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VIRTUAL MOUSE USING HAND GESTURES

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ABSTRACT:

Many technologies are continually evolving in today's technological environment. The human-machine interface is one such promising concept. For example, there is no way to extend the limit on a wired mouse. Bluetooth hardware and a Bluetooth dongle must be installed on the computer to operate a wireless mouse. The proposed system would have no such limits, depending on gesture recognition. Object identification and image processing are the key technologies applied in this study. The idea is to move the mouse pointer on the screen without using any hardware, such as a mouse, and merely by exploiting finger motions, known as gesture recognition. We present a unique Human-Computer Interaction approach in this study (HCI) (HCI). A real-time camera is utilised to control cursor movement.This research proposes a camera vision-based cursor control system using hand gestures captured througha webcam. The system will enable the user to move the computer cursor around using their hand carryingpoint-based lines and other hand gestures. The recommended system is built on a low-resolution camerathat functions as a sensor and can follow the user's hand in two dimensions carrying colour point-based lines. Python is used to implement the system. Hand gesture is the most natural and easy means of communication.

Keywords: Human-Computer Interaction (HCI), Webcam, Cursor, Object detection, Image processing

I. INTRODUCTION:

When users don’t have a real mouse, they may still manage their computer using a virtual mouse. Because it uses a standard webcam, it might be considered hardware. ' Input deviceslike a genuine mouse or a computer keyboard may be used to operate a virtual mouse. The webcam-powered virtual mouse uses different image processing methods.

As the user moves their hands, they are converted into mouse clicks. Continuously taking images is the default setting for a web camera. Facial recognition security applications haverecently been implemented on laptops

with built-in webcams. This may be done by using thewebcam's capability for vision-based CC, which eliminates the need for computer keyboardsand mice. Other HCI applications, such as sign language, databases, or motion controllers,

may also benefit from using a camera. The Microsoft Kinect and the Nintendo Wii are two examples of recent advancements in HCI technology for gaming. Thanks to this new gamingtechnology, playing video games has become more enjoyable and interactive. The NintendoWii, which sold more than 50 million units in its first year, is a clear example of how motioncontrollers transform gaming. For one-on-one computer interaction, hand gestures are extremely intuitive and effective, and they establish a Natural User Interface (NUI). Hand gesture-based cursor control has been intensively studied. New gadgets and methodologies have been developed. In addition to HCI, hand gesture recognition identifies sign languages,making it even more critical.

