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THE PITCH OF SOUND WITH MOTION GESTURE

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ABSTRACT

In this paper we are developing a volume controller in which we are using hand gestures as the input to control the system , Opencv module is basically usedin this implementation to control the gestures. This system basically uses the web camera to record or capture the images /videos and accordingly on the basis of the input, the volume of the system is controlled by this application. The main function is toincrease and decrease the volume of the system. The project is implemented using Python, OpenCV. We can use our hand gestures to control the basic operation of a computer like increasing and decreasing volume. Therefore people will not have tolearn machine-like skills which are a burden most of the time. This type of hand gesture systems provides a natural and innovative modern way of nonverbal communication. These systems has a wide area of application in human computer interaction. 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 controllingthe 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 acomputer. In this project we are developing a hand gesture volume controller system with the help of OpenCV, Python. In this system can be controlled byhand gesture without making use of the keyboard.

1. INTRODUCTION

refers to the communication and interaction between a human and a machine via a user interface. In recent decades hand gesture recognition is considered as a new technique of Human-Computer Interaction because of its automatic, natural and easiness without requiring input from output devices like keyboard and mouse. By using Hand gestures user can interact more information in less time duration. So for upgrading the interface between users and computers, human computers interaction (HCI) technology has great utilization. The best advantage of hands is the ability to communicate remotely.The use of HCI hand, gestures requires that the human hand configuration be measured by a computer. Performance is highly dependent on the accuracy of the acquisition and tracking of handicrafts. The main aim of proposed system is to identify specific human hand gestures and we can use it to convey information or we can Recently, Human computer interaction technology (HCI) has attracted attention as a promising means of human computer communication. Human–machine interaction (HMI) control any device or robot for working applications.

2. RELATED WORK

There has been significant research and development in the field of hand gesture recognition systems using computer vision and machine learning techniques. Several studies have been conducted on developing systems that use hand gestures to controlvarious devices, including volume controllers. One research study proposed a vision-based system that used color and motion detection to recognize hand gestures for volume control. The system used a camera to capture hand gestures, and the color of thehand was extracted using color segmentation techniques.

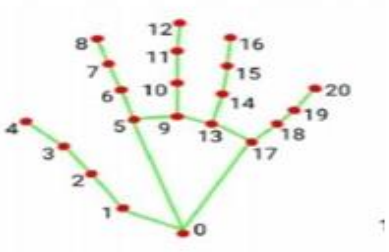

Figure 1- Architecture

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1. THUMB_MCP 13. RING_FINGER_MCP
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5. INDEX_FINGER_MCP 15. RING_FINGER_DIP
6. INDEX_FINGER_PIP 16. RING_FINGER_TIP
7. INDEX_FINGER_DIP 17. PINKY_MCY
8. INDEX_FINGER_TIP 18.PINKY_PIP
9. MIDDLE_ FINGER_MCP 19.PINKY_DIP
10. MIDDLE_ FINGER_PIP 20.PINKY_TIP

Community Gestures is a dynamic research area that aims to recognize sign language and enhance human-computer interaction through gesture recognition. To detect people's gestures and use them as input in the system, we utilize algorithms and modules such as opencv-python, media pipe, and numpy. After obtaining user input, the hand tracking system uses the captured image to verify the gesture's size and shape. The Gesture Detection module is responsible for identifying and recognizing gestures in the system. It does this by first classifying and segmenting the gestures.

3. EXISTING SYSTEM

Currently, most volume controllers are operated using buttons or dials on the device itself or through remote control devices. While these methods are effective, they require physical interaction with the device, which can be inconvenient and limiting in certain situations. Some systems that use hand gestures to control devices exist, such as the Xbox Kinect, which uses a depth-sensing camera to track hand movements and gestures. However, these systems are expensive and require specialized hardware, making them inaccessible to the average user.

The process of gesture recognition using an ANN typically involves the following steps:

1. Data Collection: An accelerometer is used to collect data on the movements and gestures of theuser. This data is typically in the form of time- series data, which includes information on the acceleration and orientation of the device over time.
2. Data Preprocessing: The collected data is then preprocessed to remove noise and normalize the data. This step is important to ensure that the ANN can accurately recognize the gestures.
3. Feature Extraction: The preprocessed data is thentransformed into a set of features that can be usedas inputs for the ANN. The features can include information on the frequency and magnitude of the movements, as well as other relevant parameters.
4. Training the ANN: The ANN is trained on the extracted features using a dataset of labeled gesture data. The training process adjusts the network's weights and biases to reduce the difference between the predicted and actual gesture labels.
5. Testing and Evaluation: The trained ANN is then tested on a separate dataset to evaluate its performance. The performance of the ANN is typically evaluated using metrics such as accuracy, precision, and recall.

