VIRTUAL MOUSE USING HAND GESTURES

(CONTROLLING MOUSE OPERATIONS VIA DIFFERENT HAND GESTURES)

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ABSTRACT

Gestures are major forms of human communication. The main concept of this project is to move the mouse pointer on the screen without using any hardware, such as mouse, and instead by using utilizing finger motions. In this project we suggest interact with computer system without using hardware mouse.This project propose a way to control the position of the cursor by controlling hand gestures.Instead of sensors, we can simply use web-cam as input.

INTRODUCTION

- The basic goal of VIRTUAL MOUSE USING HAND GESTURES is to improve the interaction between users and computers.
- Recent days we are using hardware mouse as an navigating device to a specified user for their desired operations.
- The virtual mouse is used to reduce the space for using the physical mouse, and it can be used in many situations where we cannot able to use the physical mouse.
- By using hand gestures we can implement without any physical connection between the user and system.
- Instead of using more expensive sensors, a simple web camera can identify the gestures and perform the action.

EXISTING SYSTEM

- The existing system consists of a mouse that can be either wireless and wired to control the cursor of the mouse.
- An important function of the Hardware mouse is to move the cursor from one place to another place, open and close the applications, select the folders and files.
- Mouse has mainly three basic parts i.e.,

  *Left click

  *Right click

  *Scroll Wheel

WIRELESS VS WIRED

PROPOSED SYSTEM

- The proposed system works by Navigating the position of the cursor by using specific hand gestures.
- This project proposes to increase & decrease the both brightness & volume of the system.
- We can implement basic operations of the hardware mouse in the virtual mouse using hand gestures.
- The proposed system can able to work for any skin tone of any color as well as we can accurately use it at minimal lighting condition.

SCOPE AND PURPOSE

SCOPE

Although using of hand gestures is increasing in our day-to-day life, we can add many things to it in future.

For hand gesture we can follow these things:

- Enhancement of our system to control the whole computer system.
- Volume And Brightness Control Using Hand Gestures.

PURPOSE

Technologies which will completely remove mouse dependency can be developed with the help of hand gesture based control system.

PROJECT MODULES

- Hand Recogintion & Gesture Recognition Module
- Mouse Operations Module
- Volume Control & Brightness Control Module
- Zoom and Drag Operations Module
- Output Module

PROGRAMING MODULES

- OPEN CV
- MEDIAPIPE
- PYAUTOGUI
- Enum(InTNUM)
- PYCAW(AudioUtilities,IAudioendpointvolume)
- Ctypes
- Screen_Brightness_control

ALGORITHMS

- **K-Nearest Neighbour Algorithm(K-NN):**

The KNN algorithm is a popular classification algorithm used in machine learning. In the context of a virtual mouse using hand gestures, KNN can be used to classify different hand positions and map them to recognize Through different datasets.

Working process:

1) Data Collection
2) Feature Extraction
3) Data Preprocessing
4) Training
5) Testing
6) Mapping

Proposed Algorithm:

The goal of the algorithm is to detect gestures with real time processing speed ,minimize interference , and reduce the ebility to capture unintentional gestures.

Working process of proposed algorithm:

1) Hand image
2) Hand detection
3) Preprocessing
4) Feature extraction
5) Recognition
6) Execution

❖ Transitional Algorithm:

A transitional algorithm is a set of steps that describes how to transition from one state or condition to another. This type of algorithm is commonly used in computer programming, where it is necessary to move data from one format or structure to another.

Working process:

1) Input Data
2) Data Analysis
3) Transformation Rules
4) Data Transformation
5) Data Validation
6) Output Data

SAMPLE CODE

virtual_mouse.py

```
import cv2
import mediapipe as mp
import pyautogui
import math
from enum import IntEnum
from ctypes import cast, POINTER
from comtypes import CLSCTX_ALL
from pycaw.pycaw import AudioUtilities, IAudioEndpointVolume
from google.protobuf.json_format import MessageToDict
import screen_brightness_control as sbcontrol

pyautogui.FAILSAFE = False
mp_drawing = mp.solutions.drawing_utils
mp_hands = mp.solutions.hands
# Gesture Encodings
```

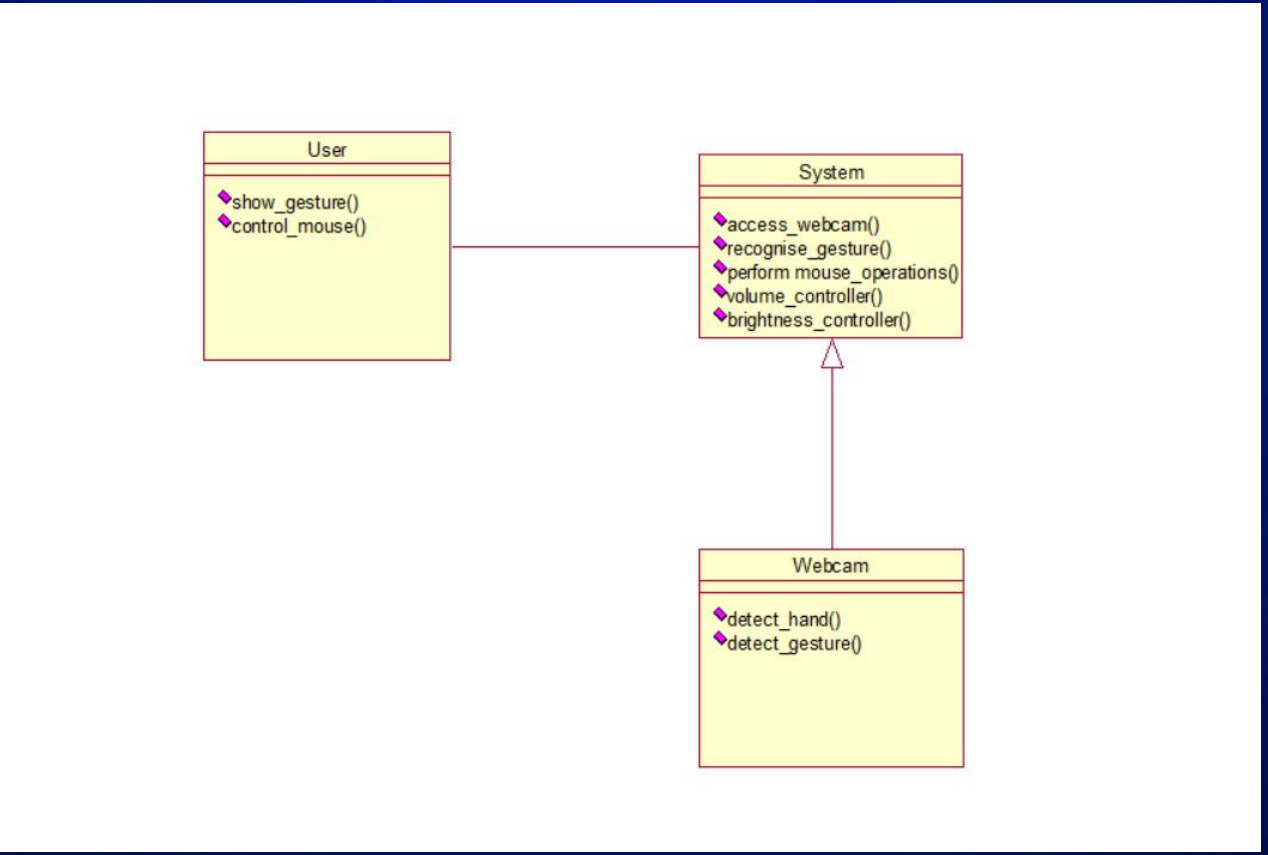
```
class Gest(IntEnum):
    # Binary Encoded
    FIST = 0
    PINKY = 1
    RING = 2
    MID = 4
    LAST3 = 7
    INDEX = 8
    FIRST2 = 12
    LAST4 = 15
    THUMB = 16
    PALM = 31
# Extra Mappings
    V_GEST = 33
    TWO_FINGER_CLOSED = 34
    PINCH_MAJOR = 35
    PINCH_MINOR

class HLabel(IntEnum):
    MINOR = 0
    MAJOR = 1
```