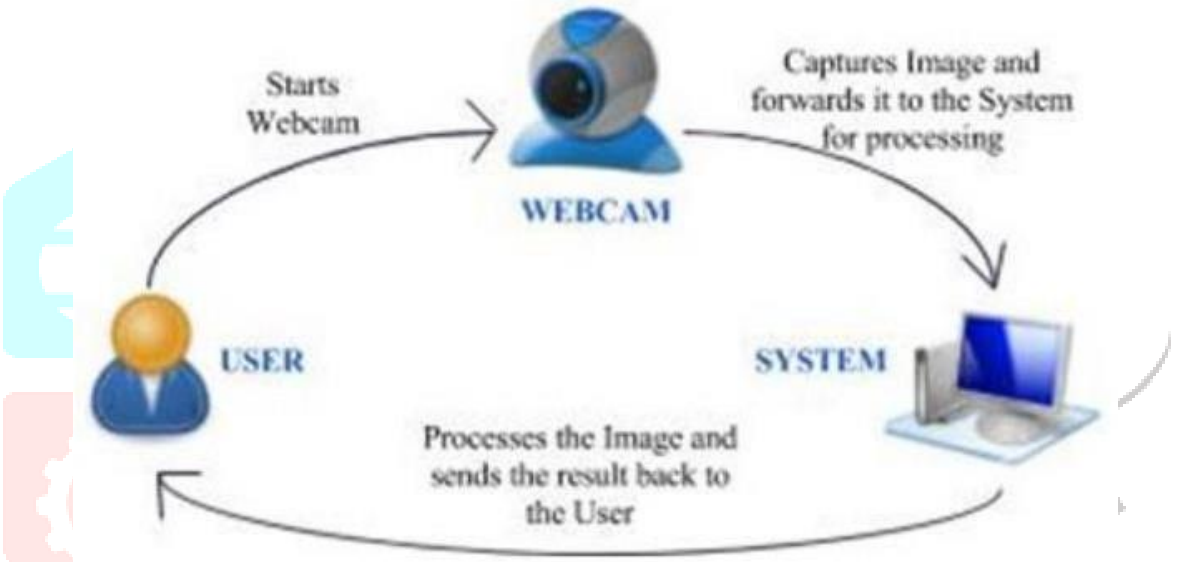


Fig : System Architecture

II. Literature Survey:

To meet the increasing importance of human-computer interaction (HCI), several mice have been created, from the basic office mouse to an extreme gaming mouse. Because they aren't as ecologically friendly as they seem to be, these gadgets have several drawbacks. For example, you'll need a flat surfaceand a certain position to utilise the mouse's functions. As a result, part of this technology is useless whenremotely communicating with computers because of connection length constraints.

Multi-point Interactive Whiteboards may be created with the Wiimote [4]. Wiimote controller, Microsoft.NET framework, Wiimote Connect, and Wiimote Whiteboard software are all required for this setup to operate. An IR pen and 1024 x 786-pixel beamer are also required. The Wiimote controllertracks the whiteboard’s infrared source, which sends data to the PC via Bluetooth. Multi-touch teachingstations, an interactive whiteboard and a stylus input conversion tool, are all part of the platform. Most people use the Wii-mote as a virtual marker based on an assessment of relevant research.

Hand gestures are not supported in the current setup, only a mouse and trackpad display control system.A hand gesture cannot be used to reach the monitor's display screen from a distance. Even though this is what it mainly seeks to do, the breadth is only limited to the virtual mouse region. In the present virtual mouse control system, the mouse cursor, left-click, right-click and drag are controlled by a hand recognition system. Abolishing the practice of hand recognition will be the new standard in the future. Even though a variety of hand recognition systems are available, Only a few movements are given for each hand-made shape, which leads to a great deal of ambiguity and makes the "still hand" difficult to grasp. It's becoming more difficult to justify using a mouse in the modern world as technology advances.

A sensor may be used to move the mouse cursor around the screen (or a built-in camera).

The software's dwell delay feature is widely used when a mouse button is unavailable. Clicking may also be accomplished with the aid of a well-placed switch.

III. PROPOSED MODEL:

As technology progresses, more and more things are becoming virtualised. There are several methods for recognising and translating spoken language into text, such as speech recognition. Because of this, keyboards may be replaced with Speech Recognition and Eye Tracking, which utilises our eyes to control the mouse pointer. The mouse may be replaced with eye-tracking in the future. Hand pictures, pixel images, or any other human posture three may be used to

