

# AI Virtual Mouse.

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## ABSTRACT-

Since the development of computer technology, the technique for constructing a process of human-computer interaction has evolved. In terms of human-computer interface, the mouse is an excellent device [9]. This study presents a method for controlling the cursor's position without the need of any electronic equipment. While actions such as clicking and dragging things will be carried out using various hand gestures. As an input device, the proposed system will just require a webcam. The system will require the use of OpenCV and Python as well as other tools. The camera's output will be presented on the system's screen so that the user can further calibrate it. NumPy, and mouse are the Python requirements that will be Utilized to create this system [7]. We use technologies like Open-CV, Media-Pipe, Python. Media-Pipe is developed by Google. It is quite efficient and helps to provide quick solutions to AI projects. The user will be able to navigate the computer cursor with their hand holding color caps or tapes, and left click and dragging will be done using various hand motions [8]. In this paper, we propose a hand gesture recognition system to control the virtual mouse for natural human computer interface.

**KEYWORDS-**Hand Tracing, Finger counter, AI Virtual Mouse.

## I. INTRODUCTION

Human computer interaction is one of the most rapidly growing technologies. Hand gestures are very significant for human-computer interaction. Hence discovering various modules of HCI via hand gestures and implementing them to innovate is the objective. The proposed systems consist of projects like Hand Tracking, Finger counting, gesture volume control and finally AI Virtual Mouse as well as Virtual Keyboard. Each are interrelated and are basics to advance. In order to increase productivity and to keep the flexibility in each module creating

mini projects is the base idea. Since the development of computer technology, the technique for constructing a process of human-computer interaction has evolved. In terms of human-computer interface, the mouse is an excellent device.

The study will present a method for controlling the cursor's position without the need of any electronic equipment. While actions such as clicking and dragging things will be carried out using various hand gestures. As an input device, the proposed system will just require a webcam. The system will require the use of OpenCV and Python as well as other tools. The camera's output will be presented on the system's screen so that the user can further calibrate it. NumPy and mouse are the Python requirements that will be Utilized to create this system. In project phase one implementation and exploration is done on a Virtual Mouse. It also includes Hand Tracking which tracks the palm of the hand and displays Frame rate, Finger counting that counts fingers and uses a hand tracking module as its base. Later, Gesture Volume control which controls the volume by extracting certain hand features. These are projects that are targeted to increase productivity. We use technologies like Open-Cv, Media-Pipe, and Python. Media-Pipe is developed by Google. It is quite efficient and helps to provide quick solutions to AI projects.

## II. LITERATURE SURVEY-

According to a survey and a sign language study, the hand gesture is the easiest and most natural manner of communicating among the many gesture communications modalities. With the help of recent breakthroughs in the field of computer vision and pattern recognition, real-time vision-based hand gesture identification is becoming more and more possible for Human-Computer Interaction. [4].

Industrial robot control, sign language translation, smart surveillance, lie detection, visual environment manipulation, and rehabilitation devices for those with upper extremity physical limitations can all benefit from virtual hand gesture recognition. In addition to being inconspicuous, virtual hand gesture recognition systems may be a natural means of interacting with machines, making them an important sort of input mechanism. The ability to reliably detect gestures from numerous perspectives is a difficult component of this technology [2]. For laptops, there are a variety of quick access techniques for hand and mouse gestures. Using our project, we could use the laptop or webcam to recognize the hand motion and operate the mouse and execute simple operations like mouse pointer control, select and deselect using left click. The completed project is a laptop-based "Zero Cost" hand recognition system that employs simple algorithms to determine the hand, hand movements, and assign an action to each movement. The system we're building, which is written in Python, is much more responsive and easier to implement because Python is a simple language that is platform independent, flexible, and portable, all of which are desirable qualities in a program aimed at creating a Virtual Mouse and Hand Recognition system [8]. The objective of this work is to explore some of the recent research in the hand gesture recognition system and to detect the virtual mouse for human and computer interaction.

### III. PROPOSED SYSTEM-

The technology recognizes the color of the hand and adjusts the cursor's position accordingly. For the purpose of clicking the user, the proposed approach can function for any skin tone and in any lighting condition. The research study has the potential to be a trailblazer in its subject and a source of future research in the field [7].

We are aiming to create a cost-free hand recognition system for laptops and PC's with a web cam support and by recognizing the hand gesture we could control the cursor of the mouse and perform basic operations like mouse pointer or cursor control as well as features of mouse like left click and right click [8]. The idea also suggests of how the fingers are gestured will define the type of click. If only index finger's tip is detected, then the cursor will act as the finger moves like a mouse. The hand movements are small and easy to do. Hence the system is also designed such that it can be used easily.

