School of Electronics and Communication Engineering

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Maths for AI PBL

Volume Control using Hand Landmarking

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1. ABSTRACT

The use of a physical controller like mouse, keyboard for human computer interaction hinders natural interface as there is a strong barrier between the user and computer.

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 project,we have designed a robust marker- less hand gesture recognition system,using the MediaPipe framework and Tensorflow in OpenCV and Python.

 which can efficiently track both static and dynamic hand gestures. Our system translates the detected gesture into actions such as controlling volume for any system.

2. 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 a computer camera. Thecomputer 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 gestures dynamically and will control the volume level.

NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. Pycaw is a Python Audio Control Library. Mediapipe is an open-source machine learning library of Google, which has some solutions for face recognition and gesture recognition, and provides encapsulation of python, js and other languages. MediaPipe Hands is a high-fidelity hand and finger tracking solution. It uses machine learning (ML) to infer 21 key 3D hand information from just one frame. We can use it to extract the coordinates of the key points of the hand. TensorFlow is an open-source library for machine learning and deep learning developed by the Google brains team. It can be used across a range of tasks but has a particular focus on deep neural networks.

3. ALGORITHM

1. Import necessary packages (cv2, numpy, mediapipe, tensorflow)
2. Make an object of mpHands with the required configurations(number of hands, confidence etc.)
3. Start a webcam feed.
4. Make objects for accessing speakers of the device.
5. Get the volume range of the device speakers.
6. Make landmarks for each hand in the webcam feed.
7. Get the length between the index tips and the thumb tips for each hand using handLandmark points.
8. Check if the length between Hand1 is less than 25 pixels and the length of Hand2 is between 30 and 200 pixels:
   a. Convert the length from Hand2 proportional to the volume range.
   b. Set the volume value to the proportionate value found.
   c. Draw points for the tips associated and lines between them.

4. RESULTS

Controlling volume using both the hands
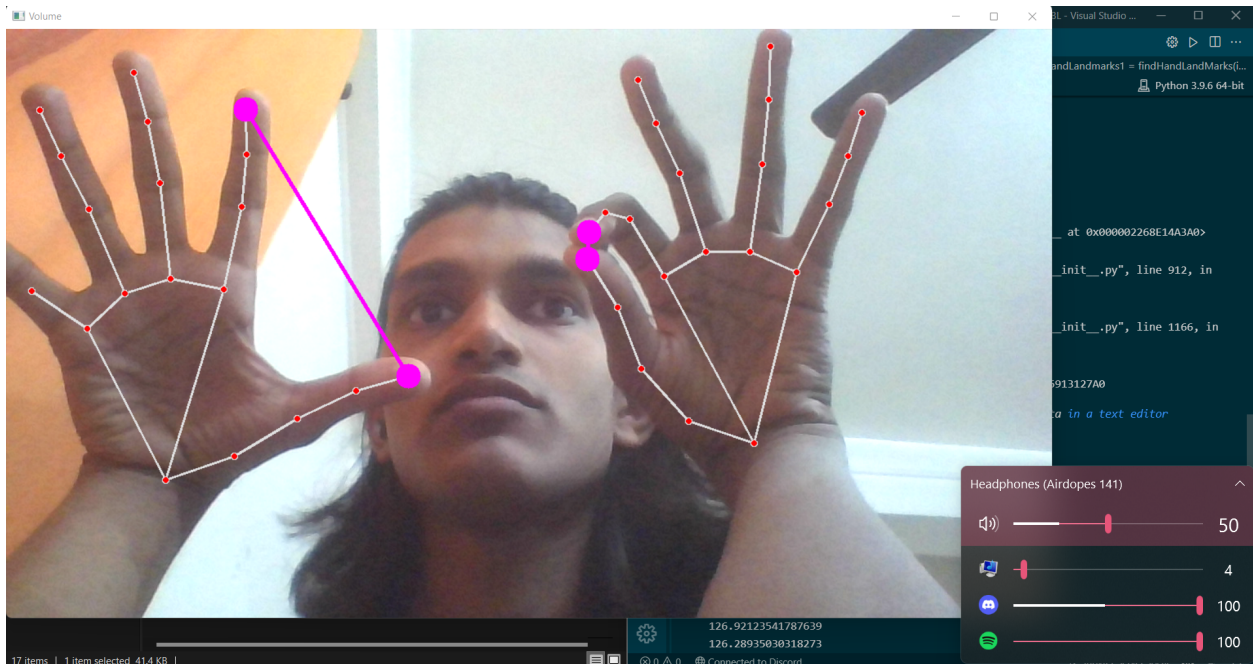
5. CONCLUSION

In this Hand Gesture Recognition project, we have built a hand gesture recognizer using OpenCV and Python. We have used MediaPipe and Tensorflow framework for the detection and gesture recognition respectively. Here we have learned about the basics of the Neural Network, File handling, some common image processing techniques, etc.

5. REFERENCES

1. https://google.github.io/mediapipe/
2. https://github.com/AndreMiras/pycaw
3. https://arxiv.org/abs/2006.10214