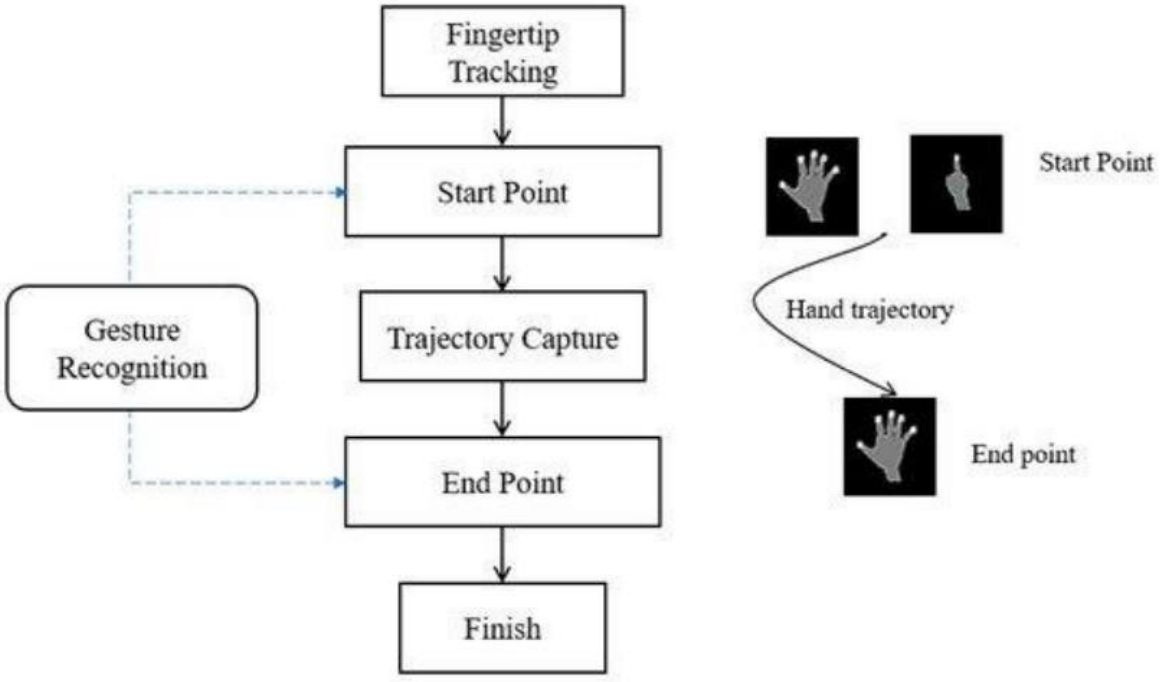


Fig : Working model

generate the devices required to make the recognitions work with minimal processing effort or power. To identify handmade gesture recognition models, companies are presenting a variety of ways. Data gloves and other specialised equipment are compatible with certain variations. Colour caps were employed to convey complex information about gestures supplied by the user/human.