The system also focuses on developing other small features such as hand tracking, finger counter and gesture volume control along with the AI virtual mouse. The reason is to increase the results and to get more outcomes from a single project.

**A. HAND TRACKING-** The Hand Tracking model will use two main modules in the backend that are palm detection and hand landmarks. The Palm detection crops the image and finds the exact image which has a palm. Hand Landmarks find 21 different landmarks on the cropped image.

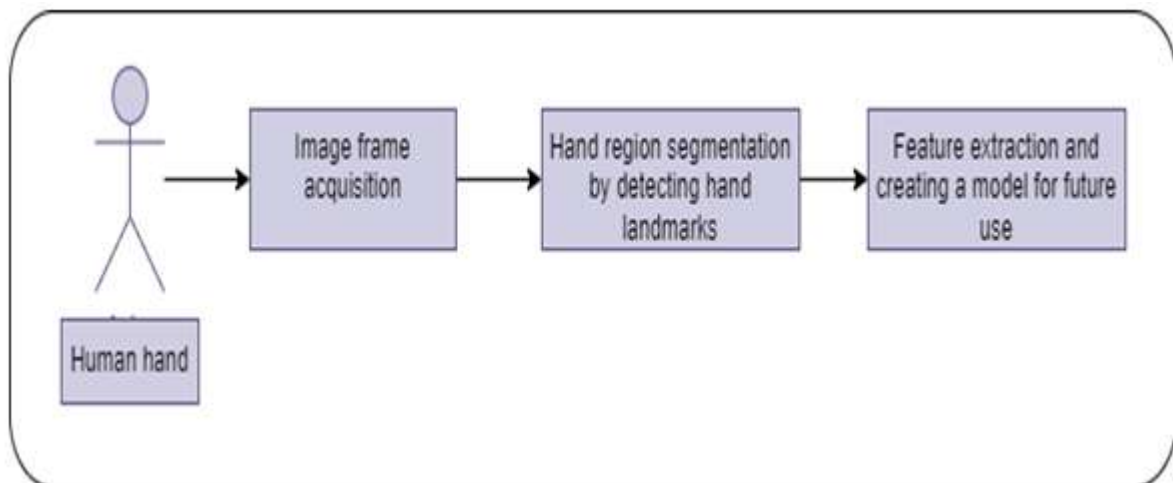


Fig. 1. Hand Tracking Model.

**B. FINGER COUNTER-**Finger Counter will import the Hand tracking model. As the Hand Tracking model will contain modules which are flexible and easing reusable importing and using it will be quite efficient. Finger counter will also

import a database that has 6 images of hand counting till five and an image of fist. The model will trace the 21-hand landmark check their position in real time and then give the estimated output of how many fingers are displayed and then

it will count fingers. Hence, we learned how to detect fingers from this model.