UML DIAGRAMS

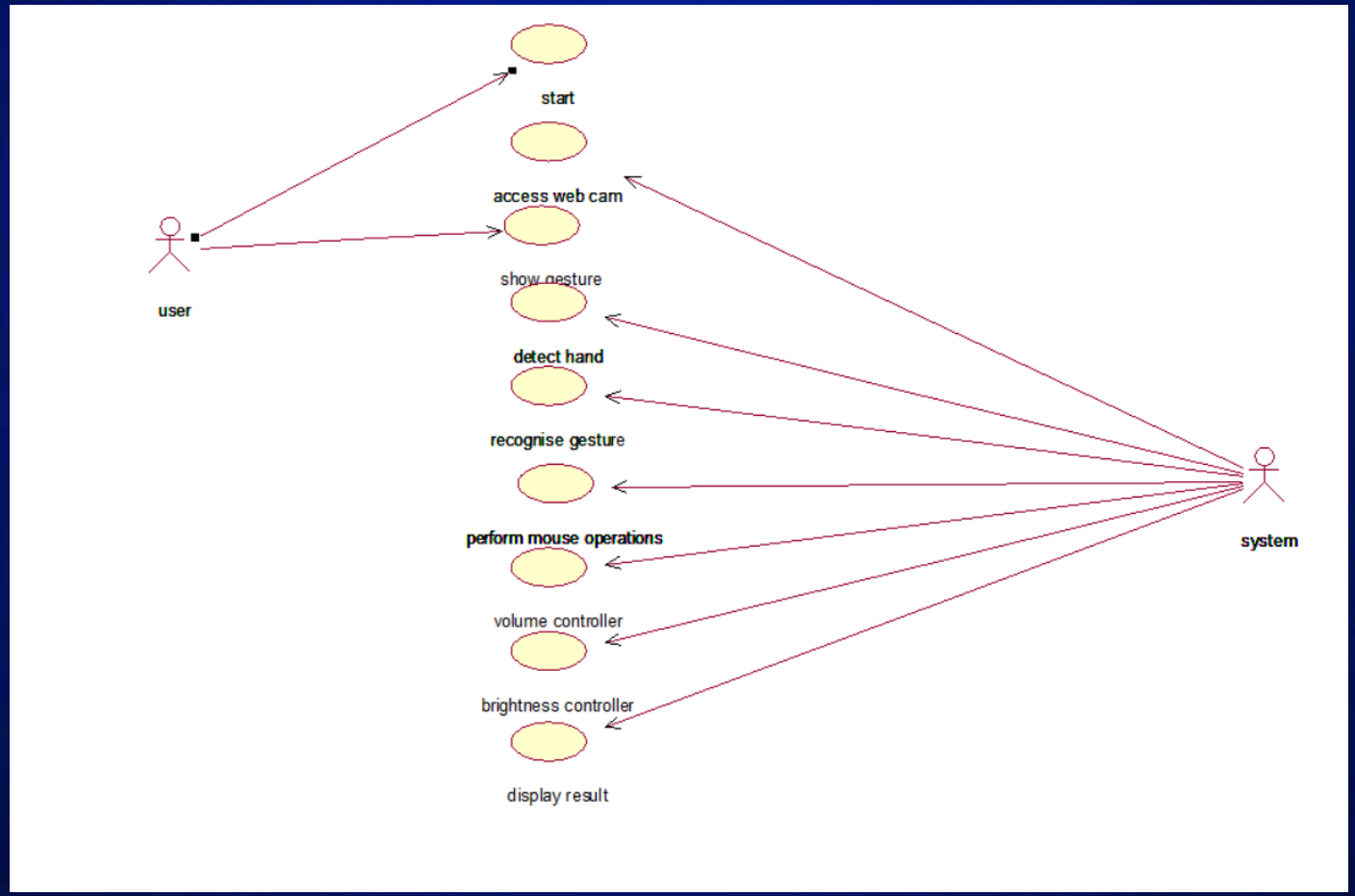
CLASS DIAGRAM:

Class diagram consists of the classes and the object and the interaction between them. It mainly deals with interaction between classes in the system , their behaviour and properties of the system



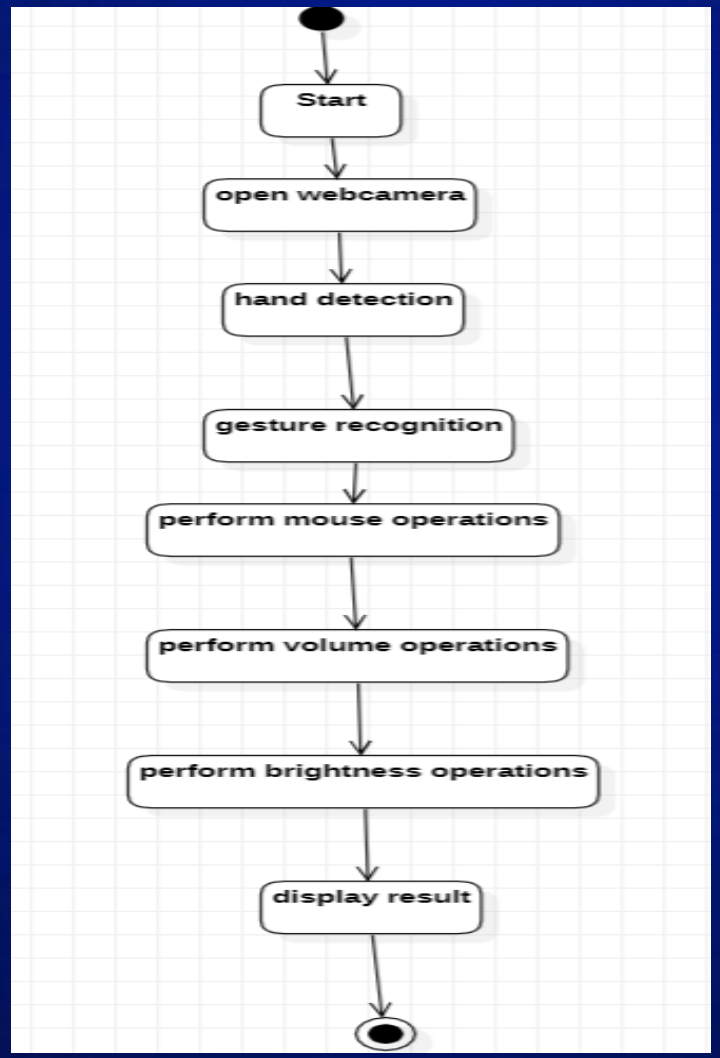
USE CASE DIAGRAM:

Use case diagram consists of use cases and actors and show the interaction between them.



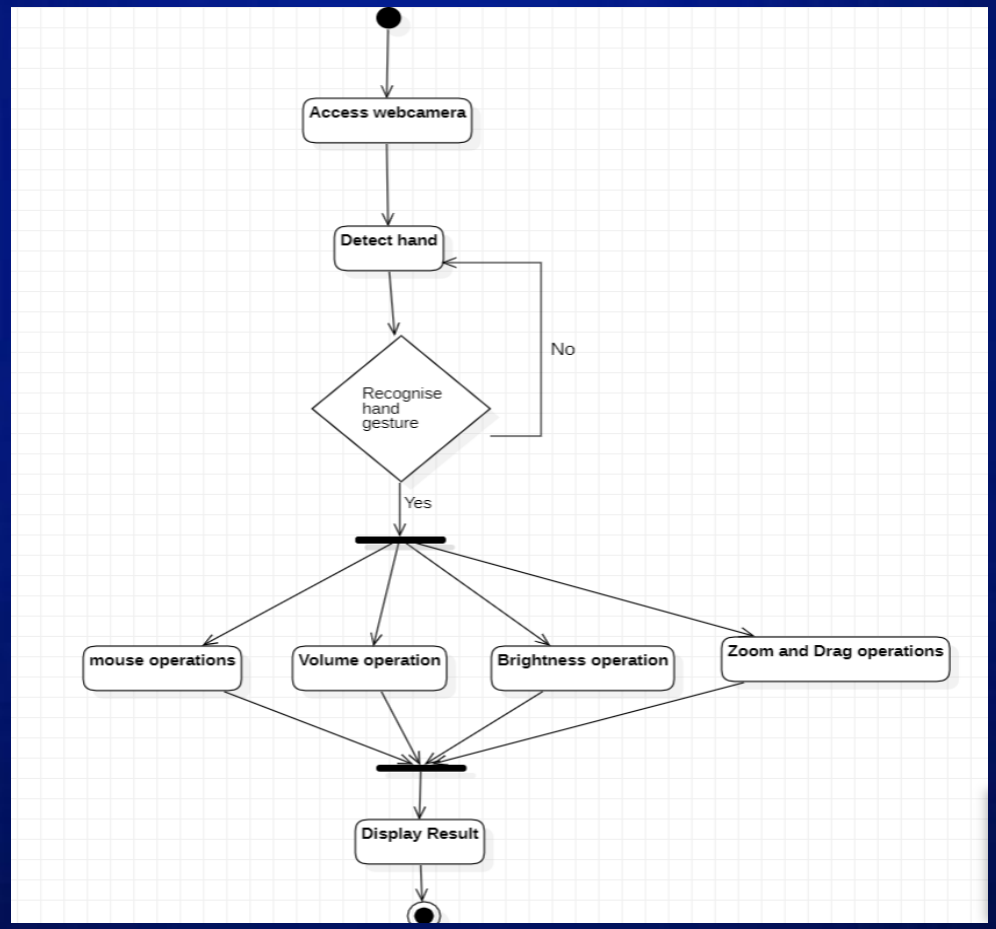
ACTIVITY DIAGRAM:

Activity diagram shows the flow from activity to activity with in a system . It emphasizes the flow of control among objects.