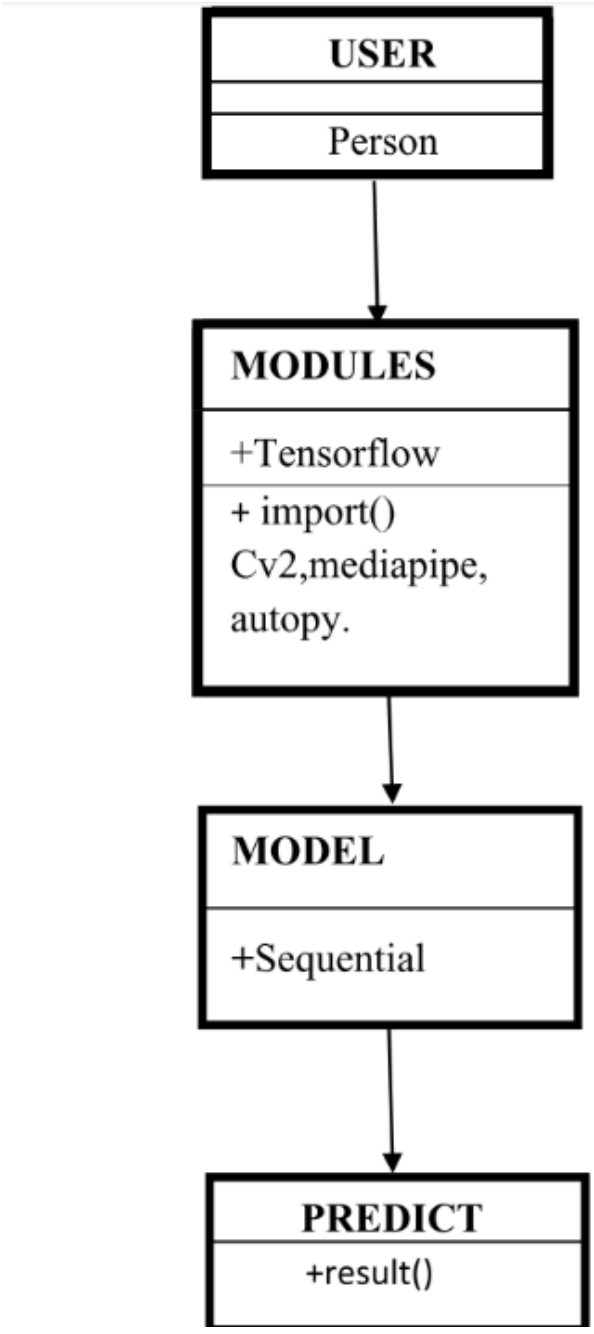


Fig : Flow chart

Software Requirements:

The software Requirements in this project include:

a.Python b.Anaconda prompt c.Spyder IDE

d.Modules (OpenCV, Mediapipe, Autopsy)

The MediaPipe framework is utilised for hand motion recognition and tracking, while the OpenCV library is used for computer vision.

Using MediaPipe in a machine learning pipeline requires using an open-source framework developed by Google. Cross-platform programming is made possible by the MediaPipe framework's utilisation of timeseries data. Several audio and video formats may be utilised with the MediaPipe framework. Developersuse the MediaPipe framework to create systems for application development and build and analyse systems using graphs. In a MediaPipe-based system, all steps are performed in the pipeline. Several platforms may be used for the pipeline for mobile and desktop scalability. Components of the MediaPipeframework may be broken down into the following categories: performance assessment, sensor data acquisition, and calculators. Calculators, the basic building blocks of a pipeline, are linked by streams, the medium via which data packets travel. Developers may use the graph's replacement or definition of custom calculators to construct their applications. Calculators and streams form a data flow diagram; thegraph is built using MediaPipe, and streams link the nodes.

A single-shot detector device is used to identify and recognise a hand or palm instantly. A single-shot detector is used in the MediaPipe. Since palms are simpler to train, it is initially used in the hand identification module to build a model for palm detection. Furthermore, the non-maximum suppression works better for small objects like hands or fists. In the hand area, locating knuckles or joint coordinatesis a model of a hand landmark.

Computer vision methods for object detection are part of the OpenCV library. Real-time computer vision applications may be created using OpenCV, a library for the Python programming language. As well as face and object identification, the OpenCV library is utilised in image and video processing.

Because of its modular nature, OpenCV comes with several shared and four static libraries. All of these modules are available for purchase.

All other modules utilise this compact module to define fundamental data structures such as Mat and thebasic functions that all other modules use.

Linear and non-linear image filtering, geometric transformations (resize, affine and perspective warping, general table-based remapping), colour space conversion, histograms, and so on are all included in the image processing module.

This is a video analysis module that contains motion estimation and background removal.

