

A Report on
Volume Control Using Hand Gestures

For

Image Processing and Machine VIS of Third Year (Semester-VI)

Submitted by

Esha Tewari (Roll No. 60)
Anand Tripathi (Roll No. 62)
Abhishek Vimal (Roll No. 64)

in partial fulfillment for the award of the degree

BACHELOR OF ENGINEERING

in

Department of Electronics & Telecommunication Engineering

under guidance of
Mr. Vaqar Ansari



St. Francis Institute of Technology, Mumbai
University of Mumbai
2022-2023

CERTIFICATE

This is to certify that Esha Tewari, Anand Tripathi, and Abhishek Vimal are the bonafide students of St. Francis Institute of Technology, Mumbai. They have successfully carried out the mini project titled “Volume Control Using Hand Gestures” in partial fulfilment of the requirement of B. E. Degree in Electronics and Telecommunication Engineering of Mumbai University during the academic year 2022-2023. The work has not been presented elsewhere for the award of any other degree or diploma prior to this.

(Internal Examiner/
Reviewer 1)

(External Examiner/
Reviewer 2)

(Dr. Vaqar Ansari)
Name of the Guide

(Dr. Kevin Noronha)
EXTC HOD

(Dr. Sincy George)
Principal

ACKNOWLEDGEMENT

We are thankful to a number of individuals who have contributed towards our final year project and without their help; it would not have been possible. Firstly, we offer our sincere thanks to our project guide, Dr. Vaqar Ansari for his constant and timely help and guidance throughout our preparation.

We are also grateful to the college authorities and the entire faculty for their support in providing us with the facilities required throughout this semester.

We are also highly grateful to Dr. Kevin Noronha, Head of Department (EXTC), Principal, Dr. Sincy George, and Director Bro. Shantilal Kujur for providing the facilities, a conducive environment and encouragement.

Signatures of all the students in the group

(Esha Tewari)

(Anand Tripathi)

(Abhishek Vimal)

ABSTRACT

In many situations, adjusting the volume of an electronic device like a television, speaker, or music player can be inconvenient or even impossible if a remote control is lost or not available. Therefore, there is a need for a hands-free, intuitive way to control the volume of these devices. One potential solution is to develop a system that allows users to control the volume using hand gestures. We have achieved this through the use of computer vision technology, which can detect and interpret the movements of a user's hand. The system could be integrated into the device itself or as a separate device that can be attached to the device. Overall, a hands-free, intuitive volume control system using hand gestures could greatly improve the accessibility and convenience of electronic devices for all users, including those with mobility impairments.

Contents

<i>List of Figures</i>	<i>v</i>
<i>1 Introduction</i>	<i>1</i>
1.1 Motivation	1
1.2 Scope of Project	1
1.3 Organization of Project	2
<i>2 Literature Survey</i>	<i>3</i>
2.1 Literature Review:	3
<i>3 Software Used</i>	<i>4</i>
3.1 PyCharm	4
3.1.1 PyCharm code	4
<i>4 Working Principle</i>	<i>6</i>
4.0.1 Why convert to RGB?	6
<i>5 Results and Conclusion</i>	<i>7</i>
5.1 Experimental Results	7
5.2 Conclusion	8
<i>Bibliography</i>	<i>9</i>

List of Figures

<i>3.1 PyCharm IDE</i>	4
<i>3.2 PyCharm Code</i>	5
<i>5.1 Result</i>	7

Chapter 1

Introduction

Gesture recognition helps computers to understand human body language. This helps to build a more potent link between humans and machines, rather than just the basic text user interfaces or graphical user interfaces (GUIs). In this project for gesture recognition, the human body's motions are read by computer camera. The computer then makes use of this data as input to handle applications. The objective of this project is to develop an interface which will capture human hand gesture dynamically and will control the volume level. The project is executed using an algorithm that uses Python language.

1.1 Motivation

Controlling volume using hand gestures can be useful for people with disabilities, such as those with limited mobility or visual impairment, as it provides an alternative method of controlling volume. It can prove convenient when we are busy doing something else and want to adjust volume without interrupting our work. We also see that post Covid-19 pandemic people have become conscious about touch surfaces that might be contaminated. This project can help to reduce the need of touching buttons and remote controls, thereby reducing the risk of infection. This project is a small step towards the future of human-computer interaction, where technology will be seamlessly integrated into our daily lives.

