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Virtual Mouse Using Open CV

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ABSTRACT

A virtual mouse is a software application that allows users to control the computer cursor without using a physical mouse. Instead, it utilizes computer vision techniques to track the user's hand movements or gestures through a camera and translates those movements into cursor actions on the screen. OpenCV (Open Source Computer Vision Library) is a widely used open-source computer vision and machine learning software library that provides tools to develop such applications. Using OpenCV, developers can create a virtual mouse system that detects hand or gesture movements, tracks them in real-time, and converts these movements into corresponding cursor movements and clicks on the screen. Virtual Mouse is a software that allows users to give inputs of a mouse to the system without using the actual mouse. To the extreme, it can also be called hardware as it uses an ordinary camera. A virtual muse can usually be operated with multiple input devices, which may include an actual mouse or computer keyboard.

The virtual mouse uses a web camera with the help of different image processing techniques. Using figures detection methods for instant Camera access and a user-friendly interface makes it more easily accessible. The system is used to implement a motion-tracking mouse, a physical mouse that saves time and also reduces effort. The hand movements of a user are mapped into mouse inputs. A web camera is set to take images continuously. Most laptops today are equipped with webcams, which have recently been used in security applications utilizing face recognition. To harness the full potential of a webcam, it can be used for vision-based CC which would effectively eliminate the need for a computer mouse or

mouse pad.

I.   INTRODUCTION

A virtual mouse is a software application that allows users to control the computer cursor without using a physical mouse. Instead, it utilizes computer vision techniques to track the user's hand movements or gestures through a camera and translates those movements into cursor actions on the screen. OpenCV (Open Source Computer Vision Library) is a widely used open-source computer vision and machine learning software library that provides tools to develop such applications. Using OpenCV, developers can create a virtual mouse system that detects hand or gesture movements, tracks them in real-time, and converts these movements into corresponding cursor movements and clicks on the screen. Virtual Mouse is a software that allows users to give inputs of a mouse to the system without using the actual mouse. To the extreme, it can also be called hardware as it uses an ordinary camera. A virtual muse can usually be operated with multiple input devices, which may include an actual mouse or computer keyboard.

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II.   RELATED WORK

➢   Open CV

OpenCV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection. Computer Vision Computer Vision can be defined as a discipline that explains how to reconstruct, interrupt, and understand a 3D scene from its 2D images, in terms of the properties of the structure present in the scene. It deals with modeling and replicating human vision using computer software and hardware. Computer Vision overlaps significantly with the following fields − Image Processing − It focuses on image manipulation. Pattern Recognition − It explains various techniques to classify patterns.

Python Packages for Data Mining :

➢   **Cv2 :**

In Python, import cv2 is the command used to import the OpenCV library. Once installed, cv2 gives you access to all the functions and classes that OpenCV offers for image processing, computer vision, and machine learning tasks.

➢   **Mediapipe as mp :**

The MediaPipe Python framework grants direct access to the core components of the MediaPipe C++ framework such as Timestamp, Packet, and CalculatorGraph, whereas the ready-to-use Python solutions hide the technical details of the framework and simply return the readable model inference results back to the callers.

➢   **Pyautogui :**

Python's pyautogui is a package that allows users to create scripts that can simulate mouse movements, click on objects, send text, and even use hotkeys. While not as elegant a solution as Selenium, pyautogui can be used to bypass systems that put up blocks against automated browser use.

