



# Survey on: Hand Gesture Controlled using OpenCV and Python

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**Abstract:** In the latest trends, gesture recognition has been used to advance machines because of its cooperative ability. Gestures are a type of nonverbal communication that allows humans and computers to communicate with one another. Hand gesture recognition is widely used in artificial intelligence to enhance features and user interaction. Here we have used certain libraries of Python (OpenCV, cvzone2) that help in capturing, image pre-processing, and detection, along with mapped action pairs to perform specific tasks.

**Index Terms** - Gesture recognition, OpenCV, artificial intelligence, python, machine learning

## I. INTRODUCTION

Hand gestures are the most robust transmission mode for human-computer interaction. Generally, we use our keyboard, mouse, or any other input device to interact with the computer or application. In this project, we will use our hand gestures to give input to our program by using python libraries.

When we make different hand gestures to the web camera, it will read the data from the image and analyse it to determine what kind of gesture our hand is making. Then it will process that data to perform a particular activity or give some output. The first step towards this process is capturing the hand gesture, then analysing it to get the data of the gesture and action mapped to gestures has to be performed.

The webcam detection process is the first step because it detects your hands and serves as a medium for the computer and the human to interact by not using any words or an external input device. Using hand gestures as input will make it very easy to perform commands. Using it for a PowerPoint presentation will perform a specific task, such as scrolling forward or backwards or pointing to anything on the display interface, simply by using your hand and making gestures.

## II. PROBLEM STATEMENT

Recognition of gestures is used nowadays for different research applications, whether it is face recognition or body recognition. Developing a recognition system that is efficient and works accurately is difficult as it involves a real-world environment. This involves the background of the image when the camera is detecting the hand gestures made by the user. To encounter this problem, we will be eliminating the background that focuses on the hand to recognize the slightest movement of our fingers and hand. The camera will be capturing this and analyzing what gestures and movements our hand is making, and based on that, it will execute them. Another condition that should be thought about is the camera quality of our device and the sharpness of the camera. We will require precise gesture capture. In the phase of result evaluation, it is important to check the accuracy of the gesture and proceed properly.

## III. SCOPE AND OBJECTIVE

The goal is to attain synchronisation with a gesture organisation that may recognise gestures. Spontaneously amend the lighting conditions to attain this goal, synced gestures are generated in real-time recognise gestures. The intention of this project is to identify, detect, and build an entire system describing hand movement via laptop vision; this structure-function one side of the laptop through user interaction, vision and AI are combined that produces to see determine which hand movements are supported and which are not.

Completely different arguments. or with a design that prioritizes simplicity and ease of use, easy and produces nothing. specific hardware. All functions area unit displayed on the identical screen, computer, or digital computer, just some specific hardware used to digitalize pictures

#### IV. LITERATURE SURVEY

Based on how individuals interpret and interpret information about their environment, a vision-based approach offers the potential to produce organic and non-contact solutions. The user interacts with it while collecting the data required for recognition using their bare hands. It collects information for gesture analysis by using image characteristics such as texture and color.

Serial no.	Author	Year	Description
1	P. Garg, N. Aggarwal, and S. Sofa (Garg, Aggarwal, & Sofat, 2009)	2009	Paper gives review about Vision based Hand Gesture Recognition methods for human computer communication, merging the different available ways, entering their common advantages and disadvantages.
2	G. Murthy and R. Jadon,(Murthy & Jadon, 2009)	2009	Authors gives foundation of the field of gesture identification as a process for connection with computers.
3	M. K. Ahuja and A. Singh(Ahuja & Singh, 2015)	2015	Authors suggested a project using a database-driven hand motion identification build upon skin colour model approach and thresholding proposal further with an effectual template complement using PCA

#### V. METHODOLOGY

The growth in computers is immense, and it is growing in all fields. In Python, there are train libraries in the field of modulation like face detection, motion detection, and many more. The PowerPoint presentation is something that is needed in every field. The system operates by capturing motion and relating the task to be performed for the specific action or motion.