1.2 Scope of Project

The scope of a project on volume control using hand gestures would involve designing and implementing a system that allows users to adjust the volume of a device through hand gestures. This project would require expertise in

computer vision and machine learning, as well as the ability to integrate hardware components such as cameras and microcontrollers. The project would involve developing algorithms to interpret hand gestures and translate them into volume control commands. Additionally, the project may involve designing a user interface to display the current volume level and provide feedback to the user on their hand gestures. The end goal of the project would be to create a user-friendly and intuitive way to adjust the volume of a device without requiring physical interaction with the device itself.

1.3 Organization of Project

- *Define the Problem Statement*
- *Literature survey*
- *Software Used*
- *Working Principle*
- *Simulation and Results*

Chapter 2

Literature Survey

2.1 Literature Review:

The first and most important step toward any hand gesture recognition system is to implement hand tracking system. The purpose of this project is to discuss a volume control using hand gesture recognition system based on detection of hand gestures. In this the system is consist of a high resolution camera to recognise the gesture taken as input by the user. The main goal of hand gesture recognition is to create a system which can identify the human hand gestures and use same input as the information for controlling the device and by using real time gesture recognition specific user can control a computer by using hand gesture in front of a system video camera linked to a computer. In this project they developed a hand gesture volume controller system with the help of OpenCV, Python. In this system can be controlled by hand gesture without making use of the keyboard and mouse.

Table 2.1: Literature Survey

Project Title	Author	Remarks
Volume Control Using Hand Gestures	Martendra Pratap Singh, Arzoo Poswal, Eshu Yadav	This project is presenting a program that allows the user to perform hand gesture for convenient and easier way to control the software. The main motive of this type of system is to automate the things in our system in order to make the things become easier to control.

Chapter 3

Software Used

3.1 PyCharm

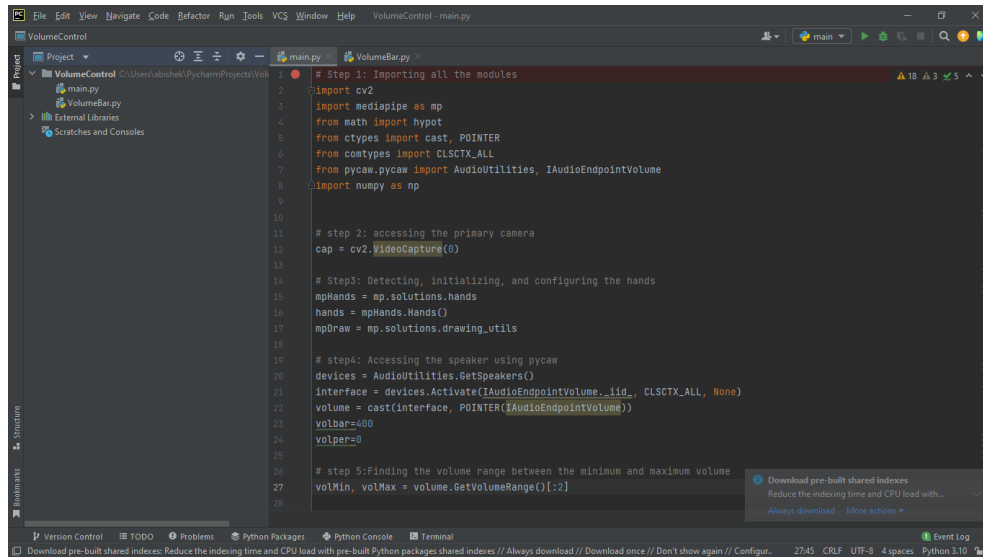
PyCharm is a dedicated Python Integrated Development Environment (IDE) providing a wide range of essential tools for Python developers, tightly integrated to create a convenient environment for productive Python, web, and data science development.



