

# **A Minor Project Synopsis Submitted to**



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**Under the Supervision of  
Prof. Gajendra Chauhan**

**Submitted By**  
**Kanishk Chouhan (0827CS201112)**  
**Khushboo Sen (0827CS201114)**  
**Mahak Soni (0827CS201127)**  
**Mayank Solanki (0827CS201134)**



**Department of Computer Science and Engineering  
Acropolis Institute of Technology & Research, Indore  
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## **1. Abstract**

Developing a solution for Gesture and voice enabled commands for operating Laptops/PCs for frequently used operations such as saving a file, exit application, print command, system shut down etc.

## **2. Introduction of the Project**

For any user, authenticated by face recognition, few gestures or voice commands could be defined for frequently used tasks- save, exit, print, screen-lock, screen unlock, system shut down, system restart. Save, print and exit operations are context sensitive meaning that it is applicable for current application. For example if word document is open and the gesture for save is done then the document will be saved, if print voice command is given then printer dialog will open etc. Similarly a gesture or a voice command could be defined for close/exit which will close the current application. If no application is opened then it will work as system shut down. It is similar to Alt+F4 key press functionality on windows PC.

## **3. Objective**

The goal of this project is to develop a software system that allows the user/people to perform some frequently performed functions using gestures and voice commands and thus saving a lot of time. Gesture recognition can be seen as a way for computers to begin to understand human body language. Compared to the primitive user interfaces, such as keyboard and mouse, it builds a richer bridge between the computers and humans.

## **4. Scope**

Researchers from all over the world are working to make our devices more interactive and to make them work with minimal physical contact. In this study, we suggest an interactive computer system that can function without the usage of a keyboard or a mouse. This device has the potential to benefit everyone, especially paralysed people who have difficulty using a real mouse. Virtual Mouse with Hand Gesture Recognition is a project that shows a novel way to control mouse movement with a real-time camera / Web camera. Our idea is to employ a camera and computer vision technologies to manage mouse tasks (clicking and scrolling), and we demonstrate how it can do all that existing mouse devices can. This project demonstrates how to construct a mouse control system. The proposed system is made up of nothing more than a sensor which is a normal-resolution webcam that can follow the user's hand in two dimensions. Python and OpenCV will be used to build the system. Hand gestures are the most

natural and effortless manner of communicating. The camera's output will be displayed on the monitor.

## 5. Study of existing system

- A. Sign Language Recognition:** Since the sign language is used for interpreting and explanations of a certain subject during the conversation, it has received special attention. A lot of systems have been proposed to recognize gestures using different types of sign languages. For example recognized American Sign Language ASL using boundary histogram, MLP neural network and dynamic programming matching. recognized Japanese sign language JSL using Recurrent Neural Network, 42 alphabet and 10 words. recognized Arabic Sign language ArSL using two different types of Neural Network, Partially and Fully Recurrent neural Network
- B. Graphic Editor Control:** Graphic editor control system requires the hand gesture to be tracked and located as a preprocessing operation. used 12 dynamic gestures for drawing and editing graphic system. Shapes for drawing are; triangle, rectangular, circle, arc, horizontal and vertical line for drawing, and commands for editing graphic system are; copy, delete, move, swap, undo, and close.
- C. Modeling:** To build 3D modeling, a determination of hand shapes are needed to create, built and view 3D shape of the hand. Some systems built the 2D and 3D objects using hand silhouette. 3D hand modeling can be used for this purpose also which still a promising field of research.
- D. Television Control:** Hand postures and gestures are used for controlling the Television device. In a set of hand gesture are used to control the TV activities, such as turning the TV on and off, increasing and decreasing the volume, muting the sound, and changing the channel using open and close hand.
- E. Cortana as a voice assistant:** is a virtual assistant developed by Microsoft that uses the Bing search engine to perform tasks such as setting reminders and answering questions for the user.
- F. Google Assistant:** is a virtual assistant software application developed by Google that is primarily available on mobile and home automation devices. Based on artificial intelligence, Google Assistant can engage in two-way conversations, unlike the company's previous virtual assistant

## 6. Project description

Over a period, the generation has witnessed a paradigm shift- a switch that altered the entire practice that we employ to manage and operate electronic devices. The digital era has welcomed gesture recognition software to meet the dynamic need of technological innovation, which can recognize hand and face movements and perform the assigned/asked task after that. The software interprets human gestures using programmed mathematical algorithms. It has facilitated every arena lying in the digital sphere of the world, such as a graphic designer who can correctly make changes in an image without using the keyboard or mouse. An engineer can zoom in

or zoom out on a 3-Dimensional representation of any model only by the hand gestures when the device is in their hand. Gesture recognition technology has a lot of benefits by which the human can direct their businesses and personal life.

Gesture recognition consists of three basic levels:

**Detection.** With the help of a camera, a device detects hand or body movements, and a machine learning algorithm segments the image to find hand edges and positions.

**Tracking.** A device monitors movements frame by frame to capture every movement and provide accurate input for data analysis.

**Recognition.** The system tries to find patterns based on the gathered data. When the system finds a match and interprets a gesture, it performs the action associated with this gesture. Feature extraction and classification in the scheme below implements the recognition functionality.

## 7. Methodology/Planning of the project work

Gesture recognition is an active research field in Human-Computer Interaction technology. It has many applications in virtual environment control and sign language translation, robot control, or music creation. In this machine learning project on Hand Gesture Recognition, we are going to make a real-time Hand Gesture Recognizer using the Media Pipe framework and Tensor flow in OpenCV and Python packages.