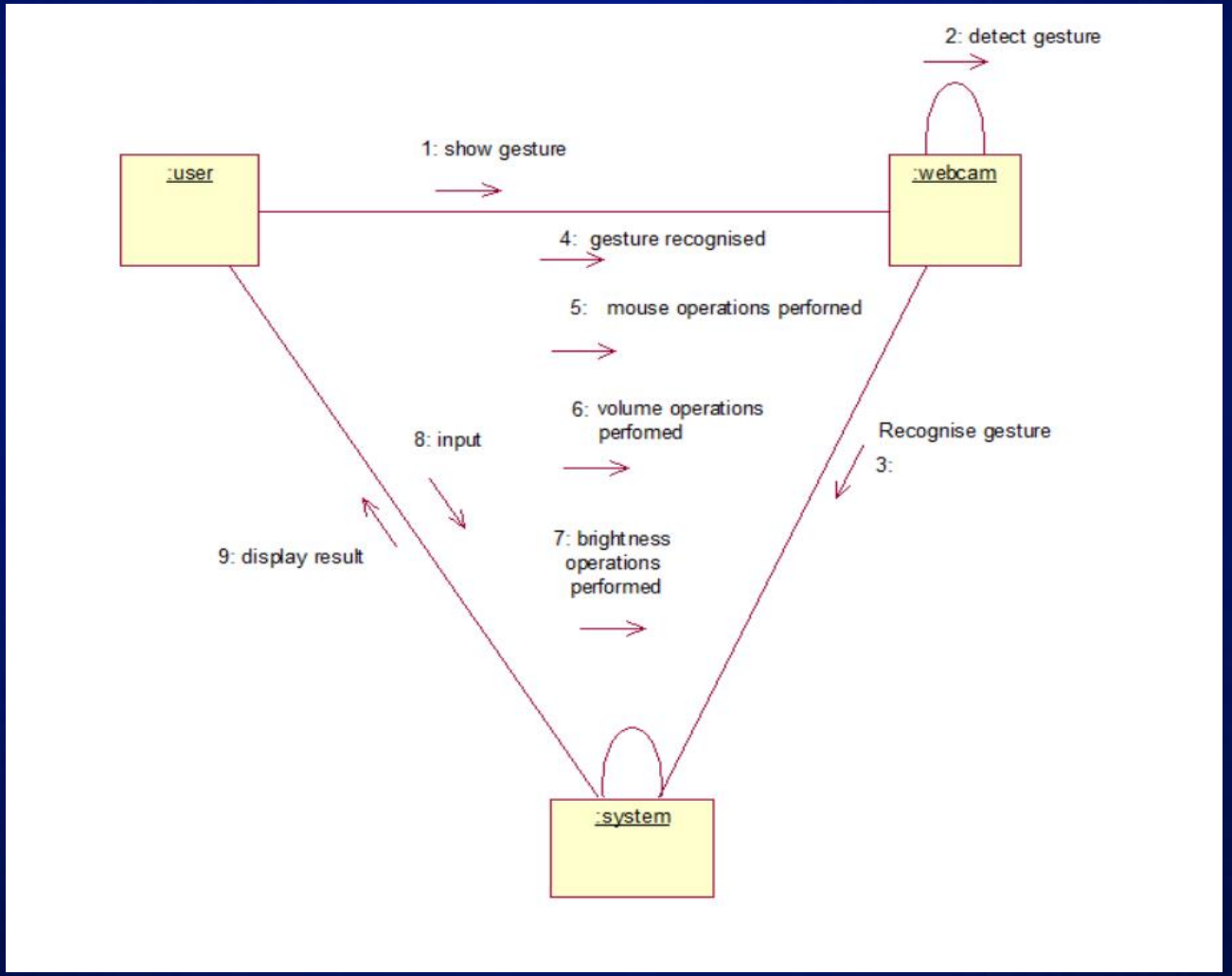
STATE CHART DIAGRAM

Describes the flow of control from one state to another state. States are defined as a condition in which an object exists and it changes when some event is triggered. The most important purpose of state chart diagram is to model lifetime of an object from creation to termination.



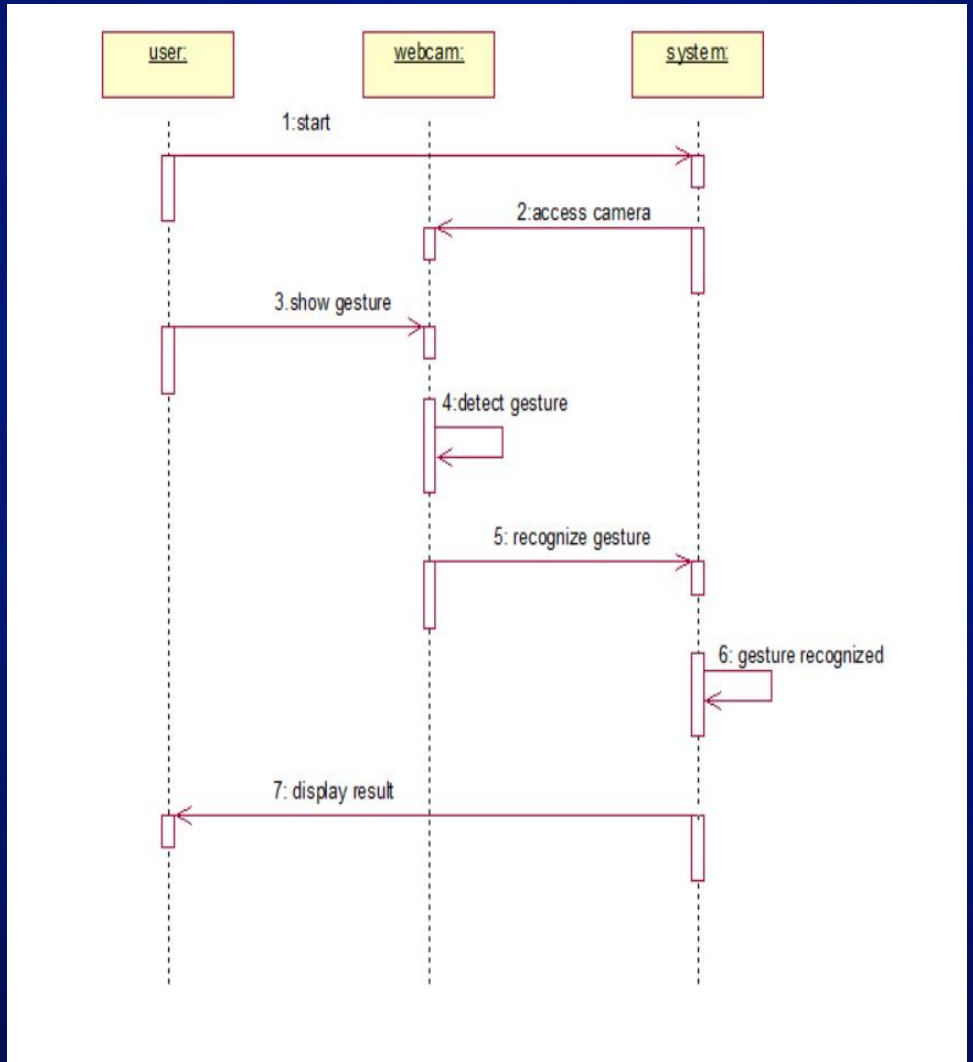
COLLABORATION DIAGRAM:

It emphasizes the structural organisation of the objects that send and receive the messages.



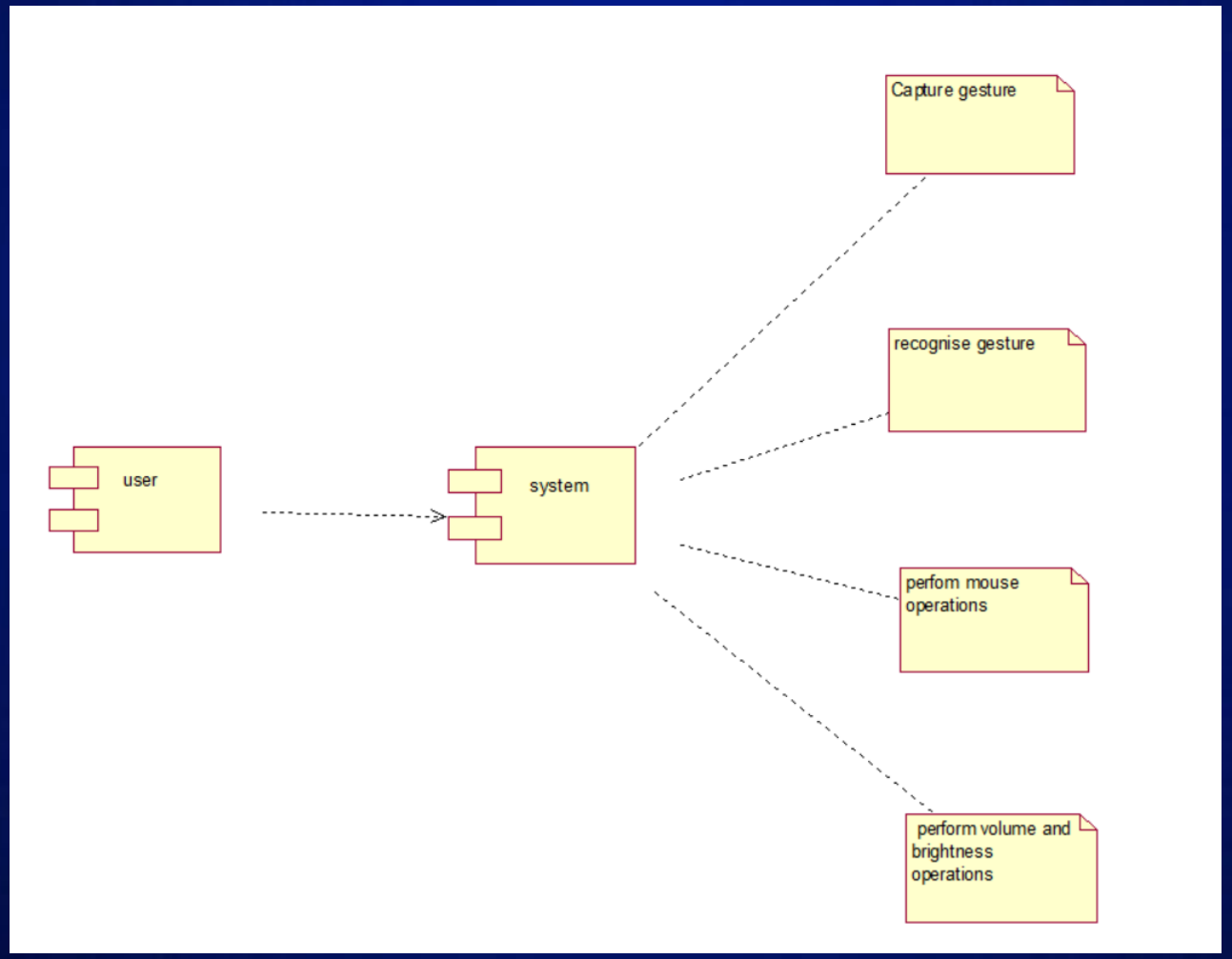
SEQUENCE DIAGRAM:

It is an interaction diagram that emphasizes the time-ordering the messages.