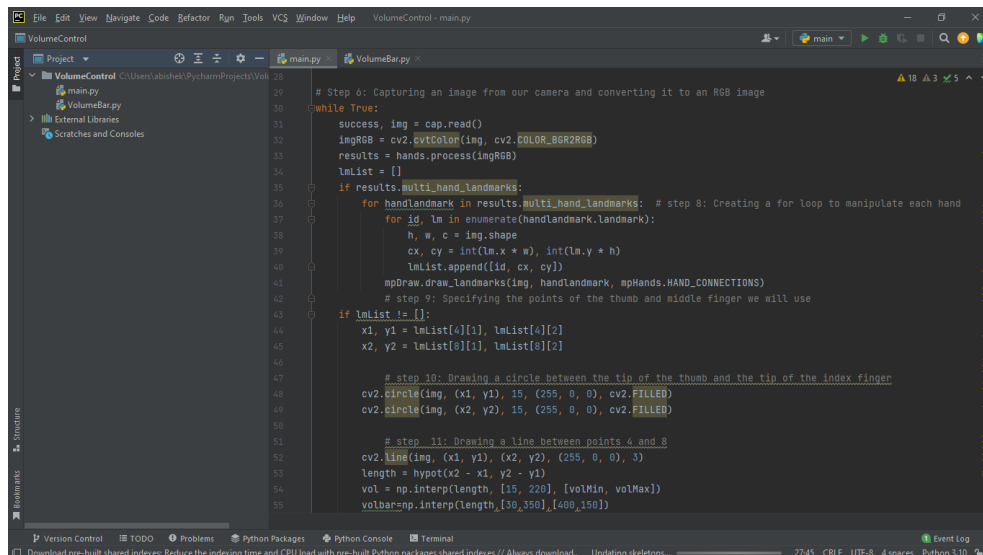
(a) Fig.a

Figure 3.1: PyCharm IDE

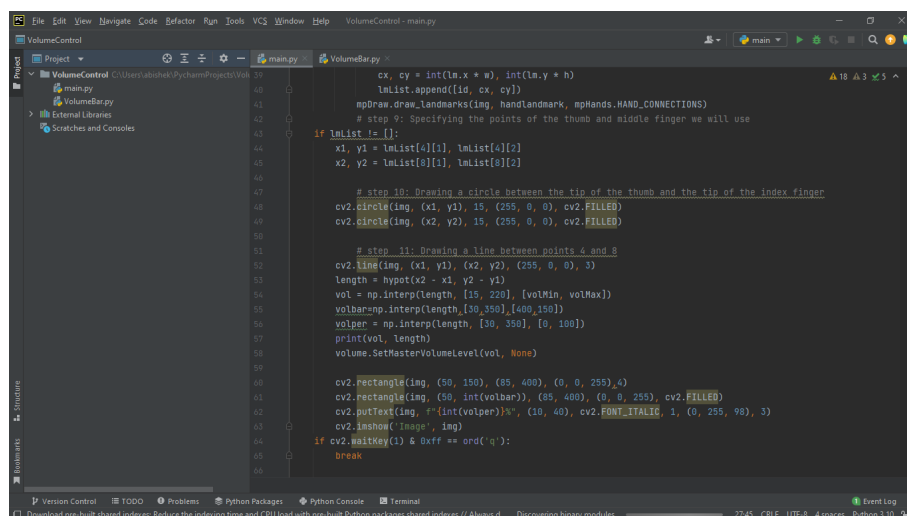
3.1.1 PyCharm code



(a) Fig.a



(b) Fig.b



(c) Fig.c

Figure 3.2: PyCharm Code

Chapter 4

Working Principle

Image processing plays a crucial role in this program as it is used to detect and track hand gestures in real-time. The program captures frames from the camera and processes them using the MediaPipe library to detect hand landmarks. The x and y coordinates of the detected landmarks are used to identify the position of the thumb and index finger of the hand in the image. The program then calculates the distance between the thumb and index finger to determine the volume level to be set. This calculation involves image processing techniques such as image scaling, interpolation, and coordinate mapping. In summary, image processing is the backbone of this program as it is used to identify and track the hand gestures in real-time and manipulate the volume based on the gesture's position in the image.