➢   **Math :**

Python has a set of built-in math functions, including an extensive math module, that allows you to perform mathematical tasks on numbers.
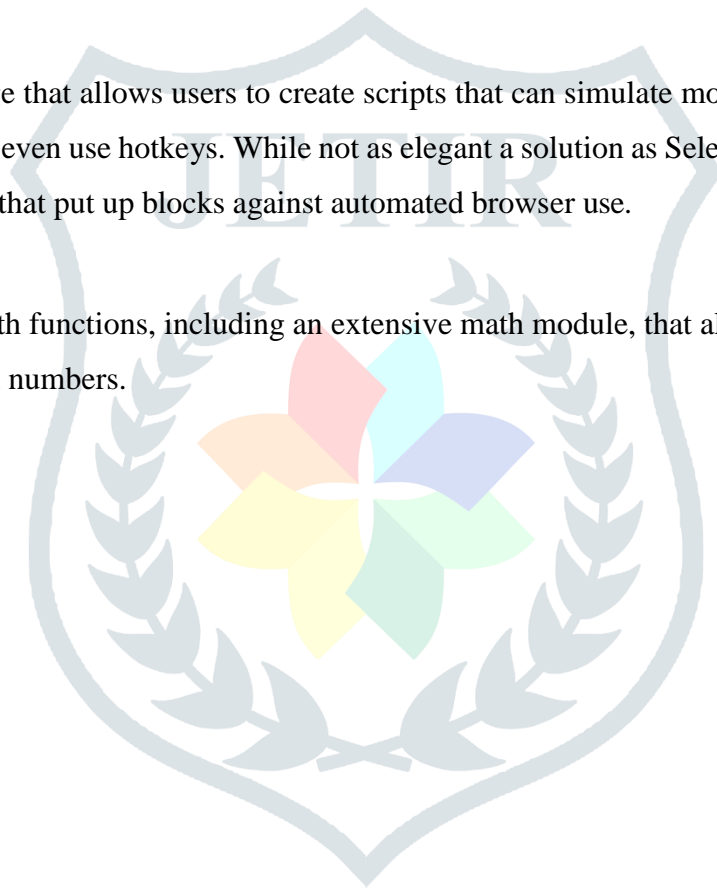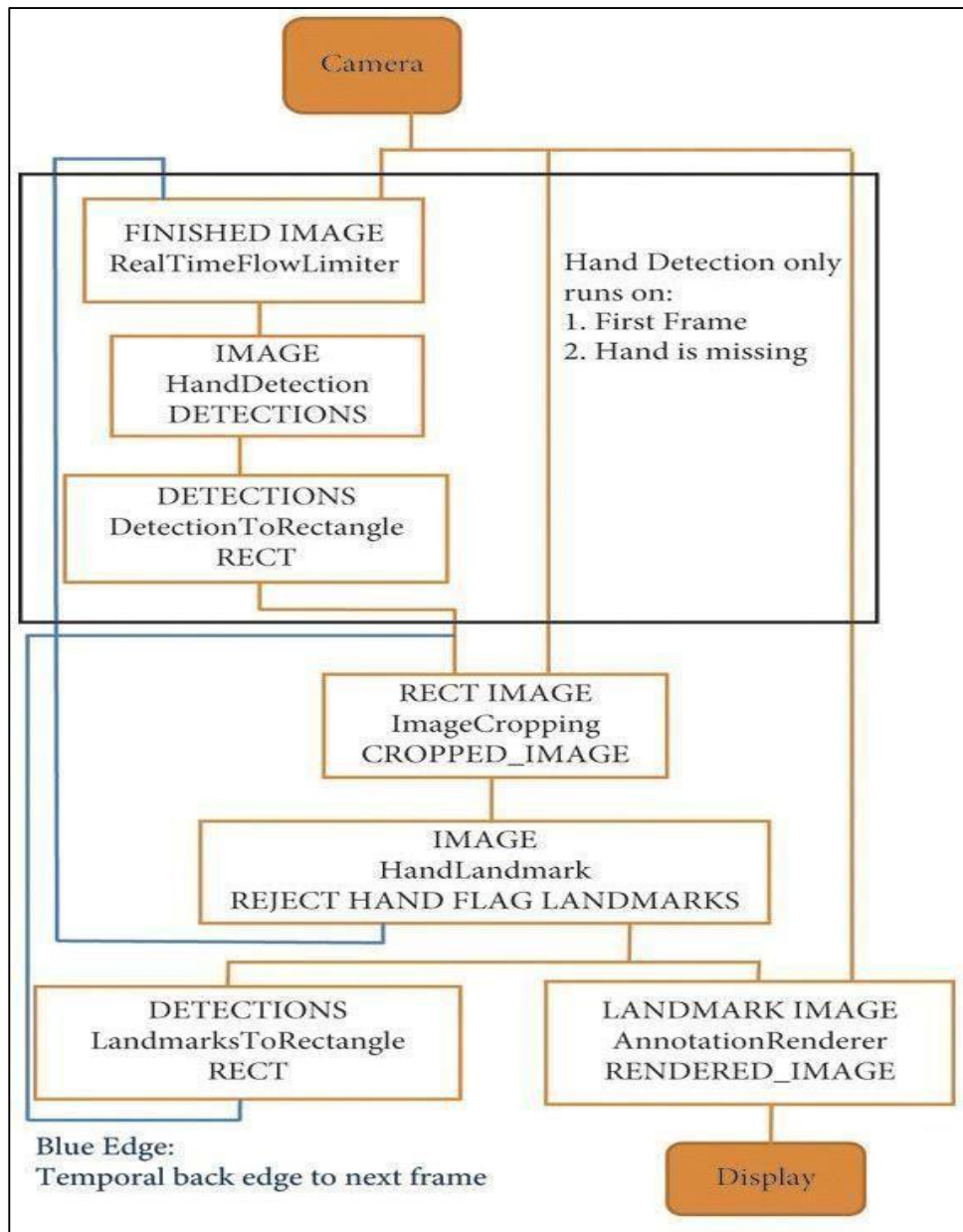
III.   SYSTEM ARCHITECTURE