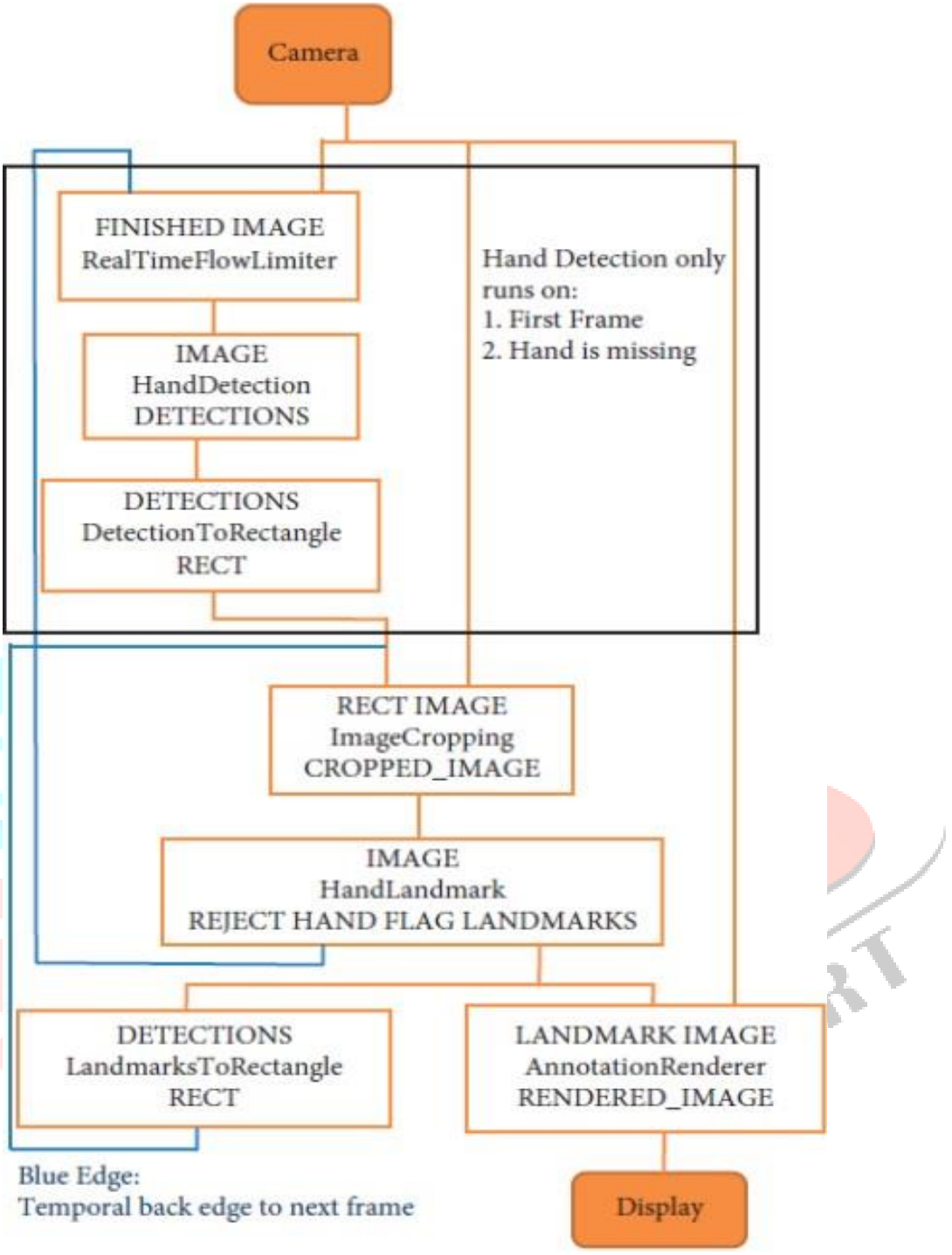


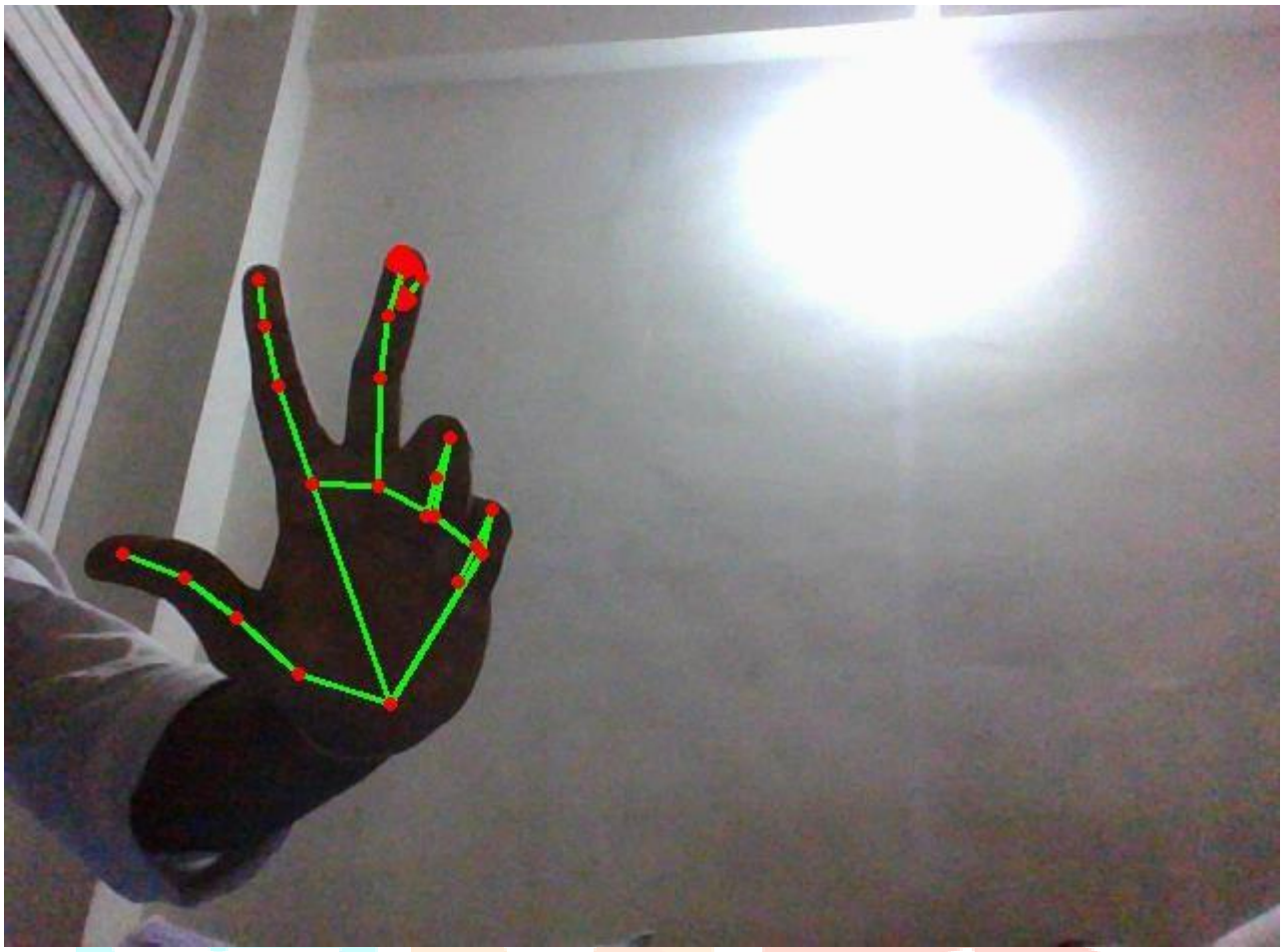
Fig : Working model

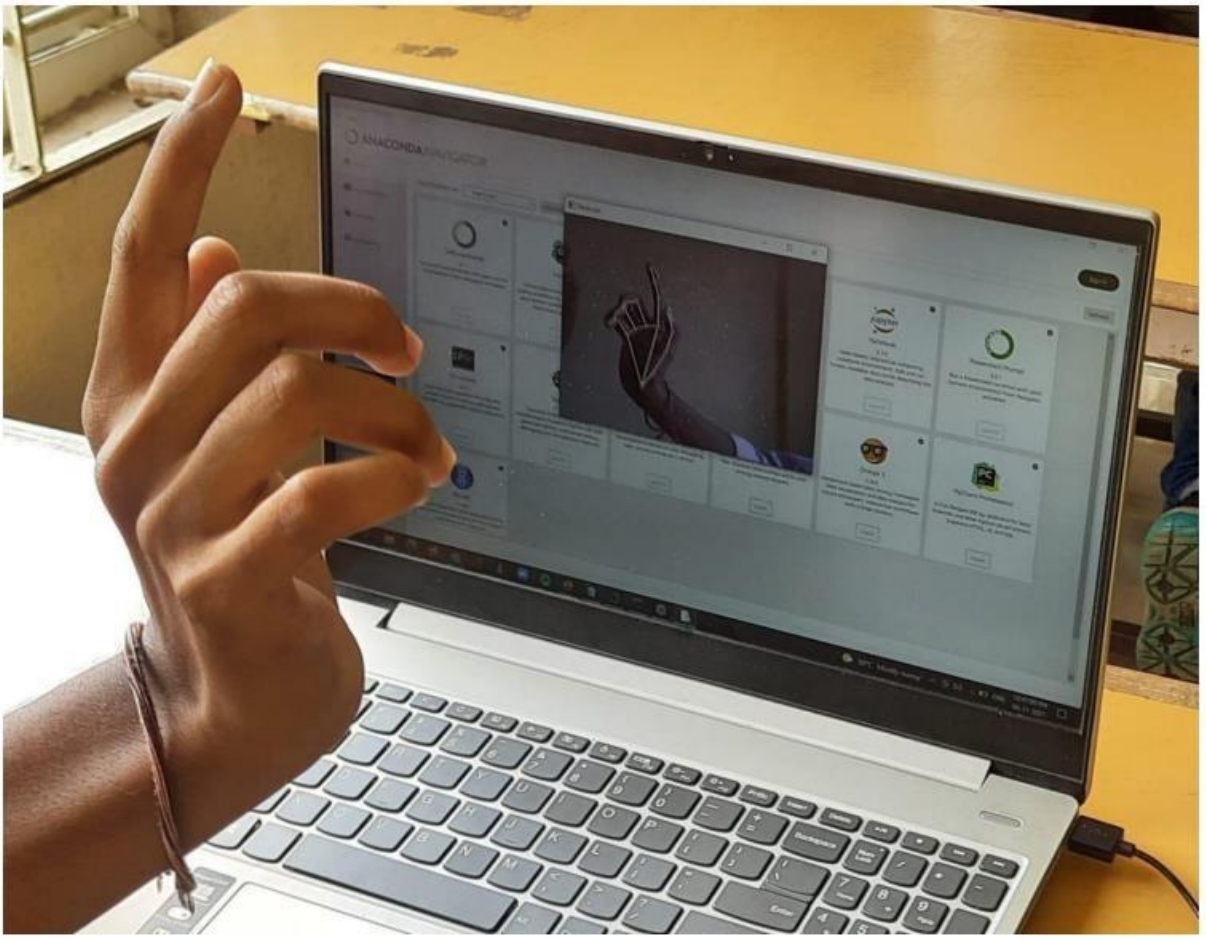
IV. RESULTS:

An image of the user's hands and the lines that control the cursor will appear on the user's screen when the command cv2.imshow("Webcam," img) is used. It isn't enough to only display a camerainput window; the user is also given the option to see other relevant information in the background,such as other light sources.

Test Case_ID	Pre Condition	Post Condition	Output
TC-1	Invoking the camera and check whether we are able to capture live video.	Camera detected and live video capturing.	Pass
TC-2	Camera detecting the hand.	Hand detected.	Pass
TC-3	Detection of multiple hands.	Multiple hands detected.	Pass
TC-4	Moment of Cursor.	Cursor moves.	Pass
TC-5	Selecting a file.	At times selected file is not opened properly.	Fail

Fig : Test case results





V. CONCLUSIONS:

A few strategies have to be devised since precision and efficiency are vital in making the application as helpful as a real mouse. There is no longer any need for a real mouse to implement such an application. This motion tracking mouse records every click and drag of a real mouse (virtual mouse).
Improvements and new features are required to make the application more user-friendly, accurate and adaptable to different contexts. The following is a list of the features and upgrades that are needed:

a) Smart movement: It is necessary to have an adaptive zoom in/out capability that can automatically vary the focus rate dependent on the distance between the user and the camera to cover a greater distance. To get a faster reaction time, hardware factors such as the CPU speed, RAM size, and camera features are important considerations.

b) Improved Accuracy & Performance If the software runs on a high-end computer with an excellent camera, it may operate better under varied lighting conditions.

c) Mobile application: Hand gestures will take the role of touchscreen controls on Android smartphones shortly.

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