4.0.1 Why convert to RGB?

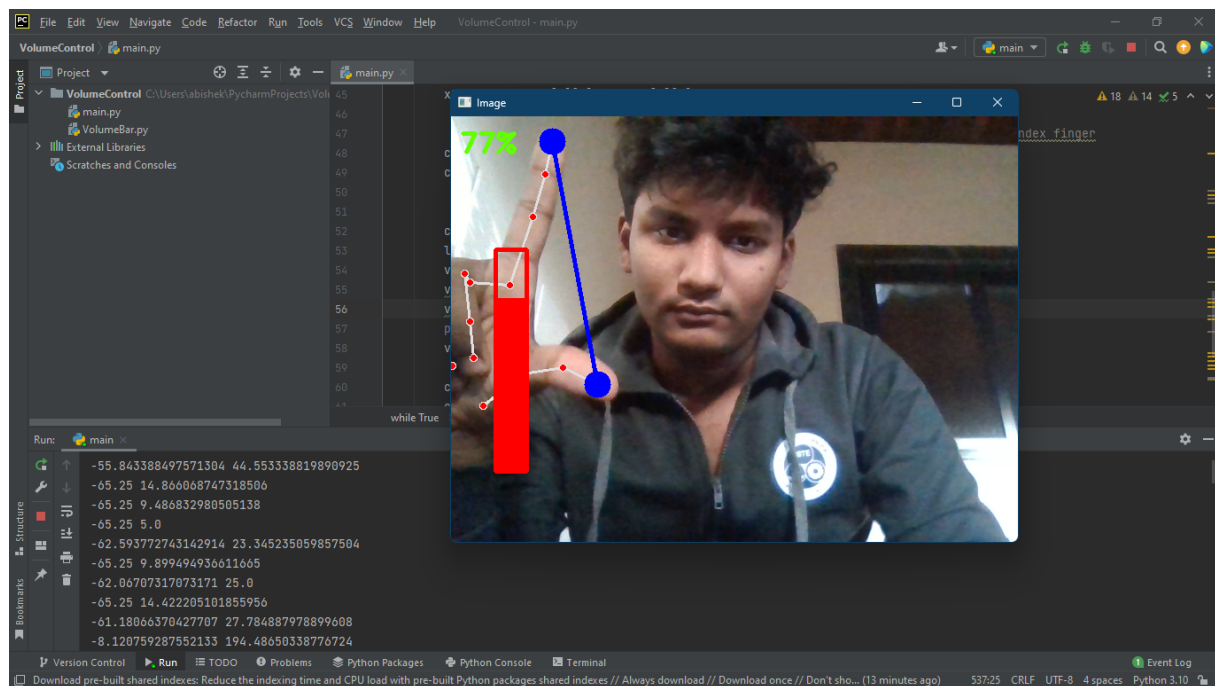
In the OpenCV library, images are usually represented as NumPy arrays in BGR (Blue, Green, Red) color space. However, many other image processing libraries and machine learning frameworks such as MediaPipe, PyTorch, and TensorFlow work with images in RGB (Red, Green, Blue) color space. In this program, MediaPipe is used to detect hand landmarks. MediaPipe expects images in RGB color space, so we need to convert the BGR image captured by OpenCV to an RGB image using the `cv2.cvtColor()` function. If we do not convert the image to RGB, the hand detection will not work correctly, and we will not be able to detect and track the hand landmarks in real-time.

Chapter 5

Results and Conclusion

5.1 Experimental Results

Volume Control using Hand Gestures is highly useful as users can adjust the volume without having to physically interact with the device, which can be especially useful when the device is out of reach or difficult to access. It provides 98 percent accuracy when the hand is held within the 5 metres of distance with the camera.



(a) Fig.a

Figure 5.1: Result

5.2 Conclusion

In conclusion, volume control using hand gestures is a promising technology that has the potential to revolutionize the way we interact with electronic devices. By allowing users to adjust the volume without touching the device, it offers a more intuitive and convenient user experience. Additionally, this technology has the potential to benefit individuals with disabilities or mobility impairments, as it enables them to control the volume of devices with ease. While there may be some challenges to implementing this technology, such as ensuring accuracy and reducing false triggers, continued research and development can help to overcome these obstacles and make volume control using hand gestures a viable and widely adopted feature in the future.

Bibliography

- [1] Martendra Pratap Singh, Arzoo Poswal, Eshu Yadav. "Volume Control using Gestures." *International Journal of Innovative Science and Research Technology*, ISSN No:-2456-2165. Volume 7, Issue 5, May – 2022