

## Review Article

# Virtual Mouse Using Hand Gesture

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## A B S T R A C T

This paper proposes a contemporary optic based cursor control system, using hand gestures captured through the webcam of the device and the use of color detection technique. The afore mentioned system will allow the user to traverse the computer cursor using the gestures of their hand without bearing color caps or tapes, left click and scrolling and dragging shall be performed using different hand gestures. It shall also be able to perform file transfer between two systems within a single network. The aforementioned system only uses a low-resolution webcam that acts as a sensor to track the different hand gestures of the user in two dimensions. The system will be implemented using python and OpenCV. The hand gesture is an effortless and innate way of communication. The user can also view the output of the camera on the monitor. Shape and position information about the gesture will be gathered using detection of gestures.

**Keywords:** Virtual Mouse, Hand Gestures, Image Capture, Processing, Masking, DnD Frame

## Introduction

Hand Gesture Recognition plays a key role in human-computer interactions. As we can see that there are so many new Technological advancements happening such as biometric authentication which we can see frequently in our smart phones, similarly hand gesture recognition is a modern way of human-computer interaction i.e., we can control our system by showing our hands in front of webcam and hand gesture recognition can be useful for all kinds of people. Based upon this idea this paper is presented. With the development of augmented-reality technology, researchers are working to reduce people's workload while increasing their productivity by studying human computer interactions (HCI). The Natural User Interface (NUI) of hand-gesture recognition is an important topic in HCI. Hand- gesture based interfaces allow humans to interact with a computer in the most natural way, typically by using fingertip movements. Fingertip detection is broadly applied in practical applications, e.g., virtual mice, remote controls, sign-language recognition, or immersive gaming technology. Therefore, virtual mouse control by fingertip detection from images has been one of the main goals of vision-

based technology in the last decades, especially with traditional red-green-blue (RGB) cameras. So, here the technique virtual mouse comes into play, making it a more reliable and secured way of interaction. Even, considering the hardware point of view; we as such need no fancy equipment or dedicated hardware or computer devices. Just a good quality working webcam is good to go. The better your webcam is, the better the performance of your virtual mouse.

## Existing System

In most of the existing approaches present in this day and age, the choice of practicality is very limited. The gestures of user's fingers sometimes become unrecognized by the system because there is no proper window assigned for the webcam to detect gestures. In order to remove such anomalies, we have implemented certain size of window only up to which gestures will be recognized. This approach makes it easy for the user as well as the system to understand what the user wants to do with the cursor. The existing systems also revolve around the use of certain colored tapes which allows the system to detect gestures, but our approach doesn't make use of colored tapes because it is not a very convenient method and makes the

system a lot complicated as a whole. Our system is specially designed to deliver smooth and efficient performance.

#### Proposed System

The proposed system is a virtual mouse which works with the aid of web camera of your laptop or PC. It is portable, compact, very comfortable to use. A camera continuously takes images of hand movements of a user, which is then mapped into mouse inputs. Then the images are analyzed using various image processing techniques and detect the position on the screen. The user must possess certain gestures for the system to detect them as action. For the scrolling of cursor point simply use your index finger and for making a click you just need to stretch your index and middle finger up to a certain distance and hence it will be detected as a click. The system is built using python and OpenCV- a library in python language.

#### Results and Evolution

With the aid of our Hand Tracking Module, we have created a basic hand recognition system that detects our hand and some basic hand gestures, along with it, this also counts frame per second (FPS).