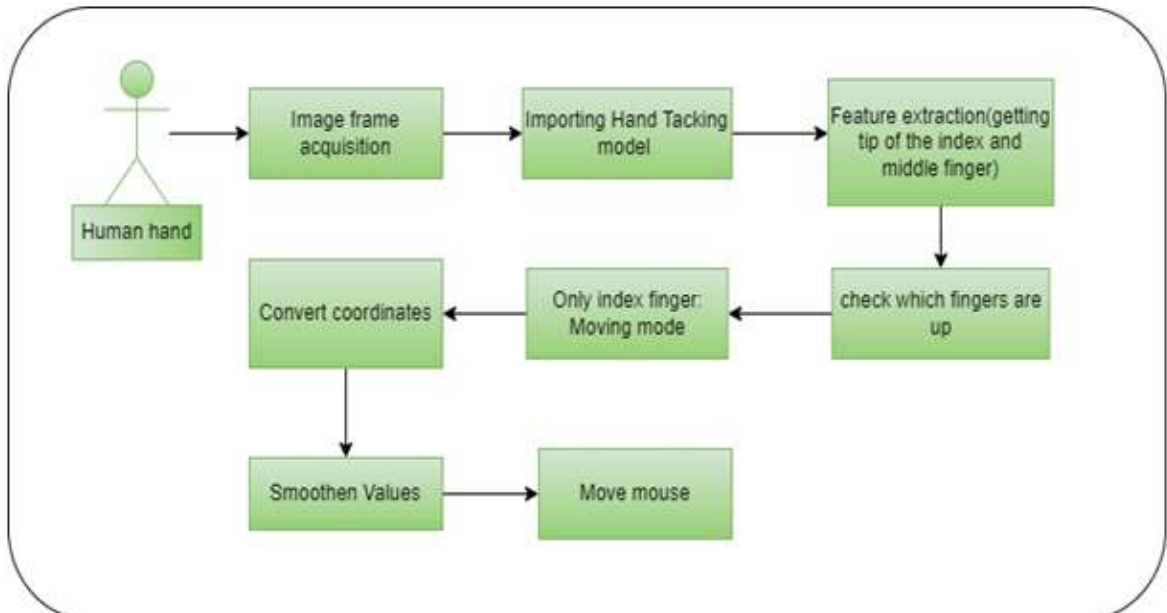


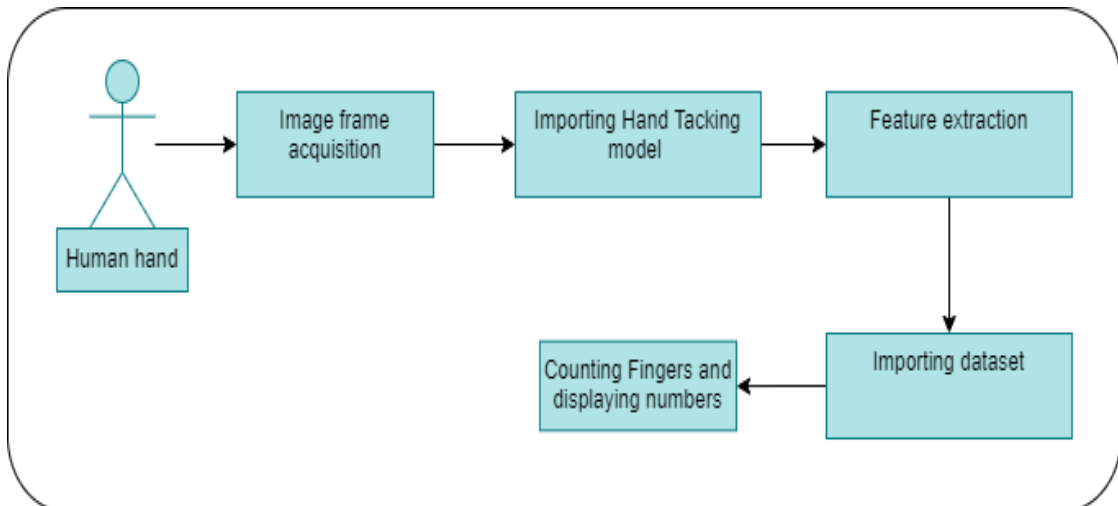
Fig. 2. Finger Counter Model.

**C. GESTURE VOLUME CONTROL-**

This model will also import Hand tracking modules. Detecting index finger and thumb to control the volume. Also detecting the pinky finger

to fix the volume. Hence using 21 hand landmark features extracting the landmarks which are required and programming them accordingly to give the expected output is the aim here.

Fig. 3. Gesture Volume Control Model.



**D. VIRTUAL AI MOUSE-** An AI mouse is a proposed system where the mouse functions will be handled by a finger using the camera. Use of the hand tracking model will be done again. Tracking

hand extracting 21-hand landmarks and programming such that only the index finger's movement will be read is the objective.