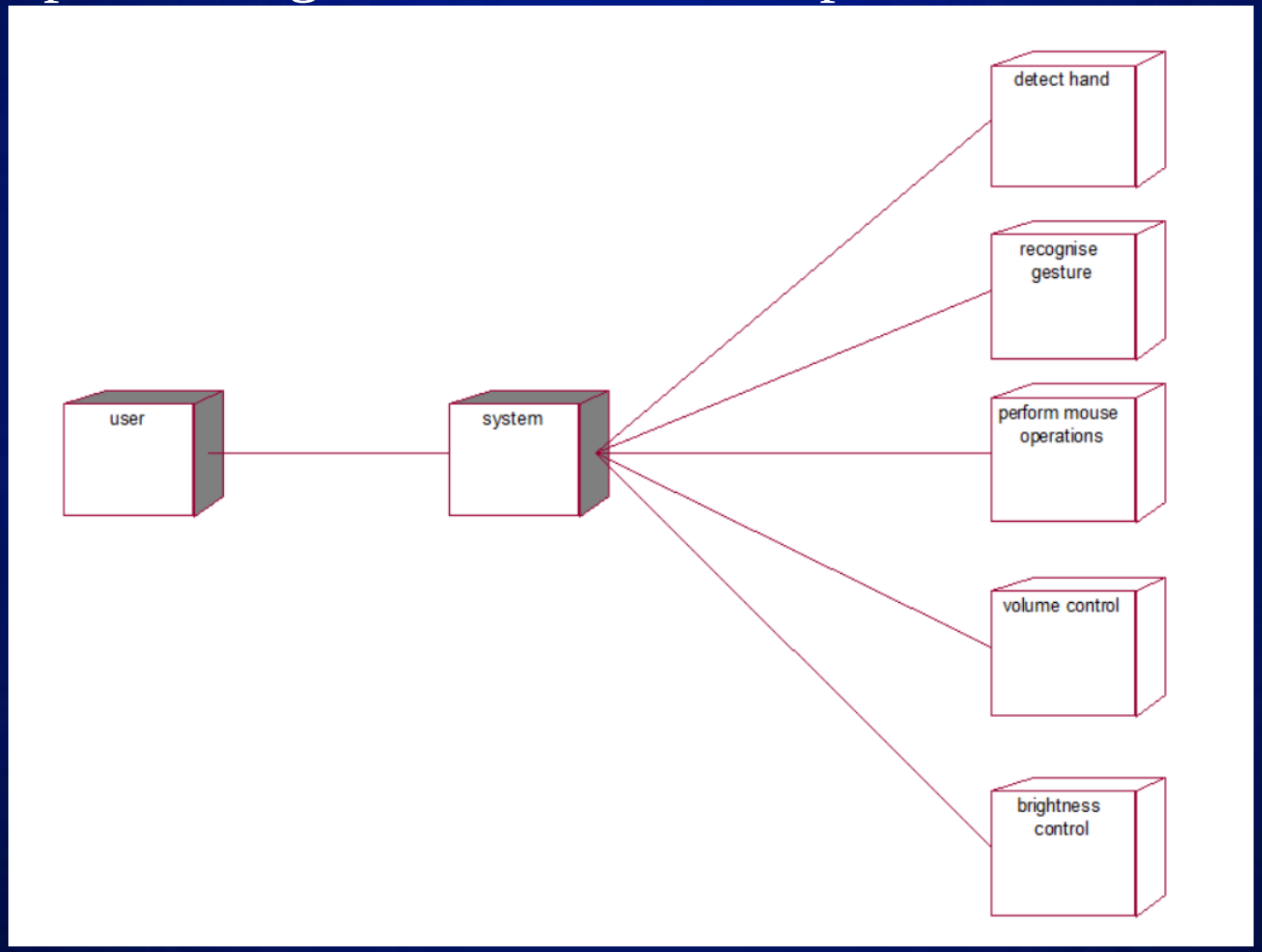
COMPONENT DIAGRAM:

It shows the organization and dependency among the set of components



DEPLOYMENT DIAGRAM:

It is a static deployment view . Deployment diagram shows the configuration of runtime processing nodes and the components.

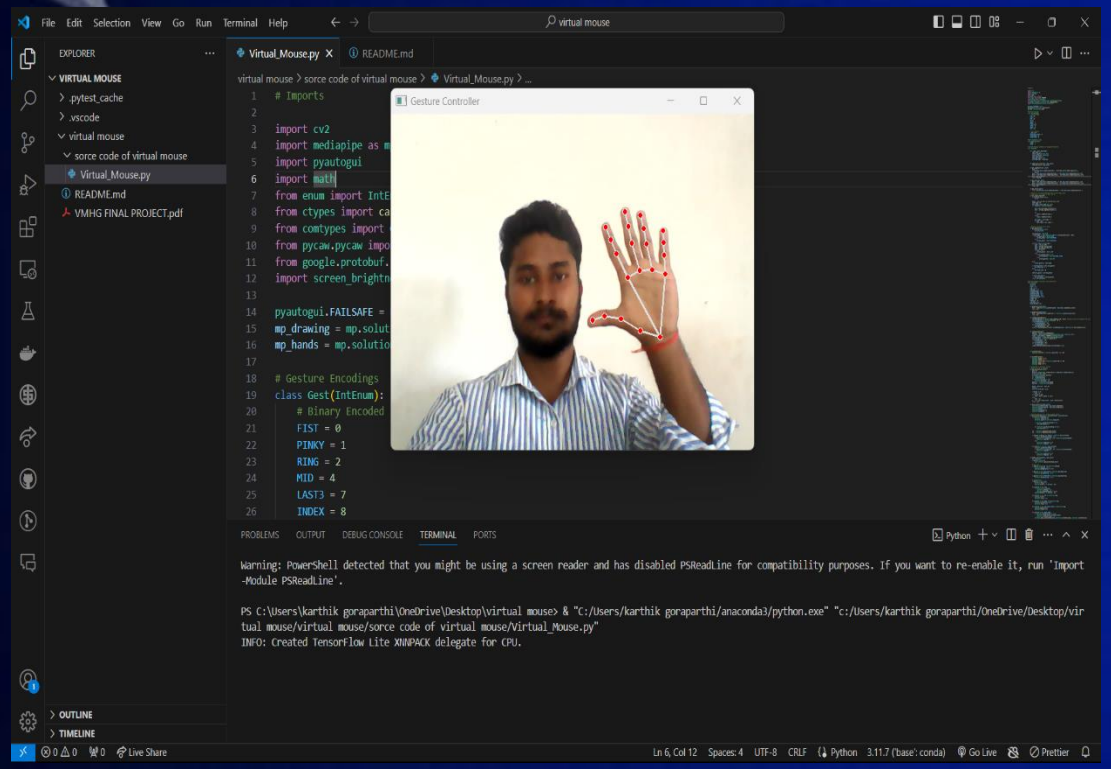


TEST CASES

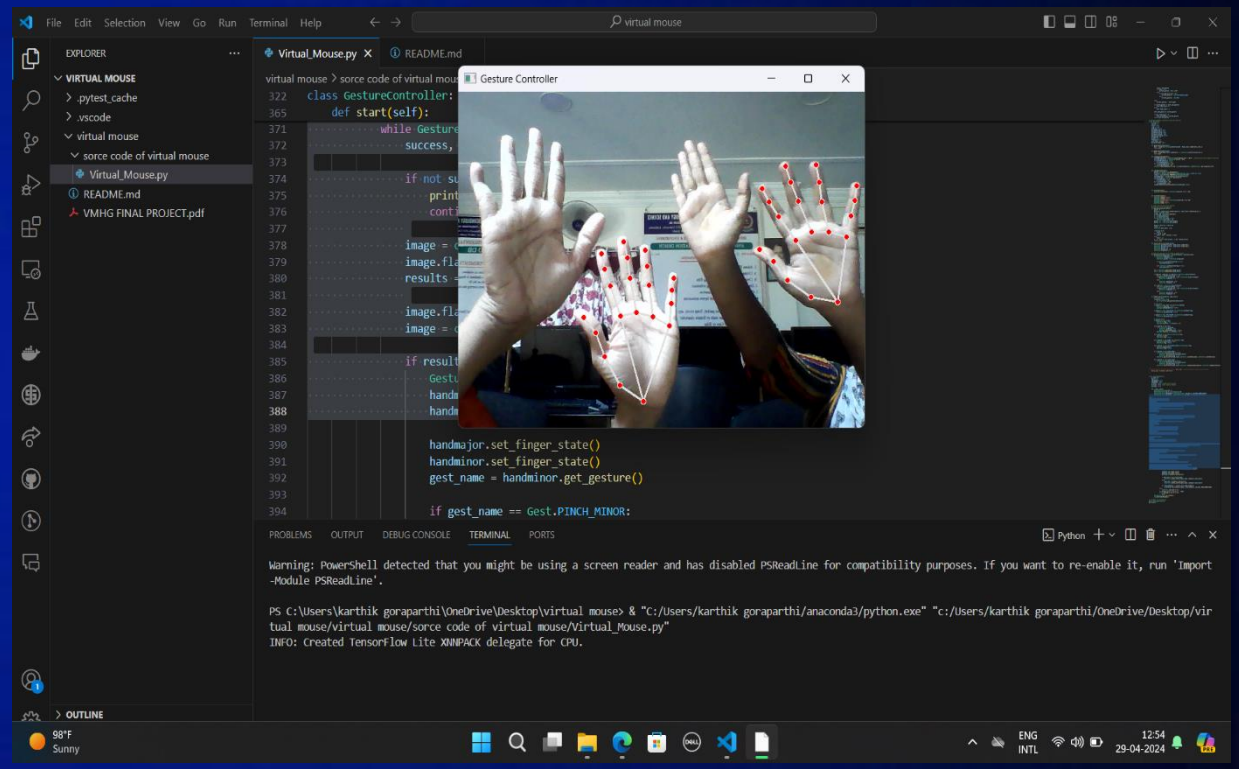
SI.NO	TEST CASE NAME	TEST PROCEDURE	EXPECTED RESULT	RESULT
TC-1	Using in Bright and normal lighting environment camera capturing hand	Making the system work in Bright light	Invoking the camera and check whether we are able to capture the Hand and its gesture in the normal light.	Pass
TC-2	Detecting Both Left and Right hands	By placing Both hands facing the Camera	Camera detecting the both hands	Pass
TC-3	Cursor movement	Cursor movement occurs when the index finger and middle finger are placed in a “V” shape gesture	Movement of cursor Occurs	Pass
TC-4	Left and Right click operations	Pressing down with the index finger will perform a left click operation and pressing down with the middle finger will perform a right click operation	performs Left and Right click operation	Pass