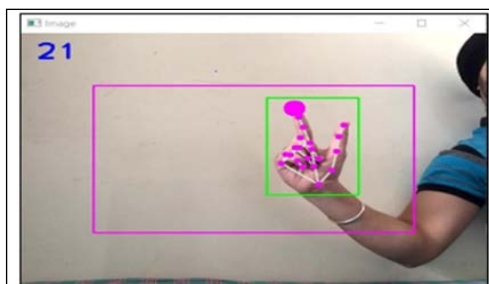


Figure 1

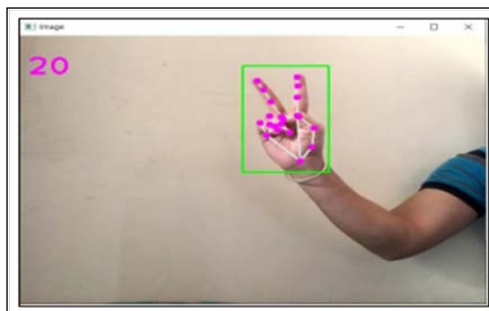


Figure 2

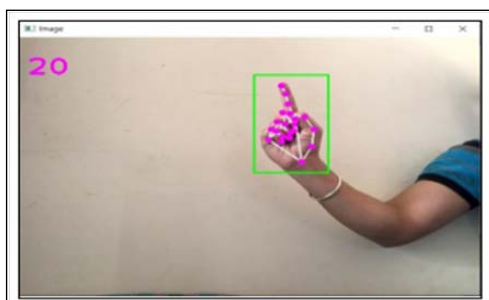


Figure 3

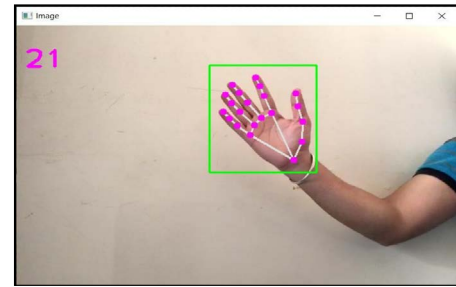


Figure 4

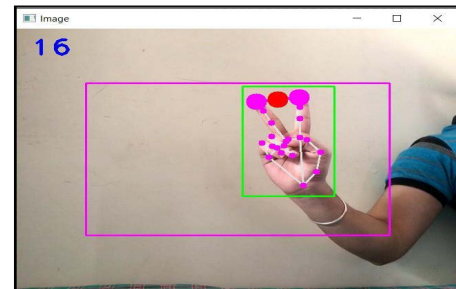


Figure 5

#### Methodology

In creating this project, we start with writing the code for the webcam to capture the hand of the user and send it for processing. Since, we are not using making tapes, so we define a frame within which the hand of the user is tracked for better functionality; the webcam displays the frame rate and the markings on the hand and the frame within which the hand is being tracked. The hand tracking module contains a code which calculates the distance between the fingers of the hand to perform the various functions. The index finger is recognized and can be used to move the cursor anywhere, the middle finger and index finger when used together in the shape of a 'victory sign' perform the clicking process, it is also displayed on the webcam in the form of a green dot, the code measures the distance between the two fingers to perform the clicking operation.

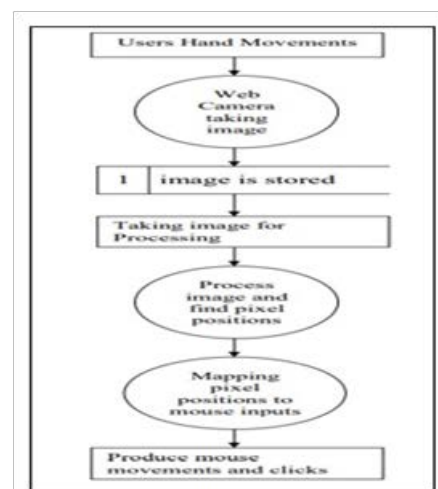


Figure 6

## Conclusion

Hand gesture recognition provides one of the best interactive experiences between a human and a machine. Gesture recognition allows a human to seamlessly interface with a machine in a very natural way. It is also a very useful application in sign language recognition for deaf and dumb people, automation controls, etc. This technology has a wide application in the fields of biomedical instrumentation, computer graphics, augmented reality, prosthetics, gaming and much more. It also works as the extension of the system providing a digital canvas for creators and artists where they can create 2D and 3D images using a virtual mouse. The technology is also beneficial for people who don't have control over their hands and have difficulty in using a mouse. In the case of computer graphics and gaming the technology is applied in the gaming consoles to make the games more immersive for the people, it goes furthermore to capture the motion of the gamers and interpreting the commands.

The major focus is to make the system do all the complex work in the background without the user knowing, for it to work even in low lighting conditions. It can further be developed to include all mouse functionalities and be more interactive with the user. It would be ideal to research advanced mathematical materials for image processing and investigate different hardware solutions that would result in more accurate hand detections. Not only did this project show the different gesture operations that could be done by the users, but it also demonstrated the potential in simplifying user interactions with personal computers and hardware systems.

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