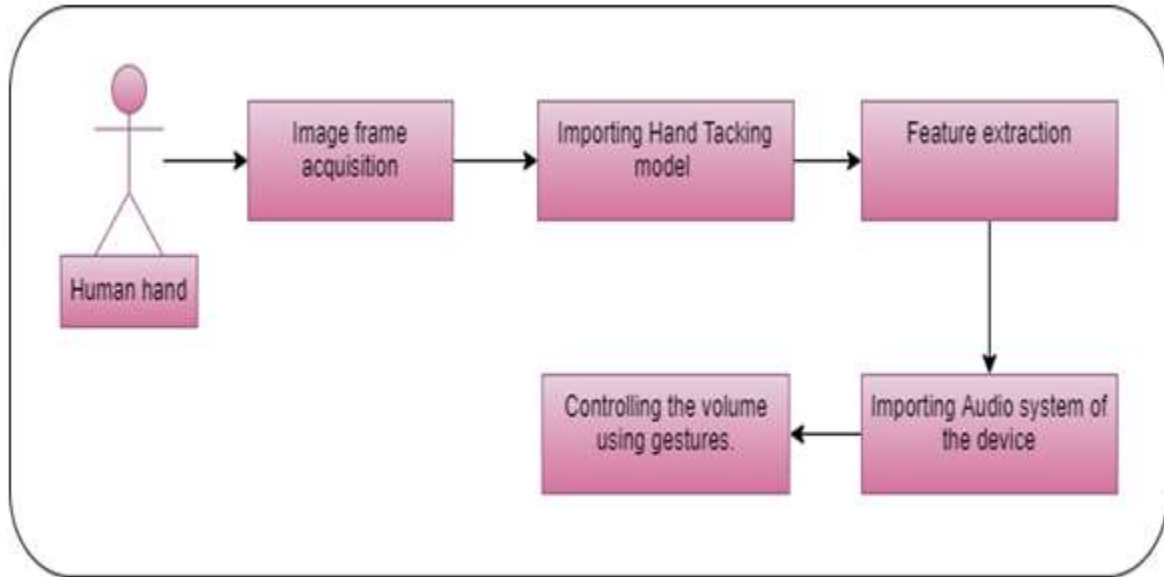


Fig. 4. Virtual AI Mouse Model.

#### IV. RESULTS-

A. **FINGER COUNTER**-The figure 5 shows the number of fingers which gets detected in the web-based camera. It counts the fingers, and presents it on the screen.

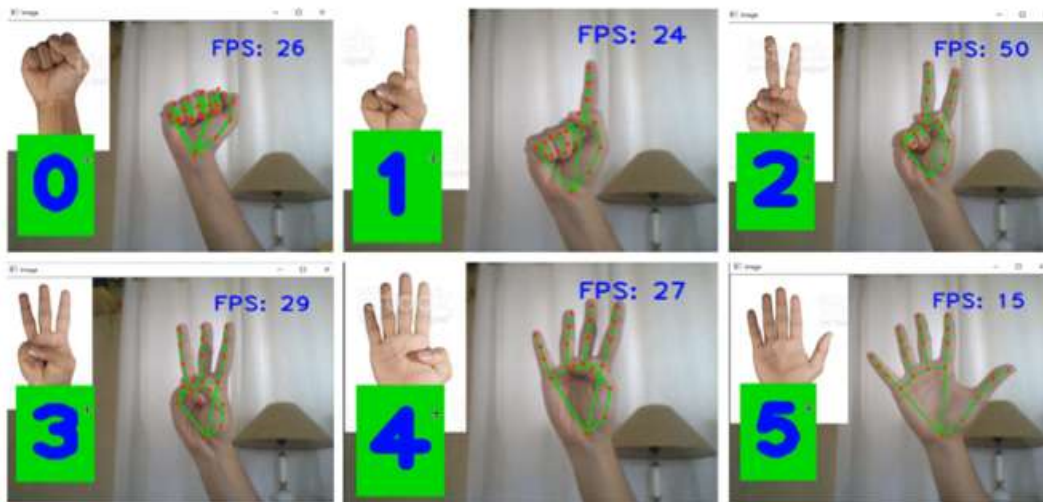


Fig. 5. Finger Counter Using Web-based Camera.

B. **HAND GESTURE RECOGNITION**-Figure 6 recognizes the hand gestures, which controls the change in the volume from high to low.