4. METHODOLOGY

In this project, we are using Python to develop the code. The code is written and designed in the Pythonlanguage, and it uses modules such as OpenCV and NumPy. To begin with, we import the libraries that will be utilized for further input and output processing. The libraries required for this projectinclude OpenCV, media pipe, math, c types, py caw, and NumPy. We obtain the video input from the maincamera and use mediapipe to detect gestures in the video input from the camera using the m hand module. Next, we access the speaker using a pycaw and provide the volume range from minimum to maximum. Once the captured input is processed, we convert the input image to an RGB image. Then, we use NumPy to specify the input and the tip of the thumb of the fingers. NumPy is a base package for computing in the Python language. It consists of several parts, including powerful N-dimensional array objects, streaming tools to integrate C, Fourier transform, and random number functions. The main steps include:-

1. Identify and define hand gestures: The first step in developing a volume controller using hand gestures is to identify and define the hand gestures that will be used to control the volume.
2. Collect and preprocess data: The next step is to collect a dataset of hand gestures and corresponding volume levels. The dataset can becollected using a camera or sensor, and it shouldbe preprocessed to remove any noise or outliers.

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3. Train a machine learning model: Once the dataset has been collected and preprocessed, a machine learning model should be trained to recognize the hand gestures and associate them with specific volume levels.
4. Implement the system: The next step is to implement the system using a microcontroller orsingle-board computer, such as a Raspberry Pi. The system should include a camera or sensor tocapture the hand gestures, a speaker or audio output device to play the audio, and a microcontroller to process the data and communicate with the machine learning model.
5. Test and evaluate the system: Once the system has been implemented, it needs to be tested andevaluated to make sure that it is accurate and reliable. The system can be tested using a varietyof hand gestures and volume levels, and theresults should be compared to the ground truth.

Process

1. **Image-Processing**

   Image processing basically includes the followingthree steps:

- Importing the image
- Analysing and manipulating the image
- Output in which result can be altered image orreport that is based on image analysis

2. **Mediapipe**

   Mediapipe is an open source cross-platform framework provided by Google to build a pipeline forprocessing perceptual data from different modalities such as video and audio. The solutions used in MediaPipe include multiple items such as posture estimation and face recognition. In this paper, we will use MediaPipe Hands for hand tracking.

3. **Pycaw**

   Python Core Audio Windows Library. The python package pycaw receives a total of 1,399 weekly downloads. pycaw is a Python library typically used in Programming Style, Reactive Programming applications. pycaw has no bugs, it has no vulnerabilities, it has build file available, it has a Permissive License and it has low support. You can install using 'pip install pycaw' or download it. Basically Pycaw is used to Manipulate the Audio.