SI.NO	TEST CASE NAME	TEST CASE PROCEDURE	EXPECTED RESULT	RESULT
TC-5	Scrolling operations	By using left hand thumb and index fingures moved up scroll up and down scroll down with the “super” symbol gesture	Performing scrolling operations	Pass
TC-6	Dragging operations	By using right fist to performing drag and drop operations	Drag operations performed	Pass
TC-7	Zoom in and Zoom out operations	By using left hand thumb and index fingures moves left to left it perform Zoom in , right to right it perform Zoom out	Zoom in and zoom out operations performed	Pass
TC-8	Volume control	By using right hand thumb and index fingures specified “super” symbol gesture moves vertically up and down	Performing volume operations respectively up increases volume and down decreases volume	Pass
TC-9	Brightness control	By using Right hand thumb and index fingures specified “super” symbol gesture moves horizontally right to left and right to right	Performing brightness operations	Pass

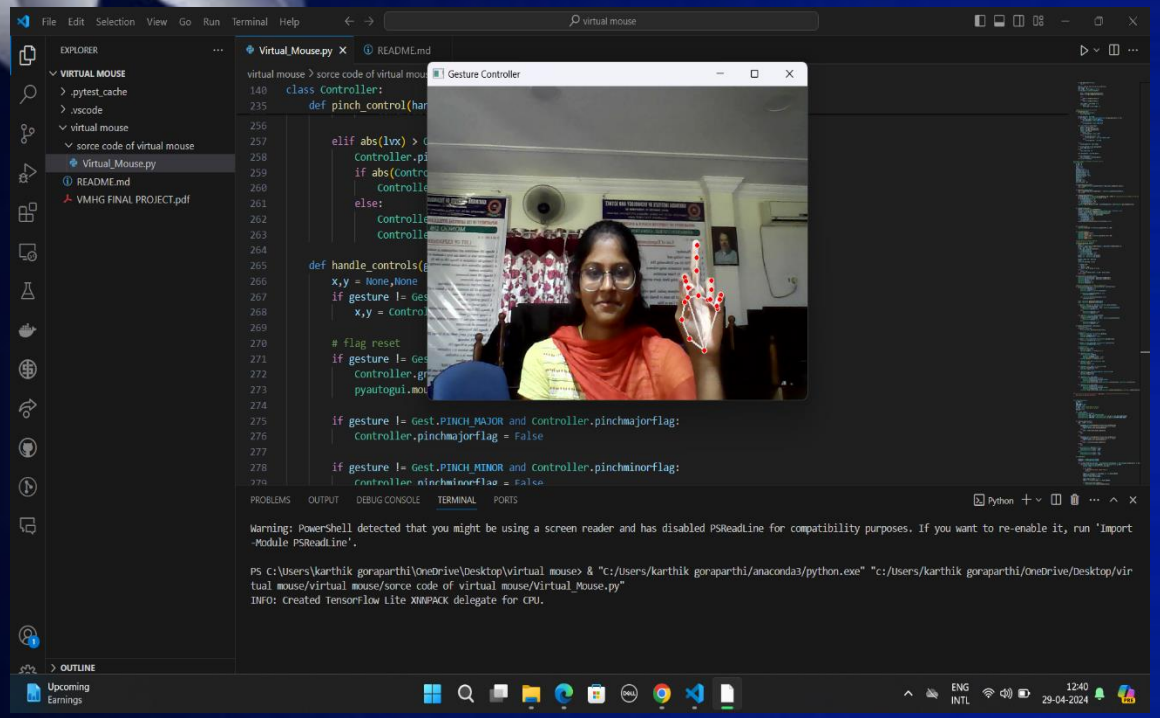
OUTPUT SCREENS

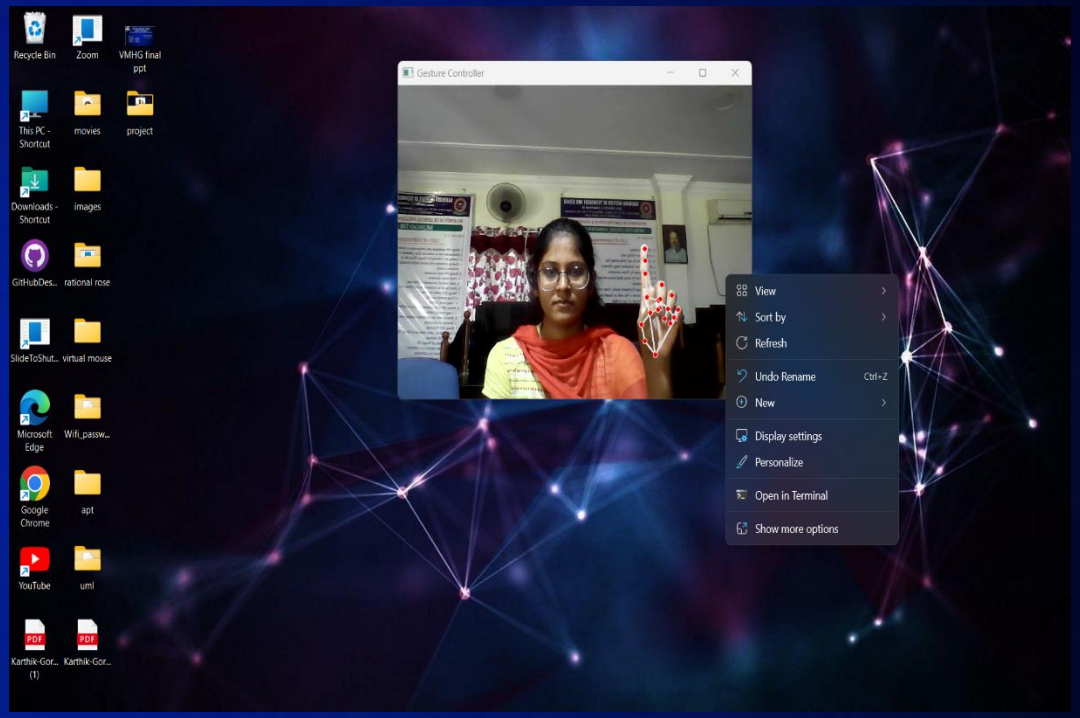


Hand recognition



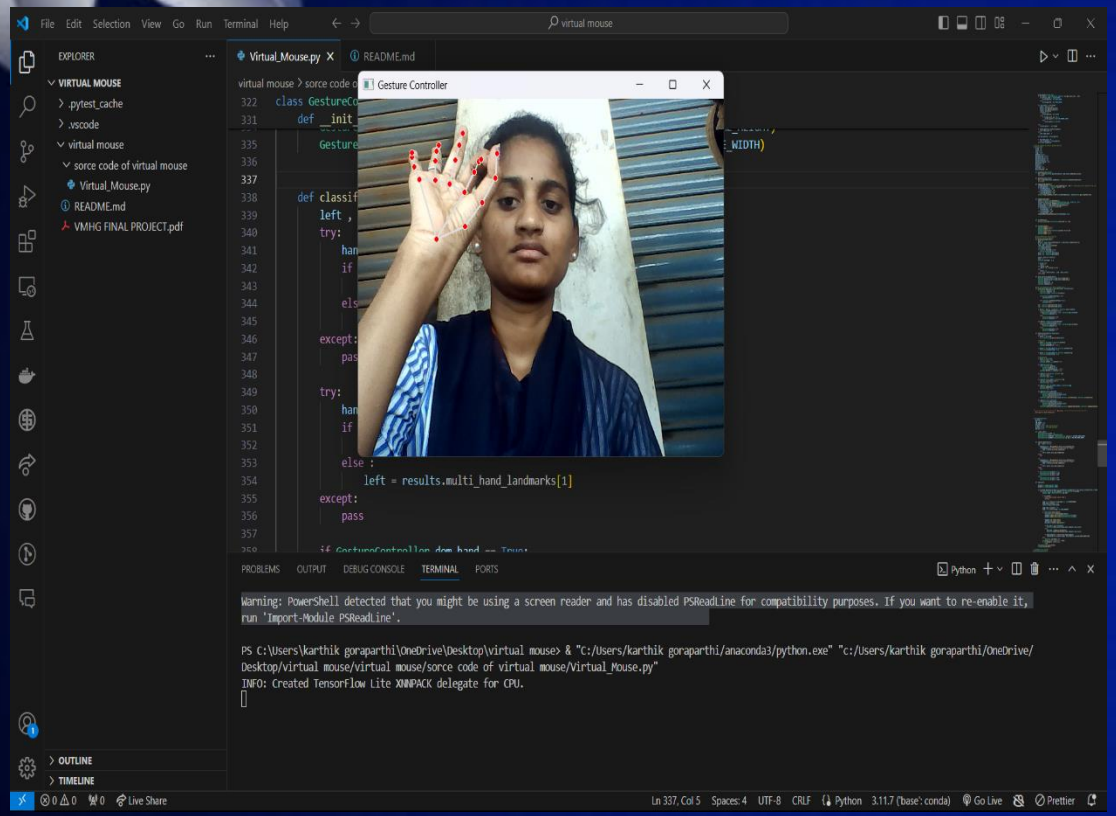
Both left & Right hands recognition



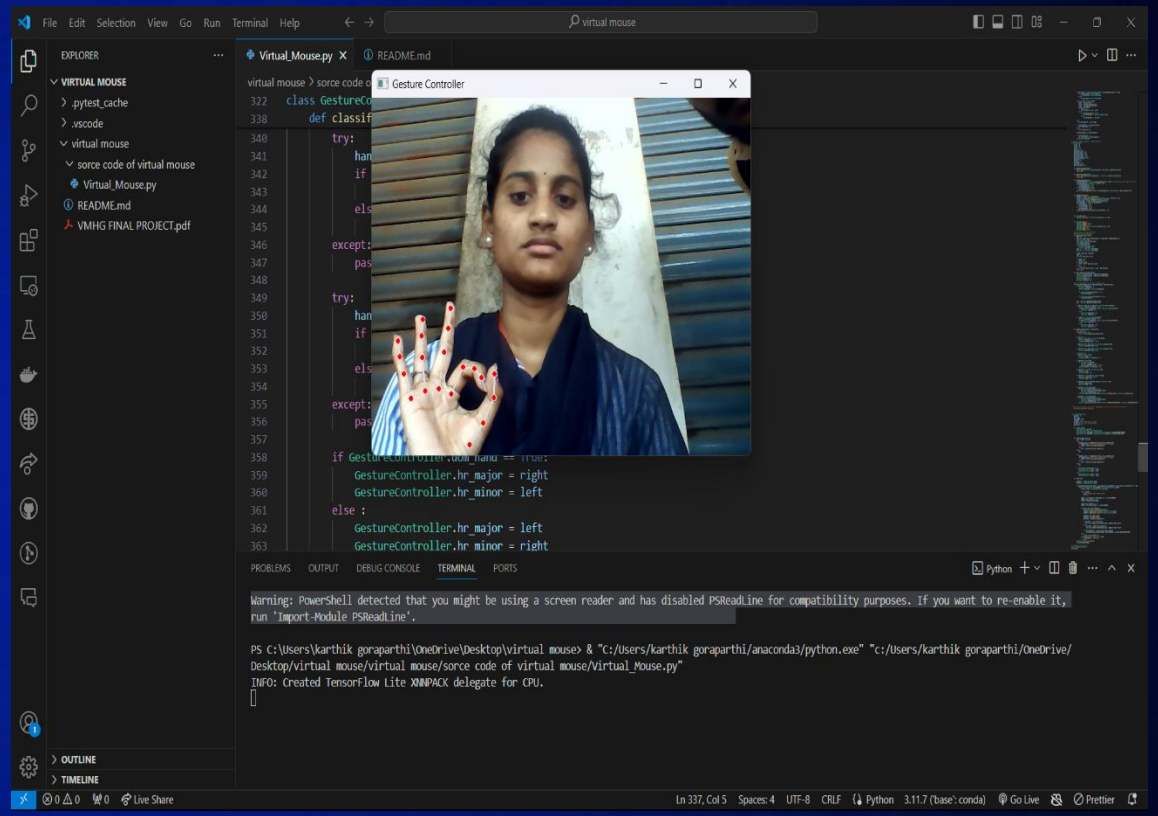


Left click

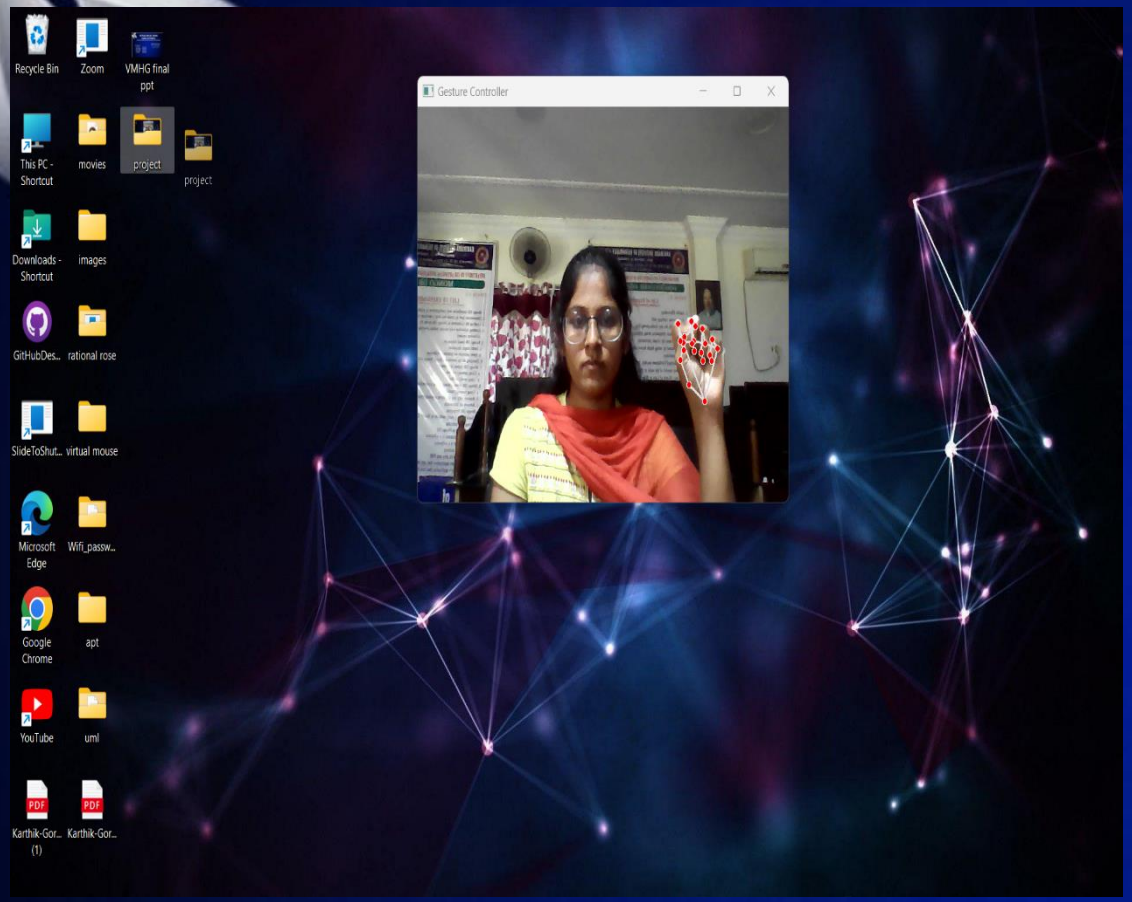
Right click