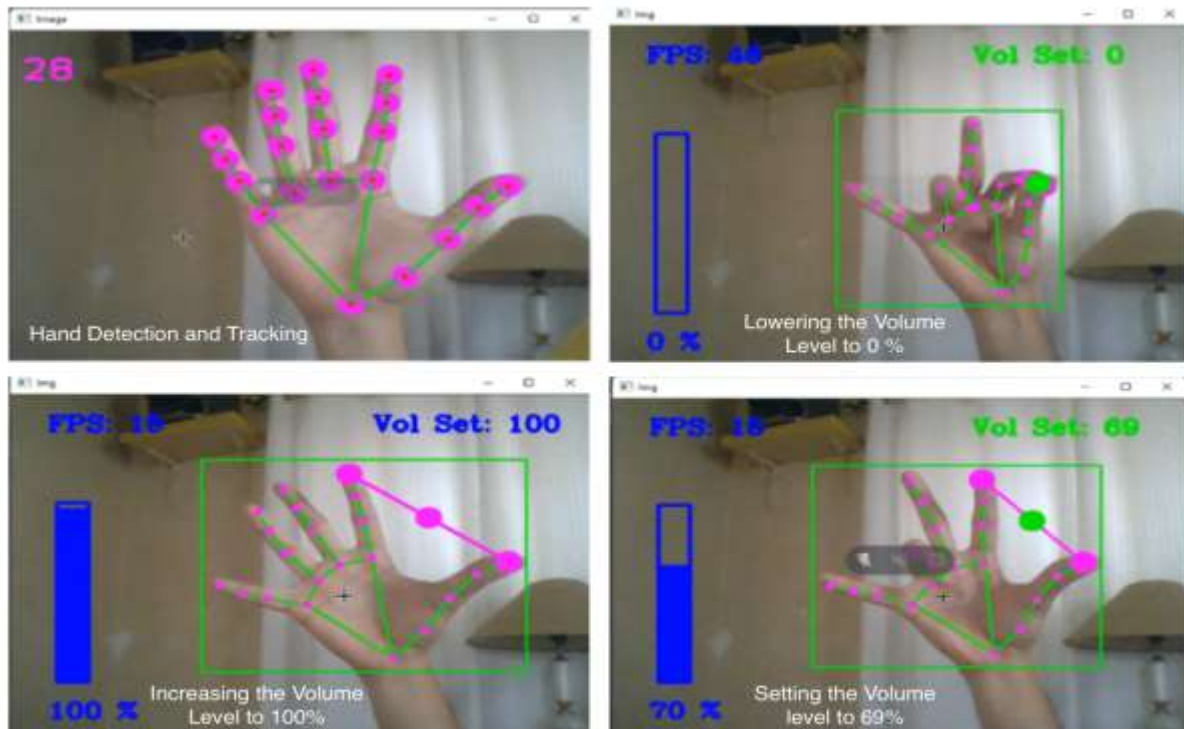


Fig. 6. Hand Gesture Signs to control the volume.

## V. CONCLUSION

Using a real-time camera and real-time hand detection and tracking, we will attempt to perform mouse functions such as right click and gesture volume control in this system. This system works with all mouse tasks and is based on computer vision techniques. However, because of the wide range of human racial colour and skin tones, it is difficult to obtain consistent results. The majority of vision algorithms have difficulty with illumination. According to the findings, if the vision algorithms can work in all conditions, our system will be more efficient. This system could be useful in presentations as well as for saving space at work.

## VI. FUTURE WORK

System is completely autonomous and easy to use. Future work will be focused on algorithm improvement, by using a combination of segmentation techniques and robot motion control by speed.

## REFERENCES

- [1] Suarez, J., & Murphy, R. R. (2012, September). Hand gesture recognition with depth images: A review. In 2012 IEEE RO-MAN: the 21st IEEE international symposium on robot and human interactive communication (pp. 411-417). IEEE.
- [2] Shah, P., Pandya, K., Shah, H., & Gandhi, J. (2019). Survey on vision-based hand gesture recognition. *International Journal of Computer Sciences and Engineering*, 7, 281-288.
- [3] Chen, L., Wang, F., Deng, H., & Ji, K. (2013, December). A survey on hand gesture recognition. In 2013 International conference on computer sciences and applications (pp. 313-316). IEEE.
- [4] Panwar, M., & Mehra, P. S. (2011, November). Hand gesture recognition for human computer interaction. In 2011 International Conference on Image Information Processing (pp. 1-7). IEEE.
- [5] Cheng, H., Yang, L., & Liu, Z. (2015). Survey on 3D hand gesture recognition. *IEEE transactions on circuits and systems for video technology*, 26(9), 1659-1673.
- [6] Patil, N., Sali, G., & Lokhande, N. (2019). Mouse on Finger Tips using ML and AI.
- [7] Sharma, V. K., Kumar, V., Iqbal, M., Tawara, S., & Jayaswal, V. Virtual Mouse Control Using Hand Class Gesture.
- [8] Abhilash, S. S., Thomas, L., Wilson, N., & Chaithanya, C. (2018). Virtual Mouse Using Hand Gesture. *International Research Journal of Engineering and Technology (IRJET)*, 5(4), 3903-3906.

- [9] Shibly, K. H., Dey, S. K., Islam, M. A., & Showrav, S. I. (2019, May). Design and development of hand gesture based virtual mouse. In 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT) (pp. 1-5). IEEE.
- [10] Nandwana, B., Tazi, S., Trivedi, S., Kumar, D., & Vipparthi, S. K. (2017, November). A survey paper on hand gesture recognition. In 2017 7th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 147-152). IEEE.