Fig: Proposed System Architecture

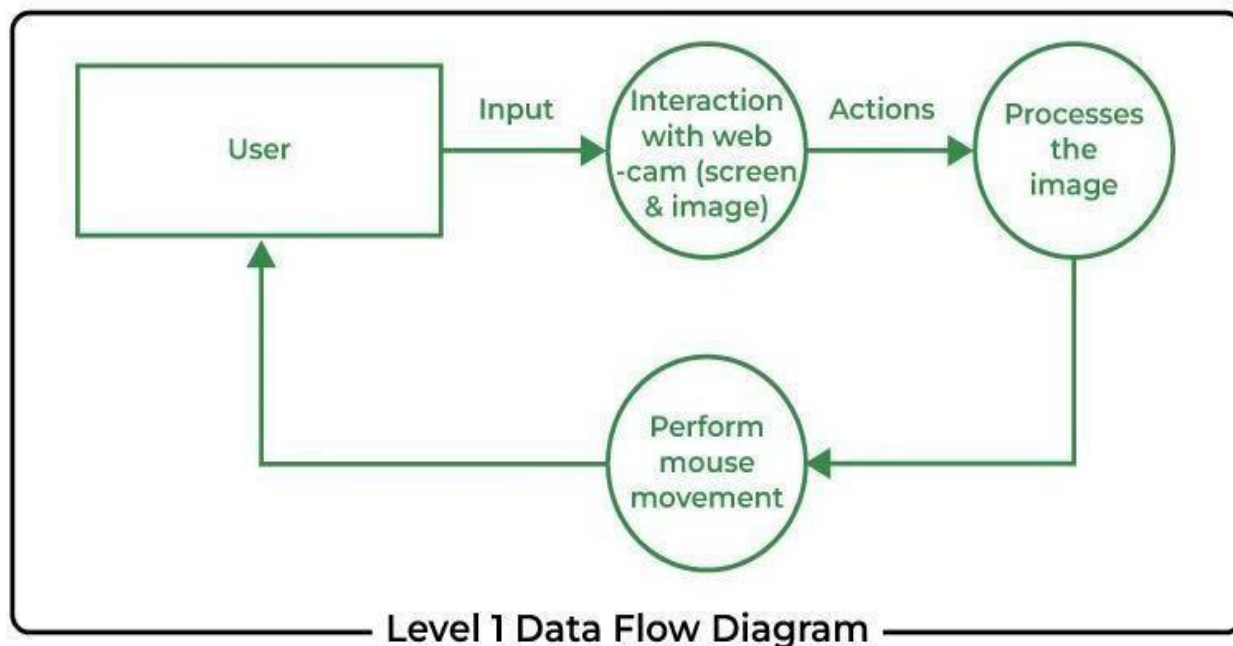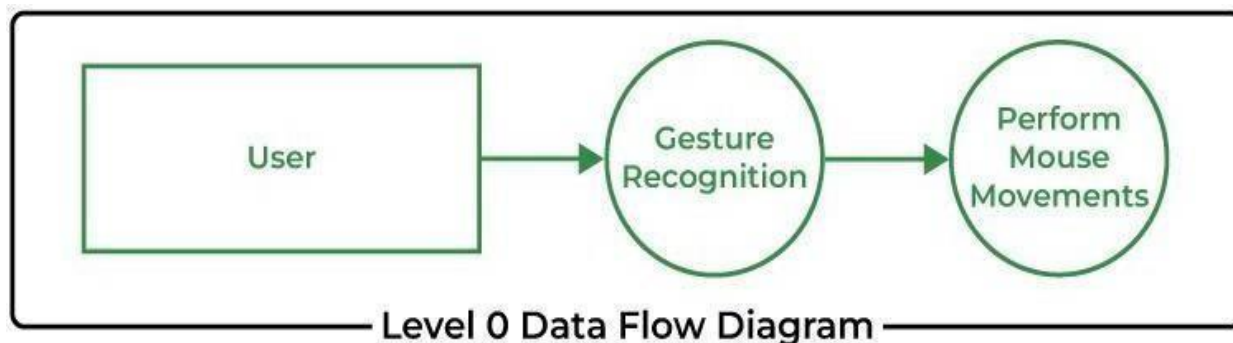# IV.　　　IMPLEMENTATION AND MODULES

