



Mouse Control Using Hand Gesture Recognition

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ABSTRACT

We all wonder if it would have been so comfortable if we could control the cursor through the use of hand gestures. Well our proposed project puts forward a hand gesture based system that allows users to control the pc mouse movements through the use of hand movements. Our system uses a PC webcam in order to detect hand gesture movements. The system continuously scans the camera input for five finger hand-like patterns. Once a hand is detected, the system then locks it as an object. A flag is set on the object in order to mark it as an object. After the object has been flagged and detected, our system then constantly records its movements in terms of x and y direction movement-based coordinates. These coordinates are then mapped real time onto the mouse cursor to move it according to hand movements.

Keywords: Virtual mouse windows application, python, webcam.

I. INTRODUCTION

Gesture Controlled Virtual Mouse makes human-computer interaction simple by making use of Hand Gestures. The computer requires almost no direct contact. All I/O operations can be virtually controlled by using static and dynamic hand gestures. This project makes use of state-of-art Machine Learning and Computer Vision algorithms to recognize hand gesture, which works smoothly without any additional hardware requirements. In this project, I am using my hand as a virtual mouse that can do anything that a mouse does without even touching your system. I am using the webcam of my system to detect my hands. It will then create a bounding box around my hand and focus on two fingers: The fore finger and the middle finger. The fore finger will act as a cursor and moving it around, we will be moving the cursor around. Now, in order to successfully click using hand tracking , it is detecting the distance between the fore finger and the middle finger. If they are joined together, then it will perform a click. Furthermore, a smoothness factor was added as the movement was really shaky.

II. LITERATURE SURVEY

The most common problem faced by customers while buying mouse online is that there is no guarantee of a product's quality and its expensive. The emergence of the pandemic has resulted in a technological paradigm shift. The development and use of a virtual mouse in place of a real mouse is one such field of research. This is a step forward in the field of HMI (Human-Machine Interaction). Even if wireless or Bluetooth mouse technology has yet to be established, it is not device-free. A Bluetooth mouse necessitates the usage of a battery and a connected dongle. The presence of additional electronics in a mouse makes it more difficult to use. This system takes frames using a webcam or built-in camera, analyses them to make them trackable, and then detects and performs mouse functions based on the gestures performed by users. As a result, the suggested mouse system eliminates the need for a device. Artificial Intelligence and Machine Learning based approaches have predominantly been used for the purpose and hence an understanding of the same is mandatory. The relation between artificial intelligence, machine learning and deep learning is depicted in the figure below. While artificial intelligence comprises of all the methodologies for emulating human intelligence on machines, yet they comprise of the fundamental sub-categories:

1. Machine Learning
2. Deep Learning
3. Neural Networks

The runtime operations are managed by the webcam of the connected laptop or desktop. To capture a video, we need to create a Video Capture object. Its argument can be either the device index or the name of a video file. Device index is just the number to specify which camera. Since we only use a single camera we pass it as '0'. We can add additional camera to the system and pass it as 1,2 and so on. After that, you can capture frame-by-frame. But at the end, don't forget to release the capture.

III. PROPOSED DETAILED METHODOLOGY

Our group was first formed on the basis of roll number followed by every member brainstorming to get project ideas and topics with relevant scope and application. After analyzing and discussing with team members and project guide, Mouse control using hand gesture was selected as our final year project. Here, we plan to create a software that controls the cursor on the monitor using hand gesture basically its called AI virtual mouse controller. The PC mouse is one of the wondrous developments of people in the field of Human Computer Interaction (HCI) innovation. In new age of innovation, remote mouse or a contact less mouse actually utilizes gadgets and isn't liberated from gadgets completely, since it utilizes power from the gadget or might be from outside power sources like battery and gain space and electric power, likewise during COVID pandemic it is encouraged to make social separating and keep away from to contact things which gave by various people groups. Inside the projected AI virtual mouse utilizing hand signal framework, this constraint might be resolve by involving advanced camera or sacred camera for perceive the hand motions and fingers recognition abuse PC machine vision. The algorithmic rule used in the framework utilizes the man-made consciousness and AI algorithmic rule. Upheld the hand signals, the gadget might be controlled pretty much and might do left click, right snap, looking over capacities, and PC gadget pointer perform while not the utilization of the genuine mouse.

