it.

II. LITERATURE REVIEW

S. Shriram etal., 2021. Deep knowledge- predicated Real-Time AI Virtual Mouse System Using Computer Vision to Avoid COVID- 19 Spread, the mouse is one of the awful inventions of Human-Computer Interaction (HCI) technology. Presently, a wireless mouse or a Bluetooth mouse still uses bias and is not free of bias completely since it uses a battery for power and a dongle to connect it to the PC. In the proposed AI virtual mouse system, this limitation can be overcome by employing a webcam or an erected-in camera for landing hand gestures and hand tip discovery using computer vision. The algorithm used in the system uses the machine learning algorithm. predicated on hand gestures, the computer can be controlled nearly and can perform left-click, right-click, scrolling functions, and computer cursor functions without the use of the physical mouse. The algorithm is predicated on deep knowledge for detecting the hands. Hence, the proposed system will avoid COVID- 19 spread by barring mortal intervention and reliance on the bias to control the computer

Saniya Khan et al., 2021. Virtual Mouse Using Hand Gesture, This Human Computer Interaction (HCI) has come one of the important systems in this new period and technology. Using the new technology numerous effects have changed in this world, but there are still many effects that are still being used the same. One of the stylish exemplifications one can give for this is the Computer System. A computer system in this period is still using the same computerized bias which was used before. But using HCI we can change these motorized biases by using the rearmost technology we have. This exploration work focuses on HCI using Hand Gesture movement for motorized bias like a mouse. Using this gesture, and movement we will be barring the use of external and motorized tackle. We'll be using free sources for the development of the design and will be using the image processing and image accession process

Jungpil Shin, Cheol Min Kim, 2017. Non-Touch Character Input System Grounded on Hand Tapping Gestures Using Kinect Sensor, there have been a lot of studies on the textbook input system using image-grounded hand gesture recognition. Some studies aim at non-touch input styles of computer systems and others concentrate on support for the deaf and hand-of- hail people. Thenon-touch image-grounded input styles don't bear keyboards, mouse bias, and body-worn bias, e.g., cyber-gloves, but image prisoner bias similar to cameras. The styles can be generally applied because the utmost mobile bias has an equipped camera. And they satisfy conditions for hygiene and cleanliness. Although voice recognition supports non-touch input, it has some downsides similar as being vulnerable to ambient noise, sequestration problems related to being eavesdropped, and problems of mispronunciation and speech complaints of druggies.

Sangbong Yoo et al., 2019. The Study of a Bracket fashion for Numeric Aspect-Writing Entry in a Hands-Free Interface, lately, numerous operations are developed in multitudinous disciplines with colorful surroundings. Since some surroundings bear hands-free operations, new technology is demanded input interfaces other than the mouse and keyboard. Thus, to meet the requirements, numerous experimenters have begun to probe the aspect and voice of input technology. In particular, there are numerous approaches to rendering virtual keyboards with the aspect. Still, since the virtual keyboards hide the screen space, this fashion can only be applied in limited surroundings. In this paper, we propose a bracket fashion for aspect written figures as the hands-free interface. Since aspect jotting is less accurate compared to virtual keyboard typing, we apply the convolutional neural network (CNN) deep literacy algorithm to fête the aspect jotting and ameliorate the bracket delicacy. Either, we produce new aspect writing datasets for training, aspect MNIST (gMNIST), by modifying the MNIST data with features of the aspect movement patterns. For the evaluation, we compare our approach with the introductory CNN structures using the original MNIST dataset. Our study will allow us to have further options for the input interfaces and expand our choices in hands-free surroundings.

III.PROPOSED METHODOLOGY

A. EXISTING SYSTEM

- In the Being system, they had designed a hand mouse scheme that determines the ‘‘move’’, ‘‘click’’, and ‘‘double click’’ mouse operations by feting the moving distances with left and right hands by three-dimensional space.
- Still, the hand-mouse interfaces have the disadvantage of the stoner demanding to be alive of the instructions for a pre-defined hand.
- Still, a stoner had some difficulty with this scheme, due to the low delicacy of the mouse function. This problem was caused by the need to prize the stoner’s physical features in real-time. When a stoner uses the hand-mouse interface, subtle changes do, (because the stoner’s body isn't fixed), which affect the mouse control area, making it delicate for the stoner to control the mouse pointer.