OpenCV is a real-time Computer vision and image-processing framework built on C/C++. But we'll use it

on python via the OpenCV-python package.

Planning Prerequisites for this project:

1. Python – 3.x (we used Python 3.8.8 in this project)
2. OpenCV – 4.5

Run “pip install open cv-python” to install OpenCV.

3. Media Pipe – 0.8.5

Run “pip install mediapipe” to install Media Pipe.

4. Tensor flow – 2.5.0

Run “pip install tensor flow” to install the tensor flow module.

5. Numpy – 1.19.3

Steps to solve the project:

Import necessary packages.

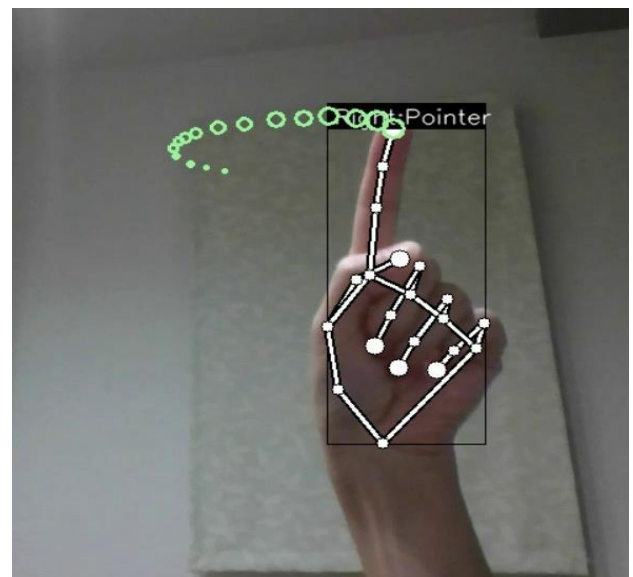
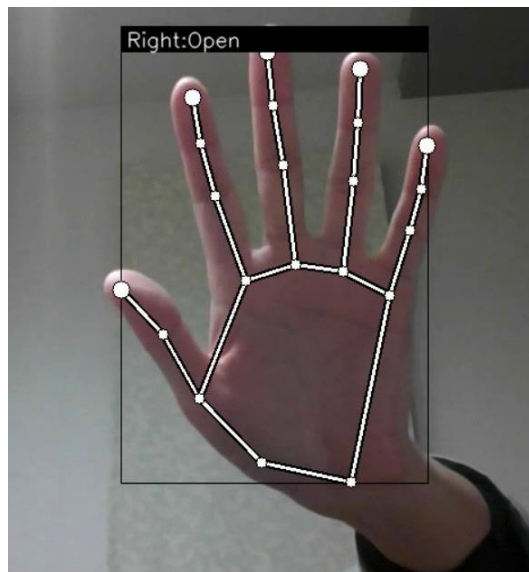
Initialize models.

Read frames from a webcam.

Detect hand key points.

Recognize hand gestures.

Once gesture recognition begins, we continue to track the target and end gesture. To perform the task, we choose the convolutional neural network (CNN) model.



## 8. Expected outcome

The main outcome of this software is that it will save a lot of time and efforts as frequently performed operations will be controlled by gesture and voice commands. So it will be very easy to use, higher accuracy, Higher stability, Quicker time to unlock a device

It has facilitated every arena lying in the digital sphere of the world, such as a graphic designer who can correctly make changes in an image without using information. the keyboard or mouse.

Also it is a way for a computer to understand human body language. This has minimized the need for text interfaces and GUIs (Graphical User Interface). A gesture is an action that has to be seen by someone else and has to convey some piece of

## 9. Resources and limitation

### Resources:

fast MCU frequency and significant memory

which are highly inapplicable to the cost-effectiveness of consumer electronics products

computational resource requirements as low as Flash < 5 KB, RAM < 1 KB

we calculated the three-axis linear acceleration by fusing accelerometer and gyroscope data with a complementary filter

then, by recording the order of acceleration vectors crossing axes in the world coordinate frame, we defined a new feature code named axis-crossing code

### Limitations:

- A. Make common grammatical error
- B. Incur high costs
- C. Make communication less personal
- D. Lack of accountability
- E. We cannot use on mobile phones

F. Only recognize English

## 10. Conclusion

Hand gesture recognition is of great importance for human computer interaction (HCI) because of its extensive applications in virtual reality and sign language recognition etc. Human hand is very smaller with very complex articulations comparing with the entire human body and therefore errors can be easily affected.

There can be no doubt that voice assistants are, and will continue to become, a great feat of human ingenuity and they are already creeping into our lives in some shape or form. With the eventual roll-out of 5G and the improvement in machine learning voice assistants may be setting themselves up to be a tool we cannot live without. However, before we get to that stage, there are hurdles to cross which include heavy investment, improvement in the technology and confidence from consumers that this device that is in their lives does not pose a risk to their privacy.

## 11. References

- [1] J.Jenkinwinston, M.Maria Gnanam (96207106056), R.Ramasamy (96207106306), Anna University of Technology, Tirunelveli: Hand Gesture Recognitionsystem Using Haar Wavelet.
- [2] Laura Dipietro, Angelo M. Sabatini, Senior Member, IEEE, and Paolo Dario, Fellow, IEEE, A Survey of Glove-Based Systems and Their Applications.
- [3] Kay M. Stanney HANDBOOK OF VIRTUAL ENVIRONMENTS Design, Implementation, and Applications, Gesture Recognition Chapter #10 by Matthew Turk
- [4] Daniel Thalman, Gesture Recognition Motion Capture, Motion Retargeting, and Action Recognition