5. RESULT

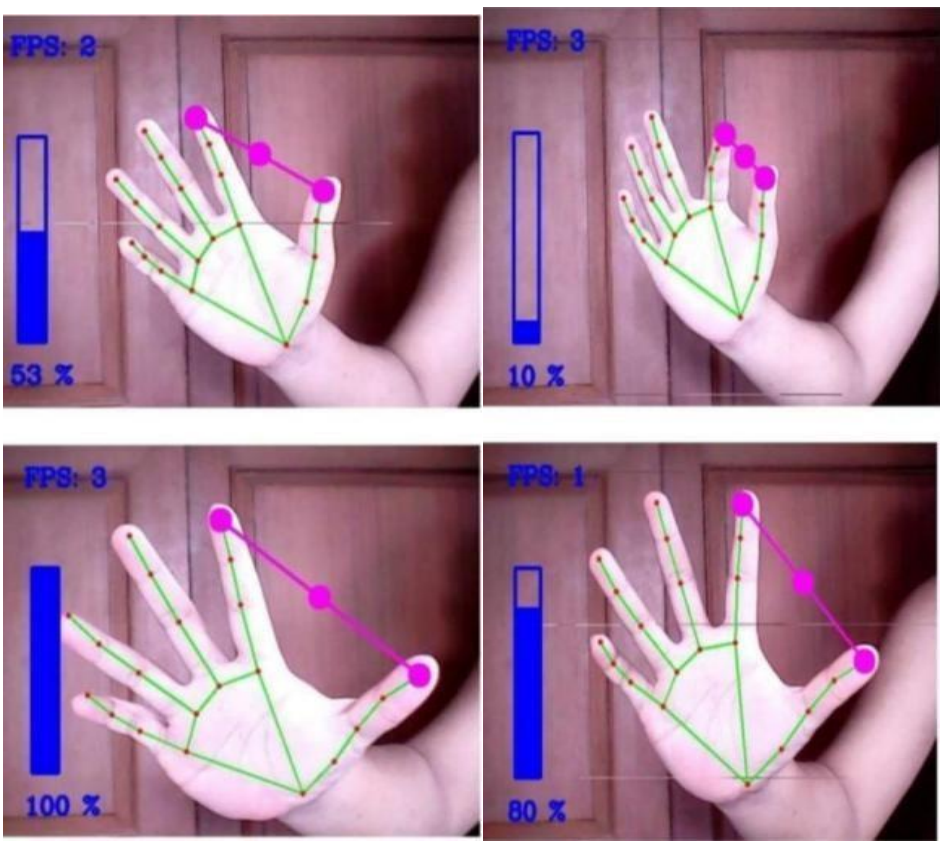

Figure2 : Controlling volume of our system usinghand

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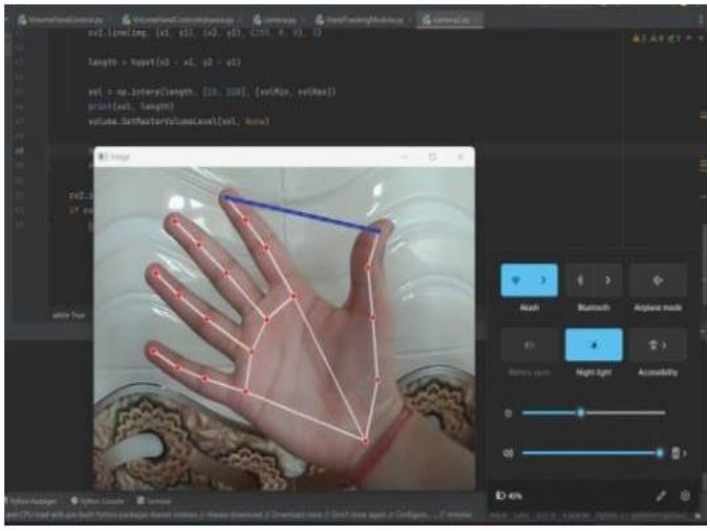
a) Volume is Increase



6. SYSTEM ARCHITECTURE

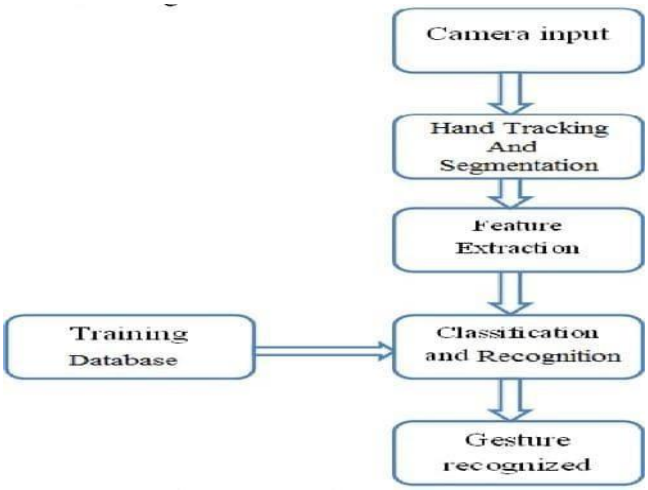
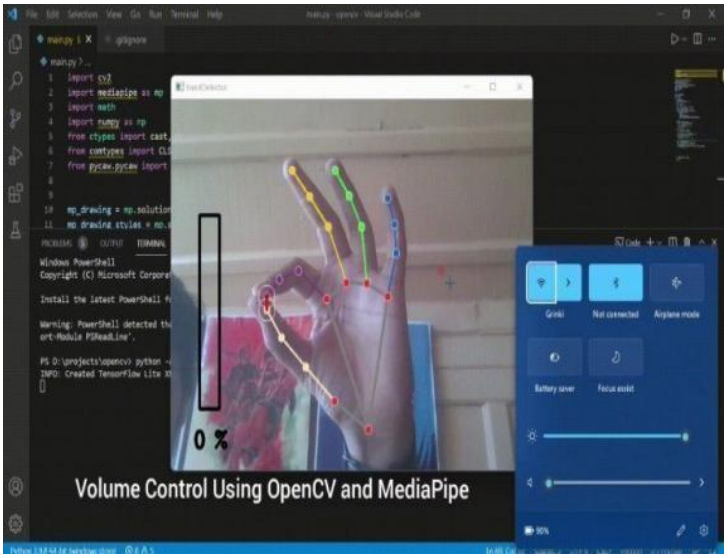


Figure 3 – System Architecture

Here, we have performd the Hand Gestures recognition system to produce the better output, webcam is enabled while executing the program, alsothe type of gesture used is static to recognize the shape of the hand and it provides us the required output. In this project the volume is controlled basedon the shape of hand. The system takes input and will capture the object ,detects after that hand gesture recognition is performed.

(a) - Volume is Decrease



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As a first step we try the hand detection based on available database of OpenCV. Then for capturing live hand of Camera the initialization has been done.The two gesture detection like palm and fist by greenline which is trained by integral images. The second step is the extracted image gestures which are compared with stored positive-negative integralimage dataset and perform finger tip tracking bycontour detection. The third step Mediapipe locate thepalm and detect the 21 hand Landmarks according toAction. Mediapipe tracks the action between thumb and index finger and give command to Pycaw to maximize or Minimize the audio.

7. CONCLUSION

The Aim of this project is to develop a real time Gesture Volume Control System. This paper explainsa model that is useful in controlling Audio volume ofsystem with the help of hand gestures. The proposedmethod here successfully developed a hand gesture volume control, which is able to manipulate (max to min) with gesture is performed by the person and accordingly perform the functionality associated withit accuracy. We have achieved 95% of accuracy usingMediapipe's technology and Machine Learning. The main integral part of the system presently are the webcam**.**

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