B. MOTIVATION AND PROBLEM STATEMENT

The growing interest in mortal–computer commerce has urged exploration in this area. In addition, exploration has been conducted on a natural stoner interface/ natural stoner experience (NUI/ NUX), which utilizes a stoner’s gestures and voice. The being hand- mouse interfaces have the disadvantage of the stoner demanding to be apprehensive of the instructions for a pre-defined hand. still, similar recognition algorithms have sinned because their perpetration is complex, and they bear a large quantum of time for training. thus, ways that include pre-processing, normalization, and point birth are demanded. A virtual examiner is generated grounded on a stoner’s physical features. It's possible for a stoner to directly control a mouse pointer using their hands. also, the virtual examiner is intuitive, because it's used like a touch screen. Through this, we propose an intuitive hand-mouse interface with better delicacy than former similar interfaces. Thus, as a volition, developing a UI with simple perpetration and excellent performance is necessary.

C. PROPOSED SYSTEM

The proposed system is a hand-mouse interface that introduces a new concept called a ‘‘virtual examiner’’ to prize a stoner’s physical features in real-time. We can fluently gain a stoner’s physical features using Kinect. A virtual examiner is generated grounded on a stoner’s physical features. It's possible for a stoner to directly control a mouse pointer using their hands. Also, the virtual examiner is intuitive because it's used like a touch screen. Through this, we propose an intuitive hand-mouse interface with better delicacy than former interfaces. The proposed hand-mouse interface excerpts a stoner’s physical features using Kinect in real-time

D. MODULES

CAMERA

The AI virtual mouse Hand mouse Interface system is grounded on the frames that have been captured by the camera in the laptop or PC. By using the Python computer vision library OpenCV, the videotape prisoner object is created, and the web camera will start landing the videotape. The camera captures and transfers the frames to the AI virtual system.

HAND TRACKING

The AI virtual mouse Hand Mouse Interface system uses the camera where each frame is captured till the end of the program. Then, the video frames are processed from BGR to RGB color space to detect the hands in the video frame by frame as shown in the following code

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

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

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

CURSOR REGION

The AI virtual mouse Hand Mouse Interface system uses a transformational algorithm that converts the coordinates of the fingertip from the camera to the computer screen for operating the mouse. While the hands are detected and when we find which finger is up for performing the particular mouse function, a rectangular box is drawn concerning the computer screen in the camera region, which indicates that we can control the mouse when we move our hand throughout that box area.

CURSOR MOVEMENT

If the index finger is only up, then the mouse cursor moves around the window.

LEFT – CLICK

If both index and middle fingers are only up and the length between them is below 40px, then it performs a Left-click operation.

RIGHT – CLICK

If both index and middle fingers are only up and the length between them is greater than 160px, then it performs a Right-click operation.

VOLUME CONTROLS

If both thumb and index fingers are up, it controls volume by adjusting the distance between them. If all five fingers are up, then no action is performed.

E. IMPLEMENTATION PROCESS

For detection and tracking of the hands, the Media Pipe, and PYautoGUI framework are used, and the OpenCV library is used for computer vision. The algorithm makes use of machine learning concepts to detect and recognize hands and hand tips.

