Hand Motion Detection Using Arduino

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ABSTRACT

Automation in recent years has increased in the field of IOT motivates developers to develop more flexible and easier to control machines. In this work, the functions of a desktop computer or laptop are controlled by various human hand gestures. The flow of data between the computer and the user in this system is greatly aided by the System for Human Machine Interaction (HMI).The present design focuses on an HMI system that can operate system applications like volume shift, horizontal and vertical scrolling, tab scrolling, etc. without the need for a mouse and keyboard.This kind of system is very helpful for the paralysis person so that they can use these system without the need of mouse and keyboard. A modern design makes it easier for persons with paralysis to operate their laptops with simple hand motions. The distance between the user and the computer is minimized by using straightforward, distinctive hand motions to control the system. In this project, a basic Arduino Uno is used as microcontroller board.

Keywords — Arduino, Human Machine Interaction, Hand Gesture, Ultrasonic.

I. INTRODUCTION

In our daily life, humans can interact with any object in the real world through the five sense organs which are eyes, ears, nose, tongue, and skin. Gesture recognition has long been one of the critical parts of making sense of the physical world. Similarly, machine-to-machine communication presented challenging tasks beyond determined specified machine-intelligible languages. There are many ways to achieve the hand HMI challenge. The hand gesture can be measured using some extant techniques such as Bluetooth gesture recognition, acoustic, optical, glove, and motion technology. However, most techniques increase the price of the system. Thus, embedded systems with multiple hardware components not only increase performance in terms of performance, and response time, but also increase reliability. There are many existing methods for running system applications virtually. The traditional technique mouse and keyboard can also be used to control the various computer or laptop application. However, they are not flexible enough to be operated by paralyzed persons [3]. In real time hand gesture can be use for complex functions also such as video control, music player, virtual reality, sign language recognition and computer games but in our project we have implemented basic operations on VLC media player[3].

In order to control the pc with the hand gesture this technique is also know as leap motion.

In these project we were going to use the two ultrasonic sensors which calculate the distance between the palm and ultrasonic sensor and basis of that distances we are going to perform certain actions. To perform that action our computer will use the special library PyAutoGui present in a Python. We are going to connect the Arduino and Python code with the help pyserial library.

II. METHODOLOGY

The principle of controlling a computer using hand gestures based on Arduino is actually very simple. You need to use the 2 ultrasonic sensors and Arduinoand calculate the distance between the palm and the sensor.This information is use to perform certain operations on the laptop. Place the 2 ultrasonic sensors on the two ends of the screen of the laptop. Distance calculated by the ultrasonic sensor is collected by a PyAutoGui library present in a Python and basic of that distances the different keys were pressed in a keyboard for play or pause, forward , rewind ,volume increase or decrease.

Circuit Diagram:
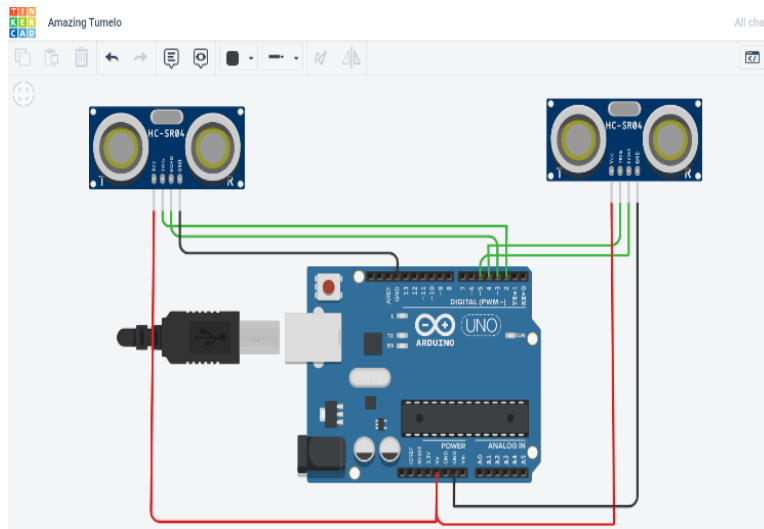
Algorithm:

Stage 1: Project Design:
The trig pin of the first ultrasonic sensor is connected to a D8 pin of the Arduino and the trig pin of the second ultrasonic sensor is connected to the D5 pin of the Arduino. The echo pin of the first ultrasonic sensor is connected to a D9 pin of the Arduino and the echo pin of the second ultrasonic sensor is connected to the D6 pin of the Arduino.

Stage 2: Program the arduino code to detect the action:
The important part of these project is to translate the distance measured by the sensors into particular command to control the certain actions Hand action can be calibrated to perform five different task on laptop.

- Forward/Rewind of Video

- Play/Pause Video in VLC Player

- Increase Volume in VLC Player

- Decrease Volume in VLC Player

Stage 3: Write the python code the code is very simple we only need to just read the serial data from the arduino and perform certain action(key pressing) on the keyboard with the help of pyAutoGui library. You need to install a special Python module called PyAutoGUI Following are 3 different hand gestures:-

Action 1: Keep your palm in front of both ultrasonic sensors at a distance (between 42 cm and 52cm) for a short time. This action plays or pauses the video (control space bar).

Action 2: Keepyour palm in front of the right ultrasound sensor at a distance between 17 to 34 cmand move your palm towards the sensor. This action will decrease the volume, while if you move your hand away from the sensor, we can increase the volume.

Action 3: Keep your palm in front of the left ultrasound sensor at a distance between 17 to 34 cm and move your palm close to the sensorThis action willrewind the videoand if you move your hand away from the sensor this action will perform forward the video in VLC   media player

RESULT AND DISCUSSION

As the hardware part is completed run the python code. It shows the operations to be performed such as play/pause, volume increased, volume decreased, forward and rewind.

Now place your palm in front of ultrasonicsensor and calculate the distance between the palm and the sensor. These information is used to perform the operations such as play, pause, volume increase, volume decrease, forward and rewind in the VLC player. Keepthetwo ultrasonic sensor properly at the top of the laptop, the output of the Arduino is collected as input for a library PyAutogui present in Python and these library convert the given information into the keyboard click actions.

When the right palm is between 17cm to 34 cm and we bring our right hand closure to the sensor, this type of action will decrease the volume as shown below

And when we move our right palm away from the sensor this type of action will decrease the volume as shown below

When the left palm is between 17cm to 34 cm and we bring our left hand close to the sensor, this type of action will rewind the video in VLC media player as shown below

And when we move our left palm away from the sensor this type of action will forward the video as shown below

When both the left and right palm are at distance between 42cm and 52cm.Then this type of action will play or pause the video in VLC player

CONCLUSION

In these project we have tried to implement the Hand motion Detection using the Arduino. We have successfully control the certain operations such as volume increase, volume decrease, play/pause, forward/rewind of the video without using the keyboard or mouse. Only with the help of gestures of hand.

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