Module 1: DFD

Fig: Data Flow Diagram- Virtual Mouse
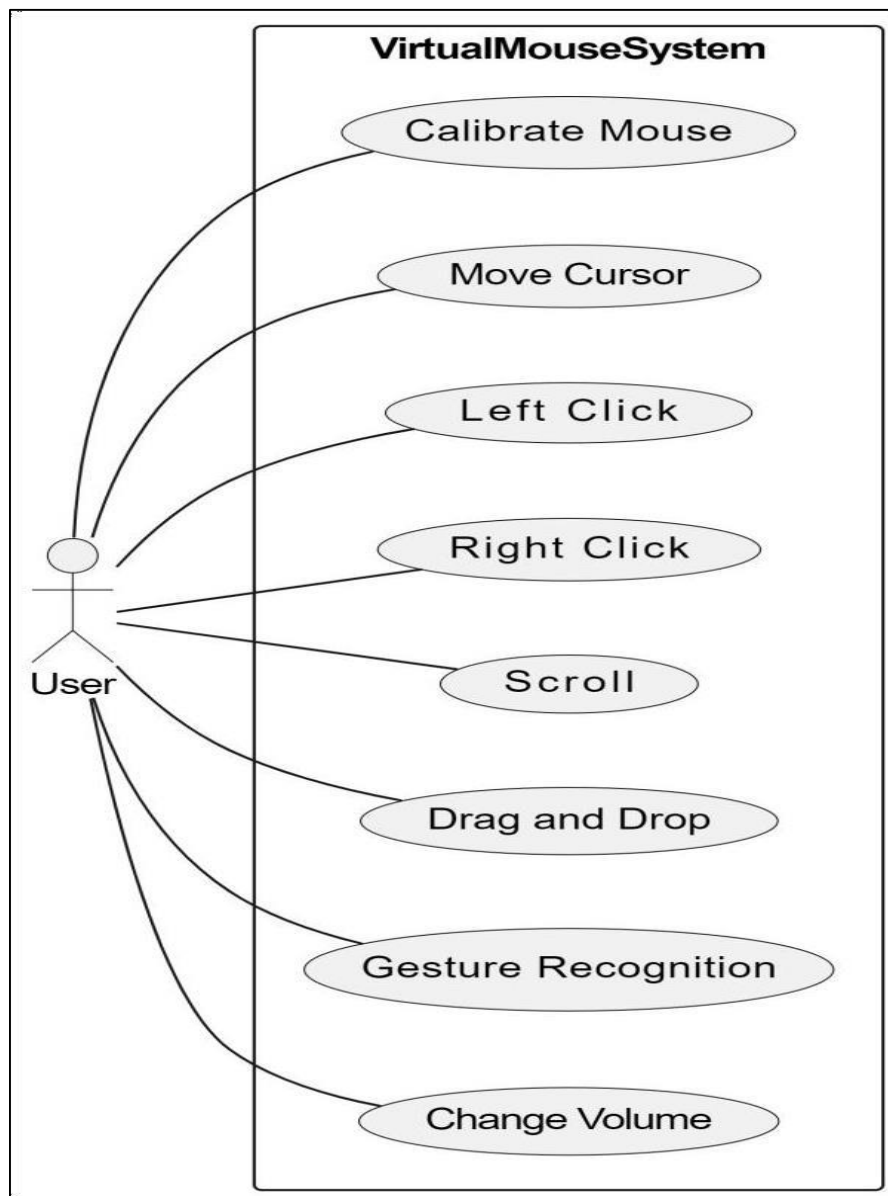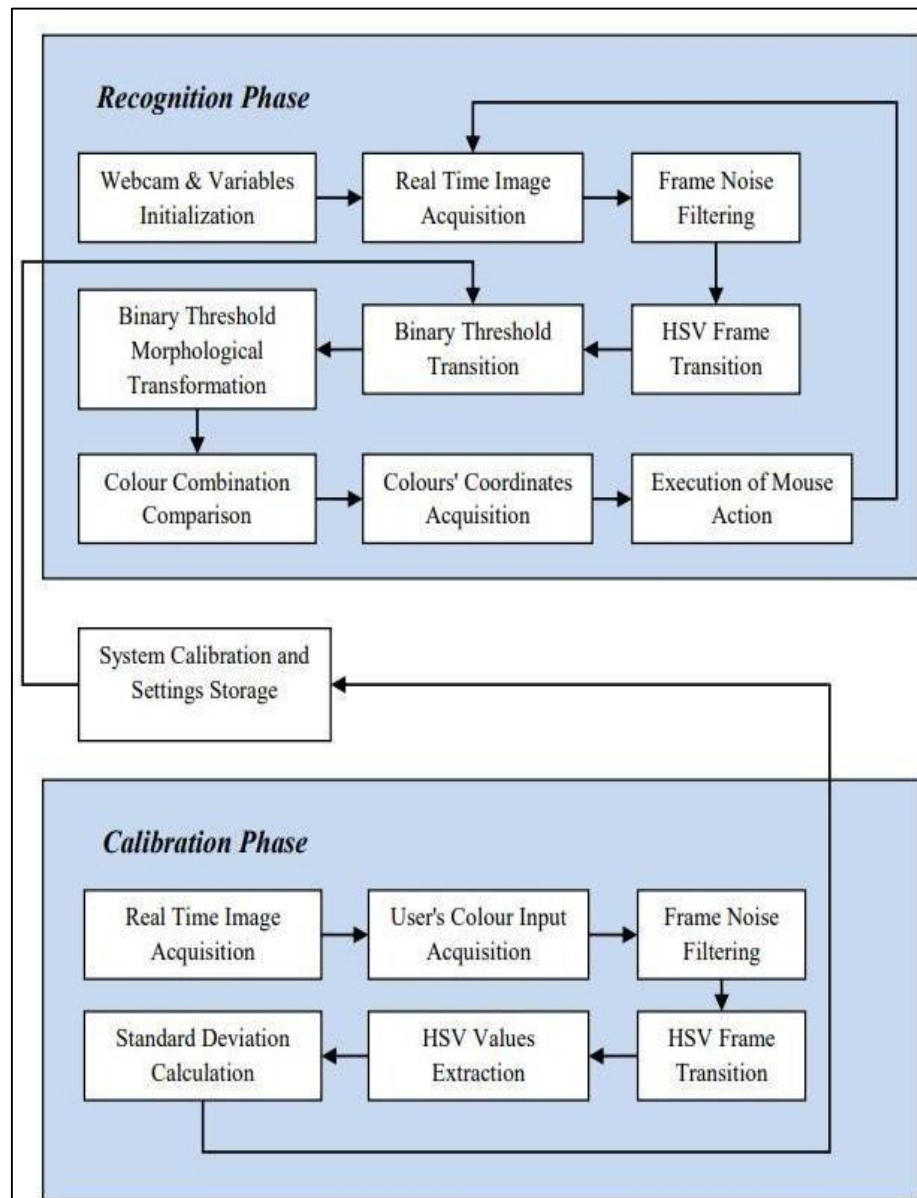
Module 2: UML

Fig : Use Case Diagram- Virtual Mouse

Module 3: BD

Fig : Block Diagram- Virtual Mouse

CONCLUSION

We have tried proposing a system which requires minimal efforts from the user's side. Use of image processing and CV gives maximum benefit in the field of automation. The system is also proposed for home automation where with the help of gestures tubes or fans can be controlled. As compared to normal execution, screen touch and recognition based system, hand gestures recognition proves to be the best and most effective system.

The proposed system can be achieved by using a webcam or a built-in camera which detects the hand gestures and hand tip and processes these frames to perform the particular mouse functions. From the results of the model, we can come to a conclusion that the proposed virtual mouse system has performed

very well and has a greater accuracy compared to the existing models and also the model overcomes most of the limitations of the existing systems. The virtual mouse can be used for real-world applications, and also, it can be used to reduce the spread of COVID-19, since the proposed mouse system can be used virtually using hand gestures without using the traditional physical mouse.

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