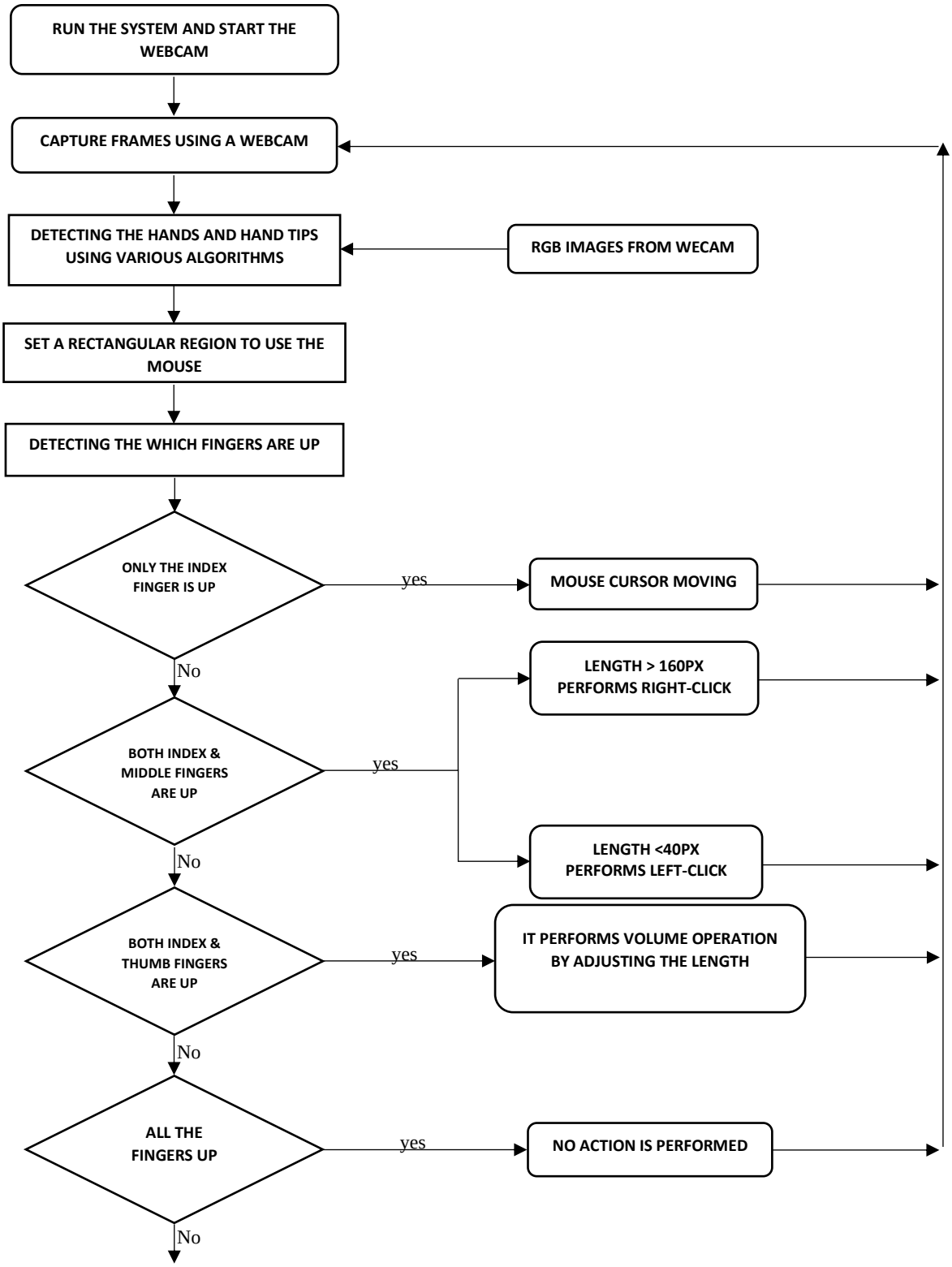

Figure 1: Implementation Process

F. PROPOSED ARCHITECTURE

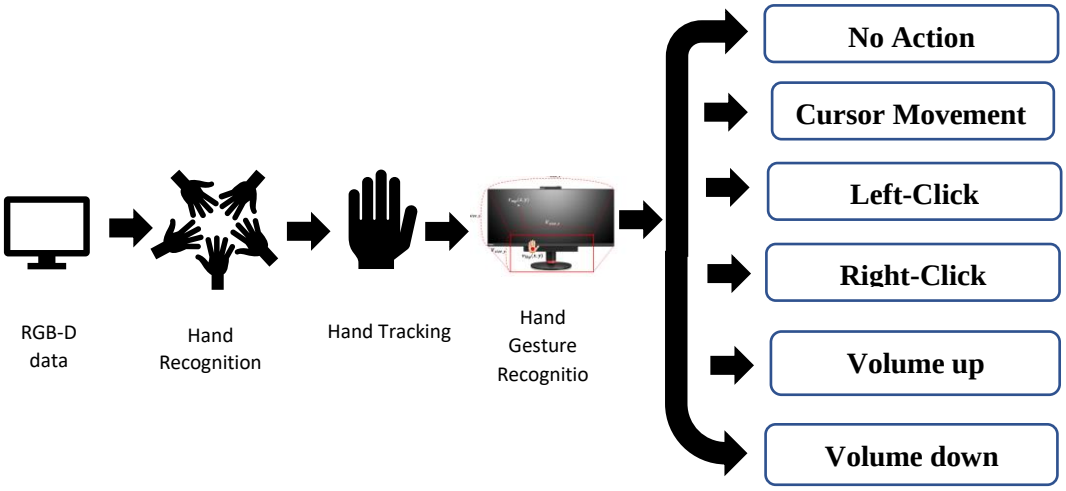

Figure 2: Proposed Architecture

G. ALGORITHMS USED

MEDIAPIPE

MediaPipe is a frame that's used for operation in a machine learning channel, and it's an open-source frame of Google. The MediaPipe frame is useful for cross-platform development since the frame is erected using time series data. The MediaPipe frame is multimodal, where this frame can be applied to colorful audio and videos. The MediaPipe frame is used by the inventor for structure and assaying the systems through graphs, and it has also been used for developing the systems for operation purposes.

The channel configuration carries out the way involved in the system that uses MediaPipe. The channel created can run on colorful platforms allowing scalability in mobile and desktops. The MediaPipe frame is grounded on three abecedarian corridors; they're performance evaluation, the frame for reacquiring detector data, and a collection of factors that are called calculators, and they're applicable.

A channel is a graph that consists of factors called calculators, where each calculator is connected by aqueducts through which the packets of data inflow through. Inventors are suitable to replace or define custom calculators anywhere in the graph creating their operations. The calculators and aqueducts combined produce a data-inflow illustration; the graph is created with MediaPipe where each knot is a calculator, and the bumps are connected by aqueducts. The single-shot sensor model is used for detecting and fetching a hand or win in real-time.

The single-shot sensor model is used by MediaPipe. First, the hand discovery module is trained for a win discovery model because it's easier to train triumphs. Likewise, non-maximum repression works significantly better on small objects similar to triumphs or fists.

OPENCV

OpenCV is a computer vision library that contains image-processing algorithms for object discovery. OpenCV is a library of python programming language, and real-time computer vision operations can be developed by using the computer vision library. The OpenCV library is used in image and videotape processing and analysis similar to face discovery and object discovery.

PYAUTOGUI

Python pyautogui library is a robotization library that allows mouse and keyboard control. Or we can say that it facilitates us to automate the movement of the mouse and keyboard to establish commerce with the other operation using the Python script. It provides numerous features, and many are given below.

- We can move the mouse and click on the other operations window.
- We can shoot the keystrokes to the other operations.
- We can also take shots and give an image.
- It allows us to detect a window of the operation, and move, maximize, minimize, resize, or close it.
- Display cautions and communication boxes.

