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Volume Control using Gestures

Martendra Pratap Singh, Arzoo Poswal, Eshu Yadav

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 used in 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 to increase 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 to learn 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 non verbal communication. These systems has a wide area of application in human computer interaction.

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 we are developing 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.

Keywords:- *Hand gesture ,Opencv-Python, volume controller, mediapipe package , numpy package , Human computer Interface.*

I. INTRODUCTION

Hand gestures is the powerful communication medium for Human Computer Interaction (HCI).Several input devices are available for interaction with computer, such as keyboard, mouse, joystick and touch screen, but these devices does not provide easier way to communicate. In this, the system which is proposed will consists of desktop and laptop interface, hand gesture can be used by the users need to wear data gloves also can use the web camera or separate cameras for recording the hand gestures.

The first and most important step toward any hand gesture recognition system is to implement hand tracking system. Some Sensor devices are generally used in Data-Glove based methods for digitizing hand and finger motions into multi parametric data. Other sensors used in this system will collect hand configuration and hand movements. The Vision Based method requires a web camera, so that one can realize natural interaction between humans and computer without using any other devices.

The challenging part in these systems is background images or videos which is recorded or captured during taking the inputs i.e. hand gesture by the user, also sometime lightning effect the quality of the input taken which creates the problem in recognizing the gestures. Process to find a connected region within the image with some of the property such as color ,intensity and a relationship between pixels i.e. pattern is termed as segmentation. And have used some important packages which have OpenCv-python, tensorflow, numpy, mediapipe, imutils, scipy, numpy.

II. EXISTING SYSTEM

Gesture Recognition using Accelerometer - The author has introduced an ANN application used for the classification and gesture recognition. Wii remote is basically used in this system as this remote rotate in the X, Y, Z direction. In order to decrease the cost and memory of the system the author has used two levels to implement the system. In the first level User is authenticated for gesture recognition. Gesture recognition method which is used by the author Accelerometer- Based .

After that in second level of the system signal are processed for gesture recognition using automata(Fuzzy).After this the data is used for normalization using k means and Fast Fourier algorithm. Now, the recognition accuracy has increases up to 95%.

Hand Gesture Recognition by using Hidden Markov Models - In this paper the author has made a system to recognize the numbers from 0-9 using the dynamic hand gestures. The author has used two steps in this paper .In the initial stage preprocessing is done and in second step classification is carried out. Basically, there are two types of gestures Key gestures and Link gestures. For spotting purpose the key gesture is used and the link gestures is used in continuous gestures. In this paper ,Discrete Hidden Markov Model(DHMM) is used for the classification purpose. This DHMM is trained by an algorithm named Baum-Welch algorithm. Average recognition rates using HMM ranges from 93.84% to 97.34%.

Robust Part-Based Hand Gesture Recognition Using Kinect Sensor- In this author has used low cost cameras in order to make the things affordable for the users. A kinect sensor is a sensor whose resolution is lower in comparison of other cameras but can detect and capture the big images and objects .To deal with the noisy hand gestures ,only fingers are matched with FEMD but not the whole hand . This system works perfectly and efficiently in uncontrolled environments. The accuracy of 93.2% is achieved with the experimental result.

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III. RELATED WORK

In vision community hand gesture is an active area of research, for the purpose of sign language recognition and human computer interaction. In this we have used some algorithms and some modules to detect the gestures of the person and these gestures are taken as the input in the system . Here, several modules are used like opencv-python, mediapipe, numpy etc for the purpose of tracking the gestures.

After capturing the input from the user the image is used in the hand tracking system to check the dimensions and shape of the gesture which is received in the system.

Hand tracking module plays a important role in identifying the input recorded in the system, after that classification and segmentation process is used to classify the gestures in the system .Machine learning and deep learning is also used to identify the training data from the system and identify it according to the requirement of the system .After this the gestures are identified from the trained data and on the basis of that data the gestures rae recognized and is used for processing of the the system to implement the functions like increase and decrease in volume.

IV. SYSTEM ARCHITECTURE AND METHODOLOGY

In this project we are using python technology to develop the project , the code is written and designed in python language using Opensv and NumPy modules. In this project firstly we import the libraries which are to be used for further processing of the input and the output. The libraries which are used in this project which needs to be imported are OpenCV, mediapipe, math, ctypes, pycaw and numpy.We get video inputs from our primary camera.

Now, here mediapipe is used to detect the video as the input from our camera and use mphand.hands module to detect the gesture .Then , in order to access the speaker we have used the pycaw and we have provided the range of the volume from minimum volume to maximum volume.

Next step is to convert the input image to rgb image to complete the processing of the input captured. Then its turn to specify the points of thumb in input and fingers.

Volume range id processed using the hand range in this process numpy is used to convert this process and process the required output. NumPy package is fundamental package for computing in Python language. It is consist of several things like-

- powerful N-dimensional array
- object broadcasting
- tools to integrate C
- Fourier transform, and random number capabilities.

