“I-SCROLL”

Introduction

In this project, we have implemented a simple Arduino based hand gesture control where you can control few functions of your web browser like switching between tabs, scrolling up and down in web pages, shift between tasks (applications), play or pause a video and increase or decrease the volume (in VLC Player) with the help of hand gestures.

Principle behind the Project

The principle behind the Arduino based Hand Gesture Control of Computer is actually very simple. All you have to do is use two Ultrasonic Sensors with Arduino, place your hand in front of the Ultrasonic Sensor and calculate the distance between the hand and the sensor. Using this information, relevant actions in the computer can be performed.

The position of the Ultrasonic Sensors is very important. Place the two Ultrasonic Sensors on the top of a laptop screen at either end. The distance information from Arduino is collected by a Python Program and a special library called PyAutoGUI will convert the data into keyboard click actions.

Components Required

- Arduino UNO x 1
- Ultrasonic Sensors x 2
- USB Cable (for Arduino)
- Few Connecting Wires
- A Laptop

Design of the Project

The design of the circuit is very simple, but the setup of the components is very important. The Trigger and Echo Pins of the first Ultrasonic Sensor (that is placed on the left of the screen) are connected to Pins 11 and 10 of the Arduino. For the second Ultrasonic Sensor, the Trigger and Echo Pins are connected to Pins 6 and 5 of the Arduino.

Now, coming to the placement of the Sensors, place both the Ultrasonic Sensors on top of the Laptop screen, one at the left end and the other at right. You can use double sided tape to hold the sensors onto the screen. Coming to Arduino, place it on the back of the laptop screen. Connect the wires from Arduino to Trigger and Echo Pins of the individual sensors. Now, we are ready for programming the Arduino.

Programming Arduino to Detect Gestures

The important part of this project is to write a program for Arduino such that it converts the distances measured by both the sensors into the appropriate commands for controlling certain actions.

We have already seen a project called "PORTABLE ULTRASONIC RANGE METER**"** , where you can measure the distance of an object placed in front of an Ultrasonic Sensor with the help of Arduino. A similar concept is used here to measure the distance of your hand in front of both the Ultrasonic Sensors in this project. The fun part starts after calculating the distance. The hand gestures in front of the Ultrasonic sensors can be calibrated so that they can perform five different tasks on your computer. Before taking a look at the gestures, let us first see the tasks that we can accomplish.

- Switch to Next Tab in a Web Browser
- Switch to Next Tab in a Web Browser
- Scroll Down in a Web Page
- Scroll Up in a Web Page
- Switch between two Tasks (Chrome and VLC Player)
- Play/Pause Video in VLC Player
- Increase Volume
- Decrease Volume

The following are the 3 different hand gestures or actions that We have programmed for demonstration purpose.

Gesture 1: Place your hand in front of the Right Ultrasonic Sensor at a distance (between 15 CM to 35CM) for a small duration and move your hand away from the sensor. This gesture will Scroll Down the Web Page or Decrease the Volume.

Gesture 2: Place your hand in front of the Right Ultrasonic Sensor at a distance (between 15 CM to 35CM) for a small duration and move your hand towards the sensor. This gesture will Scroll up the Web Page or Increase the Volume.

Gesture 3: Swipe your hand in front of the Right Ultrasonic Sensor. This gesture will move to the Next Tab.

Gesture 4: Swipe your hand in front of the Left Ultrasonic Sensor. This gesture will move to the Previous Tab or Play/Pause the Video.

Gesture 5: Swipe your hand across both the sensors (Left Sensor first). This action will Switch between Tasks.

Python Programming for the Project

Writing Python Program for Arduino based Hand Gesture Control is very simple. You just need to read the Serial data from Arduino and invoke certain keyboard key presses. In order to achieve this, you have to install a special Python Module known as PyAutoGUI.

Application of Arduino based Hand Gesture Control of Computer

- In this project, we have implemented Arduino based Hand Gesture Control of Your Computer, where few hand gestures made in front of the computer will perform certain tasks in the computer without using mouse or keyboard.
- Such Gesture based Control of Computers is already present and a company called Leap Motion has been implementing such technology in computers.
- This type of hand gesture control of computers can be used for VR (Virtual Reality), AR (Augmented Reality), 3D Design, Reading Sign Language, etc.
- A number of functions of computer can be operated by using ultrasonic sensor.
- This technique may be very useful for those who does not know functionally of computer. This technique decreases the learning time required.
- Using this technique it is easy to interact with the computer and there is no language barrier.
- By using this system we can control our laptop from a small distance and it can help to control laptop in conference room presentation.

Conclusion

This article presents one of the solution among various others, for operating a computer using hand gestures. It is one of the easiest way of interaction between human and computer. It is a cost effective model which is only based on Arduino UNO and ultrasonic sensor. The python IDE allows a seamless integration with Arduino UNO in order to achieve different processing and controlling methods for creating new gesture control solutions.