IV. EXPERIMENTAL ANALYSIS

FINDING THE HANDS

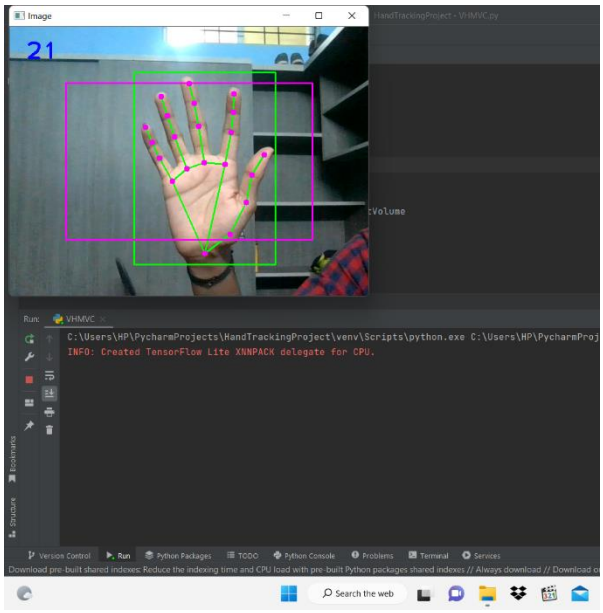

Figure 3: hand recognization

CURSOR MOVEMENT

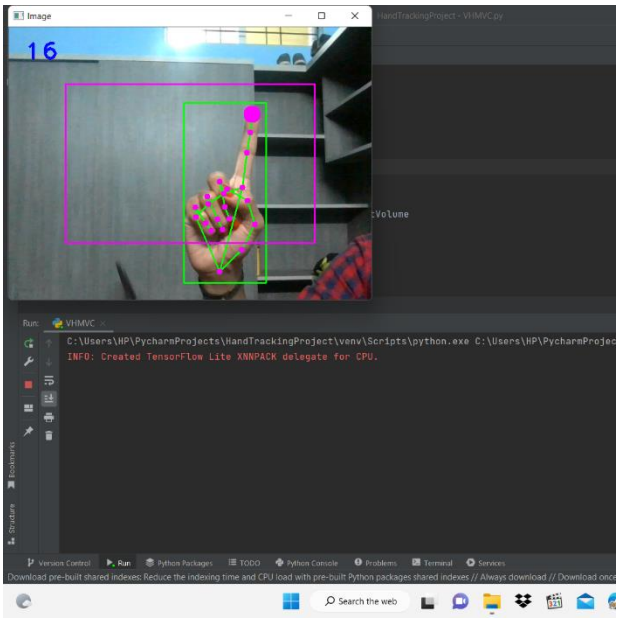

Figure 4: cursor movement

LEFT – CLICK BUTTON

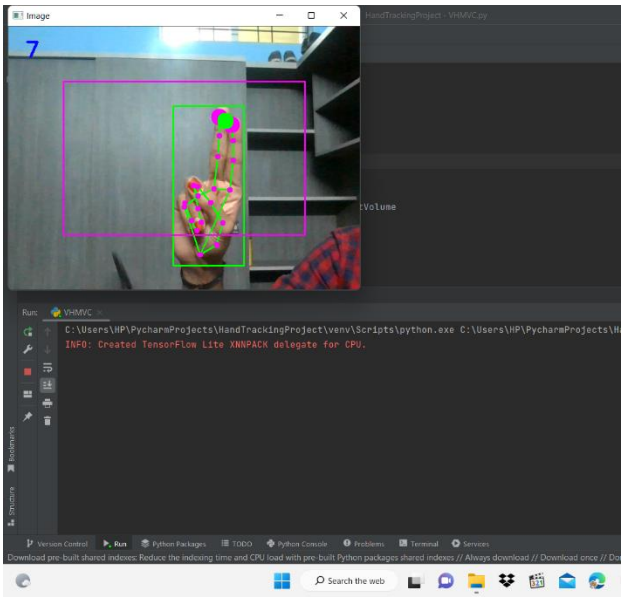

Figure 5: Left-click button

VOLUME UP

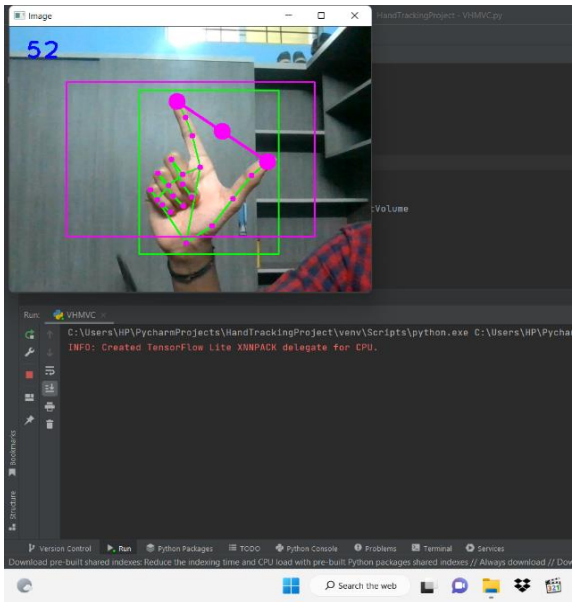

Figure 7: volume up

RIGHT – CLICK BUTTON

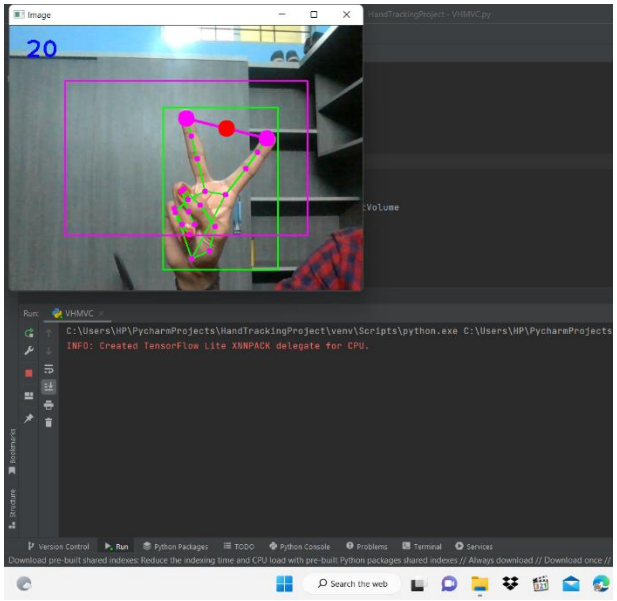

Figure 6: Right-click button

VOLUME DOWN

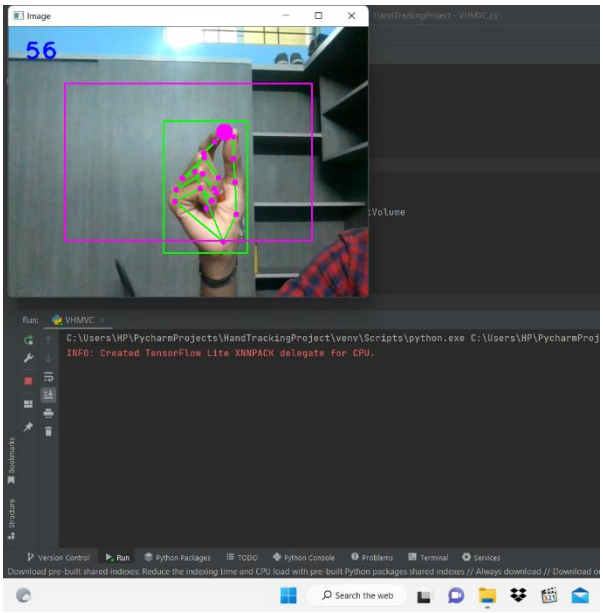

Figure 8: volume decreasing

V. CONCLUSION

The main idea of the AI virtual hand mouse interface system is to control the mouse cursor functions by using hand gestures rather than using a physical mouse. The proposed system can be achieved by using a webcam or an erected-in camera that detects the hand gestures and hand tips and processes these frames to perform the particular mouse functions. From the results of the model, we can conclude that the proposed AI virtual hand mouse interface system has performed veritably well and has lesser delicacy compared to the being models and also the model overcomes utmost of the limitations of the being systems. Since the proposed model has lesser delicacy, the AI virtual hand mouse can be used for real-world operations since the proposed hand mouse system can be used nearly using hand gestures without using the traditional physical mouse. The model has some limitations similar to a small drop in delicacy in the volume down function and some difficulties in clicking and dragging to elect the textbook. Hence, we will work next to overcome these limitations by perfecting the fingertip discovery algorithm to produce further accurate results.

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