The OpenCV is the library that helps get the motion detected, and it is combined with the camera where the dimension in the camera is drawn to restrict the motion in a particular area. This gesture-controlled project focuses on gesture control and how it may be used to perform specific tasks using finger movements, such as forwarding and going backwards presentation slides, clicking, and writing on the screen. Underneath the green line displayed by the camera during its deployment, the gesture is captured. The theory is used to describe how gestures are captured, recognised, and execute particular jobs which can make our work easy.

The gesture recognition process focuses here on entire procedure explained below. The overall system comprises of two sections back end and front end. The back-end framework comprises of three modules camera module, detection module, and interface module.

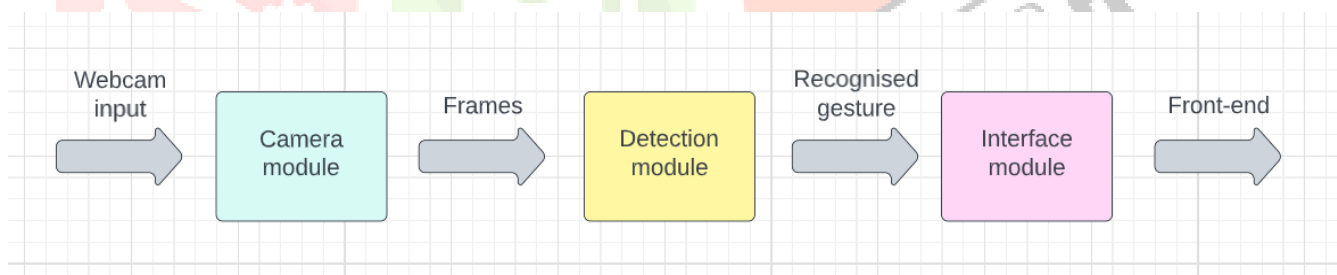


Fig1. Front-end and back-end process

**Camera module** is subjected for interfacing and capturing the images of gestures being made and transfer it to the detection module for handling.

**Detection module** has the work for image processing. Whatever the images come from the camera module detection module processes it, removes all the noise from image, remove the background and make the image readable to detect the gesture.

**Interface module** is liable for calibrating the detected hand gestures to their assigned actions to perform. These assigned actions are then sent to our application which is PowerPoint presentation and the necessary action is carried out.

We proposed a gesture recognition system that follows a very efficient methodology.

Gesture detection and image processing work flow:

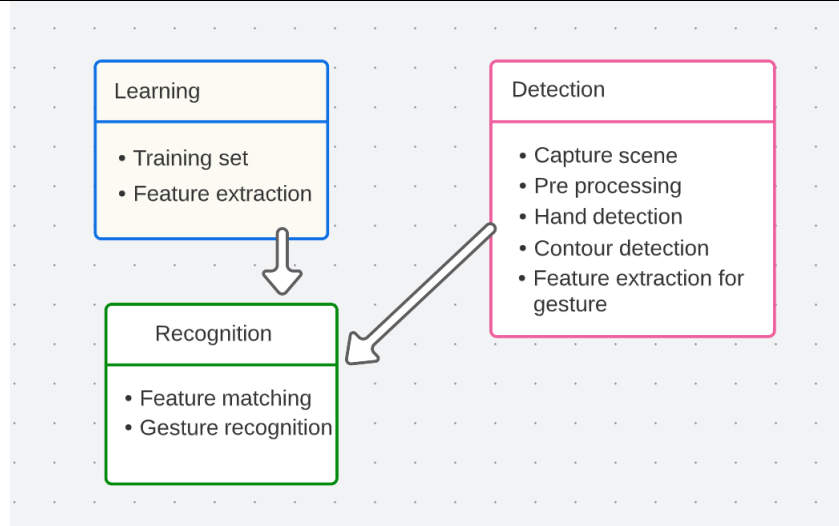


Fig2. Gesture recognition general process

Image capturing at this initial stage, we merely employed bare hand movements and a webcam to capture the RGB values (frame by frame).