Scroll up

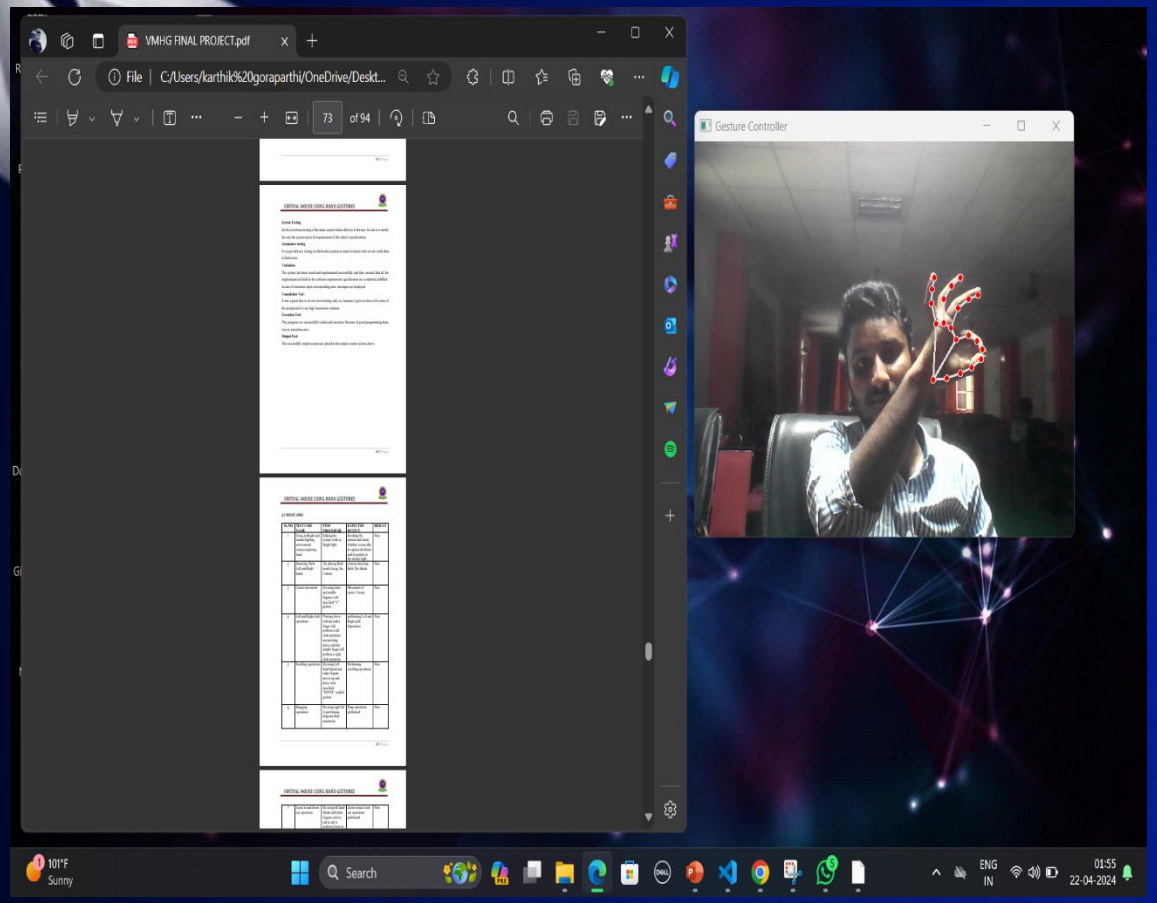


Scroll Down

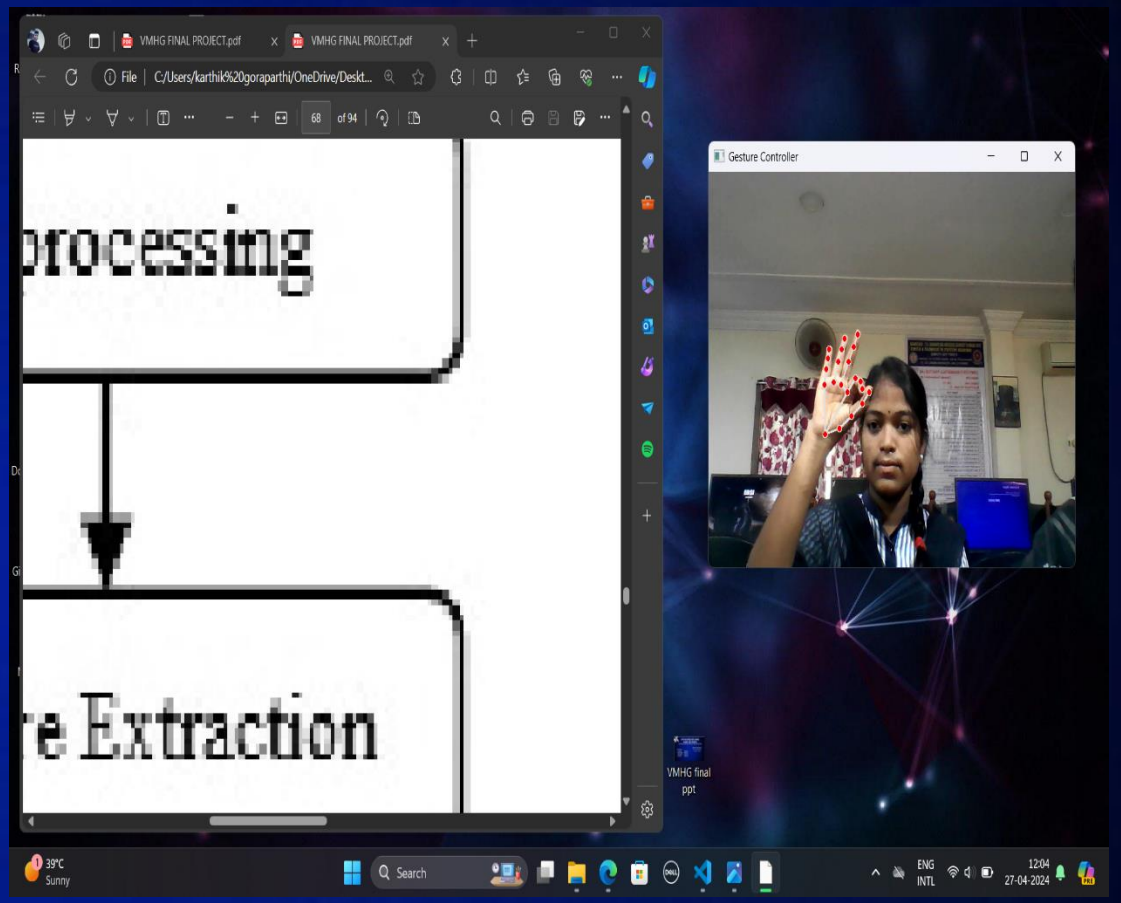


Drag & Drop

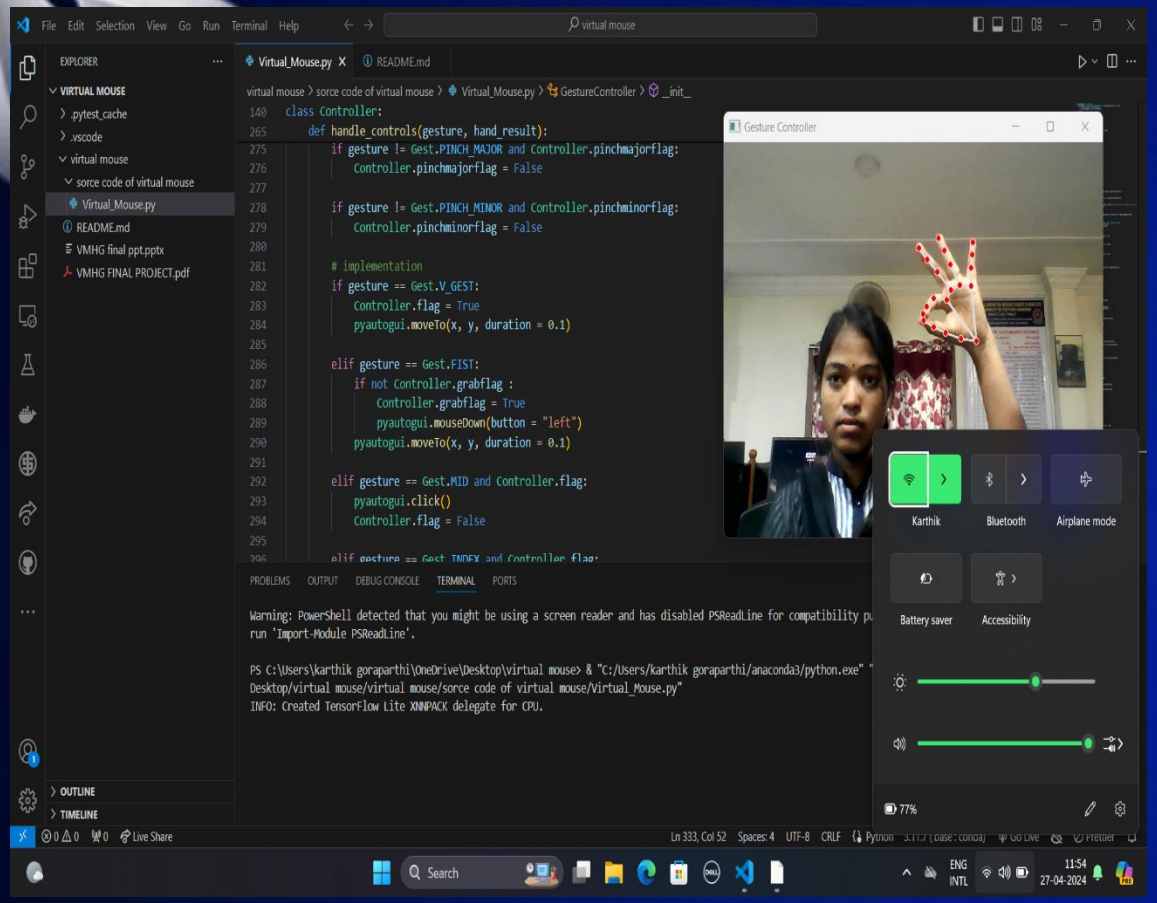
Cursor



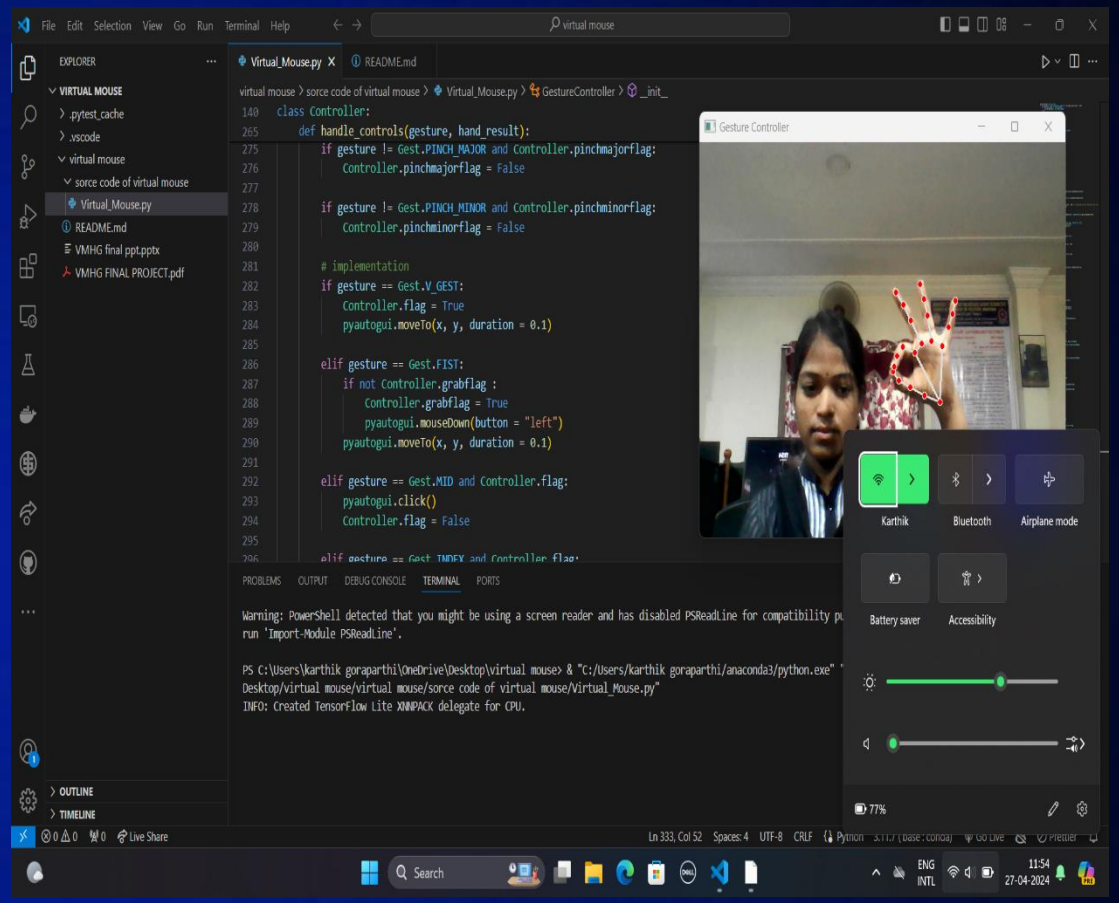
Zoom In



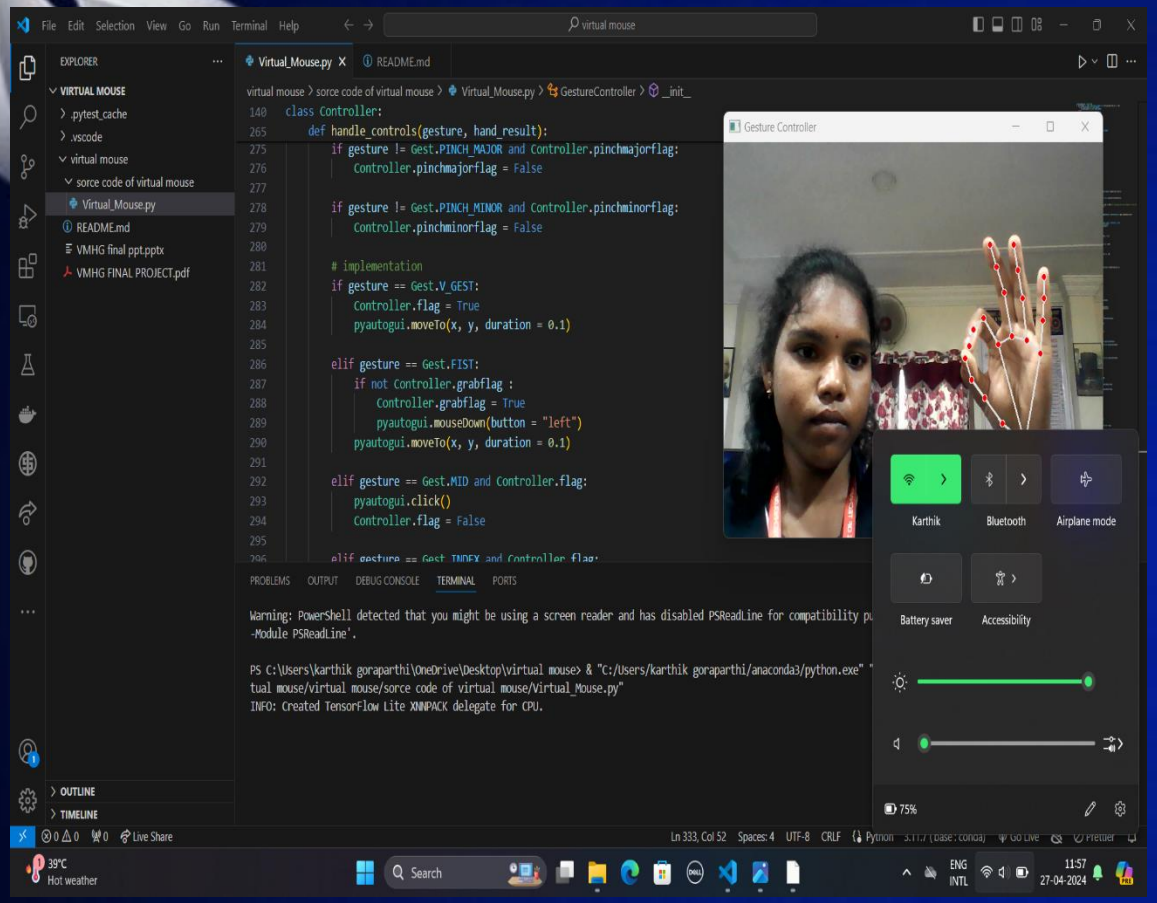
Zoom Out



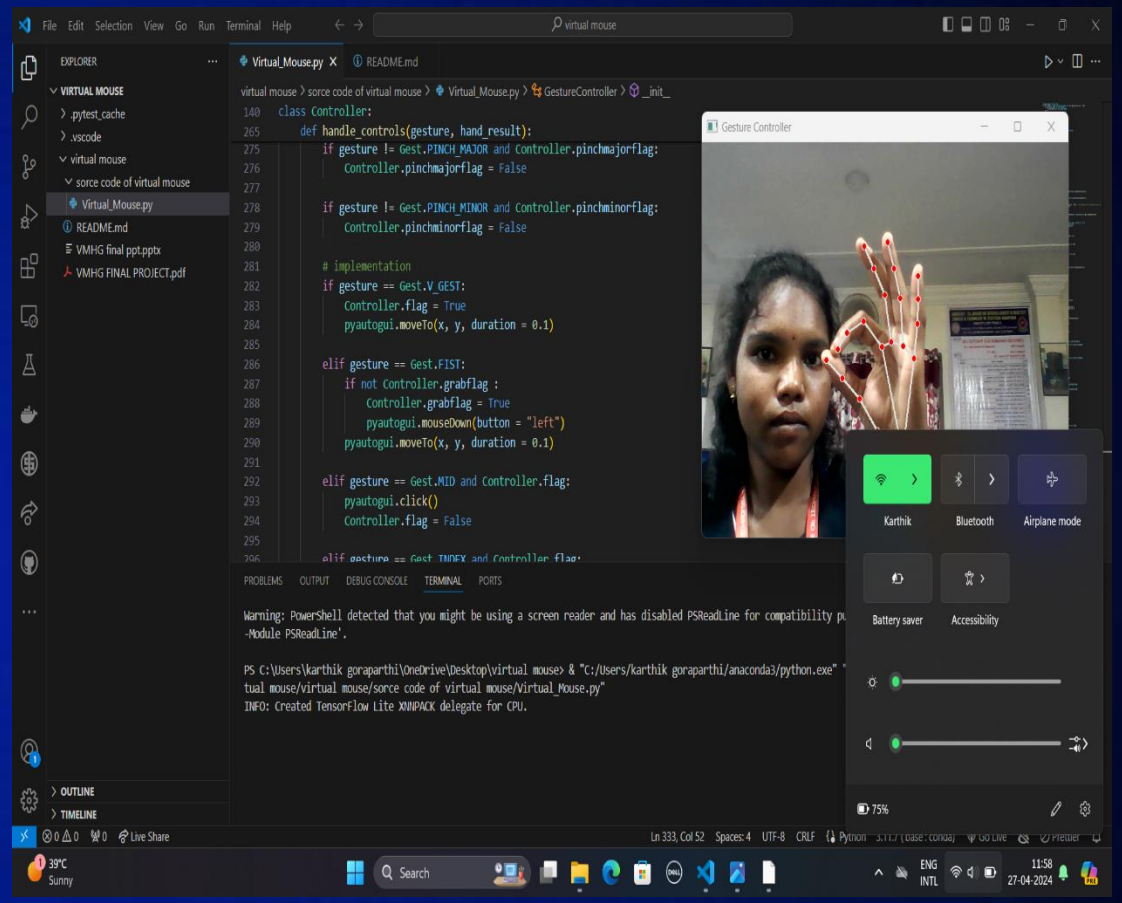
Volume Up



Volume Down



Brightness Increase



Brightness Decrease

Conclusion

Due to accuracy and efficiency plays an important role in making the program as useful as an actual physical mouse, a few techniques had to be implemented. After implanting such type of application there is big replacement of physical mouse i.e., there is no need of any physical mouse. Each & every movement of physical mouse is done with this motion tracking mouse (virtual mouse).There are several features and improvements needed in order for the program to be more user friendly, accurate, and flexible in various environments.

FUTURE SCOPE

Enhancement Of The System:

To Control whole System using the Hand.

GESTUIRE BASED PASSWORDS:

To perform the security based passwords with the specified gesture **.**

Mobile Application:

In future this web application also able to use on Android devices, where touchscreen concept is replaced by hand gestures.

THANK YOU