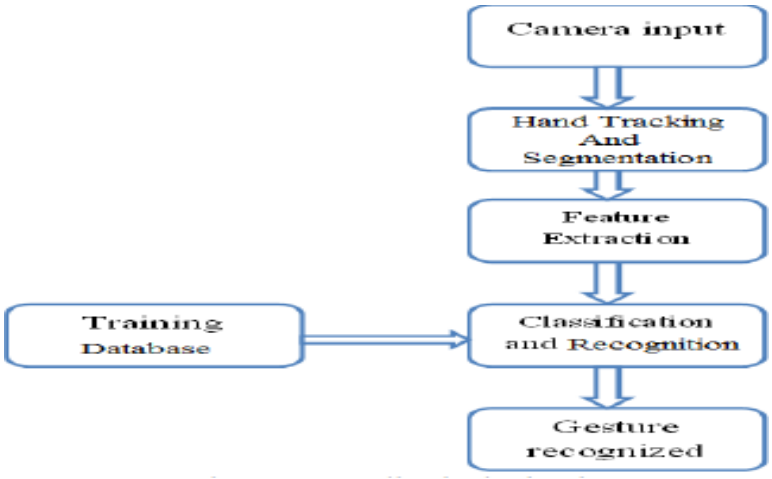

Fig. 1: System Architecture

Here, we have performd the Hand Gestures recognition system to produce the better output, webcam is enabled while executing the program, also the 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 based on the shape of hand. The system takes input and will capture the object ,detects after that hand gesture recognition is performed.

A. OPEN CV

Open CV is a library of python which tackle PC vision issue. It is used to detect the face which is done using the machine learning .It is a very important library and is used in several projects to detect the face and recognize the several frames also it supports several programming languages. It also performs object detection and motion detection. It also support several type of operating system and can be used to detect the face of the animals also.

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B. NUMPY

NumPy is the module of the Python. The numpy word basically shows Numerical Python and it is utilized. This is the module which is basically written in c language and is said as expansion module . Numpy guarantee remarkable execution speed. Numpy is mostly used for performing calculations, tasks using certain functions it provides like multiply, divide, power etc.

C. IMAGE FILTERING -HISTOGRAM

Histogram is a type of graph which represents the movement of the pixels power in the portrayal.In this we use to filter the images using histogram and convert them into the rgb in order to process the image in our system . Consequently the power of a pixel is in the range [0,255].

D. MEDIAPIPE

MediaPipe is a module for processing video, audio and several types of related data across platform like Android, iOS, web, edge device and several applied ML pipeline. Several types of functions are performed with the help of this module , we have used this module in our project to recognize the hand gesture and detect the input from it.

- Face Detection
- Multi-hand Tracking
- Segmentation
- Object Detection and Tracking

V. RESULTS

Fig. 2

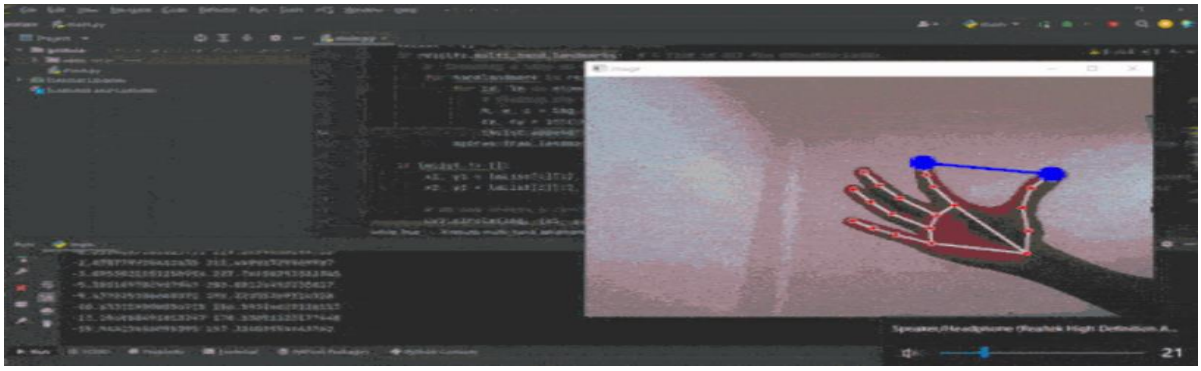

Fig. 3

Fig. 4

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Fig. 5

VI. CONCLUSION

This project is presenting a program that allows the user to perform hand gesture for convenient and easier way to control the software .A gesture based volume controller doesn't require some specific type of markers and these can be operated in our real life on simple Personal Computers with a very low cost cameras as this not requires very high definition cameras to detect or record the hand gestures. Specifically, system tracks the tip positions of the counters and index finger of each hand.The main motive of this type of system is basically to automate the things in our system in order to make the things become easier to control. So in order to make it realiable we have used this system to make the system easier to control with the help of these applications.

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