Pre-Processing Next, in this step, we have just used the region of interest (also known as the region of significance) rather than the entire frame from the video stream in order to reduce the computation time (ROI). Create a grayscale image of the area of interest.

1. Using edge detection, hand region segmentation eliminates extraneous data from the video stream.
2. RGB values as a consequence of the RGB values for the hand being completely different from the image's background.
3. Removing the background

These processes are taken care by python libraries called as OpenCV, cvzone, Handtracking module.

The hand gestures predefined function is built to execute certain tasks such as having to scroll left and right, clicking, and writing on the screen using colours. After the gestures are recognised, the results are mapped with specific action pairs using OpenCV, cvzone's library called the Handtracking module, and the hand gestures.

## VI. REQUIREMENTS

### Hardware requirements:

- Operating system: windows 10 and above, macOS or Linux.
- Webcam (For real-time hand Detection)
- GPU: NVIDIA GeForce GTX 800 or higher
- System Type: 64-bit operating system, x64-based processor
- Memory Space: More than 2 GB
- Processor: Intel(R)Pentium(R) CPU N3710 @1.60GHz
- Installed Ram: 8 GB

### Software requirements:

- Python compiler
- Python version: 3.6 or 3.8
- Library: OpenCV, cv2, NumPy, cvzone

### Test Dataset:

- 5 Screenshots of your presentation

## VI. CONCLUSION

We can conclude from the above project that a person can use their hand gestures as an input method to perform some certain tasks such as scrolling through PowerPoint presentation slides or point at something on the screen. Machine learning is a growing branch in computer technology. Many new features we can use these days because of machine learning. Gesture control feature uses the help of machine learning to read the data through the computer's camera and carry out the function assigned to that gesture. Python is the main programming language used and with its help this project is completed. Gesture control is a very vast field and you can

have different types of gestures and customized only for you gestures to carry out any activity you want it to. Here we were just focused on PowerPoint presentation and controlling it through gestures of our hands.

## VII. FUTURE SCOPE

In the future, we can implement more gestures and different types of gestures so that we will be able to perform more things and get more benefits from this. Also, we will be focusing on accuracy and helping to improve it more and more. For future scope, we can also include whole body action and face gestures to perform certain tasks, or if we have to use some application to scroll through some different application rather than a PowerPoint presentation, we will be able to do it. accessible to more and more people, so everyone can benefit from this and their work will be easier.

## IX. REFERENCES

- Li, L., & Zhang, L. (2012). Corner Detection of Hand Gesture. TELKOMNIKA Indonesia Journal of Electrical Engineering, 10(8), 2088-2094.
- Murthy, G., & Jadon, R. (2009). A review of vision-based hand gestures recognition. International Journal of Information Technology and Knowledge Management, 2(2), 405-410.
- Parvini, F., & Shahabi, C. (2007). An algorithmic approach for static and dynamic gesture recognition utilising mechanical and biomechanical
- Ahuja, M. K., & Singh, A. (2015). Static vision-based Hand Gesture recognition using principal component analysis. Paper presented at the 2015 IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE).
- Bretzner, L., Laptev, I., & Lindeberg, T. (2002). Hand gesture recognition using multi-scale colour features, hierarchical models and particle filtering. Paper presented at the Proceedings of fifth IEEE international conference on automatic face gesture recognition.
- Garg, P., Aggarwal, N., & Sofat, S. (2009). Vision based hand gesture recognition. World academy of science, engineering and technology, 49(1), 972-977.
- Gupta, S., Jaafar, J., & Ahmad, W. F. W. (2012). Static hand gesture recognition using local gabor filter. Procedia Engineering, 41, 827-832.
- Hasan, H., & Abdul-Kareem, S. (2014). Retracted article: Human-computer interaction using visionbased hand gesture recognition systems: A survey. Neural Computing and Applications, 25(2), 251-261.
- Hasan, M. M., & Mishra, P. K. (2012). Hand gesture modeling and recognition using geometric features: a review. Canadian journal on image processing and computer vision, 3(1), 12-26.