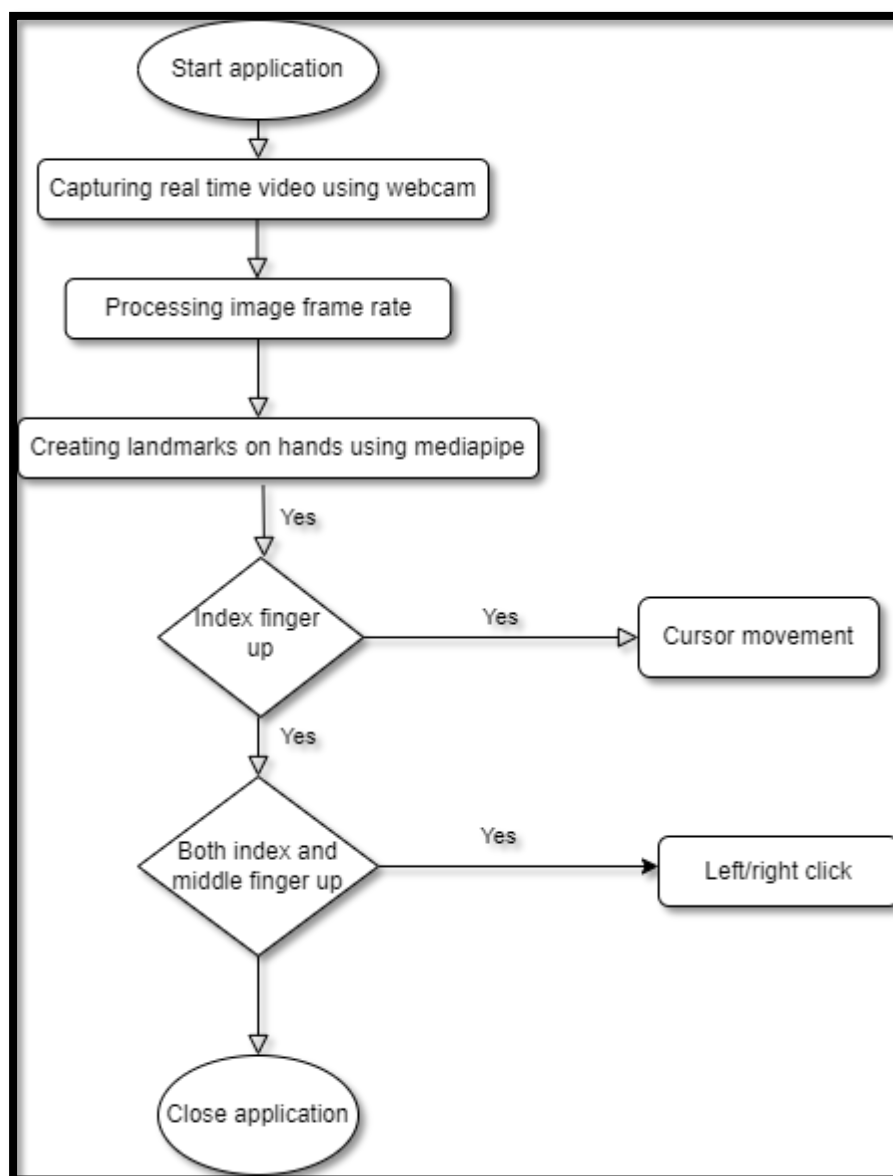
The overview of the hand gesture recognition is described in figure 4, the hand is detected using the background subtraction method and the result of hand detection is transformed to a binary image. Then, the fingers and palm are segmented so as to facilitate the finger recognition. Moreover, the fingers are detected and recognized. Last, hand gestures are recognized using a simple rule classifier.

IV. MODELING AND ANALYSIS

The main focus of the modeling and analysis is to provide a detailed report on the modeling of the report .In this section we present the graphs and charts

to show the analysis and the glimpse of our research work.This contains very useful information regarding the modeling of the research. In this we have made a app named AI Mouse

Flowchart:



V. PROBLEMS / ISSUES FACED

We faced alot of dependency issues throughout this project. Some of the issues and their solutions are as follows:

- Autopy not installing: This is because autopy currently doesn't support Python versions above 3.8
- Webcam not opening: It was a bug in mediapipe and was fixed in latest python versions

Hence, inorder for the project to run smoothly, you need to degrade the Python version to 3.8

Follow the following steps to degrade python version:

- Uninstall Python from add/remove programs
- Go to AppData and remove any python folder you see.
- Download Python 3.8 from this link: <https://www.python.org/downloads/release/python-380/>
- Python 3.8 Install it.
- Open command prompt and run "pip" inorder to confirm installation.
- Your python version has been degraded.

VI. REQUIREMENTS

Following modules need to be installed for it to work properly: OpenCV, Mediapipe, Autopy

OpenCV: OpenCV is a huge open-source library for computer vision, machine learning, and image processing. OpenCV supports a wide variety of programming languages like Python, C++, Java, etc. It can process images and videos to identify objects, faces, or even the handwriting of a human. It can be installed using "pip install opencv-python"

Mediapipe: MediaPipe is a framework for building multimodal (eg. video, audio, any time series data), cross platform (i.e Android, iOS, web, edge devices) applied ML pipelines. It can be installed using "pip install mediapipe"

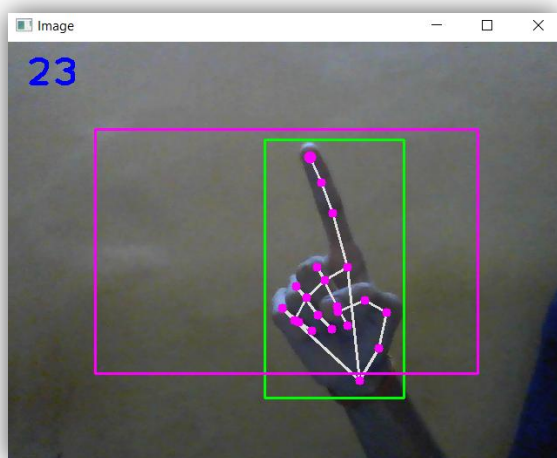
Autopy: AutoPy is a simple, cross-platform GUI automation library for Python. It includes functions for controlling the keyboard and mouse, finding colors and bitmaps on-screen, and displaying alerts. It can be installed using "pip install autopy"

VII. CONCLUSION

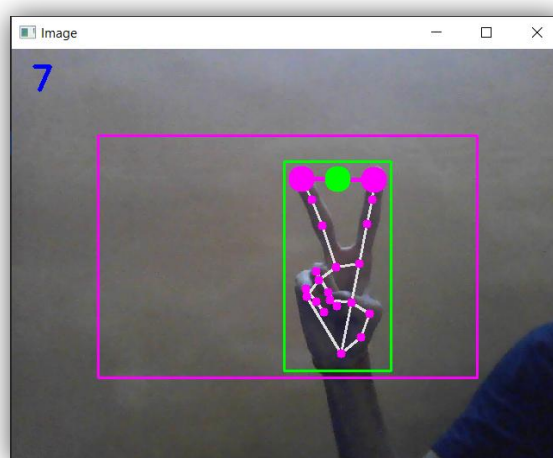
The main objective of the AI virtual mouse system is to control the mouse cursor functions by using the hand gestures instead of using a physical mouse. The proposed system can be achieved by using a webcam or a built-in camera which detects the hand gestures and hand tip and processes these frames to perform the particular mouse functions.

From the results of the model, we can come to a conclusion that the proposed AI 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. Since the proposed model has greater accuracy, the AI 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. The model has some limitations such as small decrease in accuracy in right click mouse function and some difficulties in clicking and dragging to select the text. Hence, we will work next to overcome these limitations by improving the finger-tip detection algorithm to produce more accurate results.

Cursor movement



Left / right click



Features and advantages of virtual mouse:

- Accurate
- Cost reduction
- Flexibility for customers
- Cursor movement
- Left click
- Right click

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