*Computer Peripherals and Interfacing Laboratory*

# ***CSE-360***

**Project Name:** Gesture controlled Computer

**Group Rolls:** 38,39,40,41,42,43

**Submitted by :**

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**Roll** : 40

**Exam Roll**: 160034

# Project Name: Gesture controlled Computer

## Objective:

The concept behind the project is very simple. We will place two Ultrasonic (US) sensors on top of our monitor and will read the distance between the monitor and our hand using Arduino, based on this value of distance we will perform certain actions. To perform actions on our computer we use Python pyautogui library. The commands from Arduino are sent to the computer through serial port (USB). This data will be then read by python which is running on the computer and based on the read data an action will be performed.

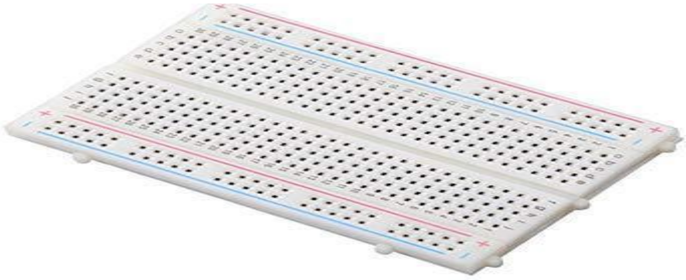
## Equipments:

1. Arduino UNO –

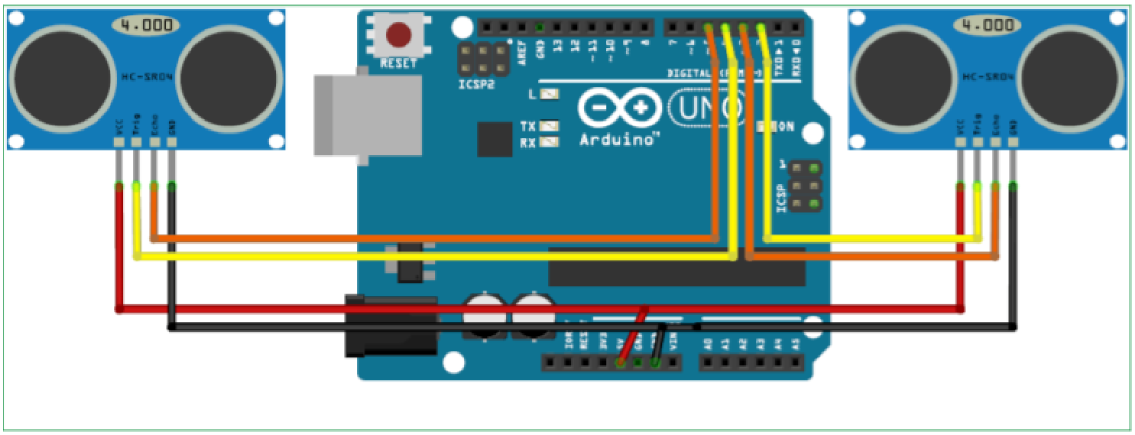
2. HC-SR04 Ultrasonic Sonar sensor

3. Jumper wires (male-to-male, male-to-female)

4. Mini breadboard



**Circuit Diagram:**



**Actions -**

Action 1: When both the hands are placed up before the sensor at a particular far distance then the video in VLC player should Play/Pause.

Action 2: When right hand is placed up before the sensor at a particular far distance then the video should Fast Forward one step.

Action 3: When left hand is placed up before the sensor at a particular far distance then the video should Rewind one step.

Action 4: When right hand is placed up before the sensor at a particular near distance and then if moved towards the sensor the video should fast forward and if moved away the video should Rewind.

Action 5: When left hand is placed up before the sensor at a particular near distance and then if moved towards the sensor the volume of video should increase and if moved away the volume should Decrease.

## Arduino Programming

We start with defining the I/O pins. The two US sensors are connected to Digital pins 2,3,4 and 5 and are powered by +5V pin. The trigger pins are output pin and Echo pins are input pins. Please notice that the Serial communication between Arduino and python takes places at a baud rate of 9600.

Then We need to calculate the distance between the Sensor and the hand each time before concluding on any action. So, we have to do it many times, which means this code should be used as a function. We have written a function named calculate_distance() which will return us the distance between the sensor and the hand.

Now run Arduino code in Arduino IDE and python code on python IDE. Code is given below.

## Arduino code

```
const int trigger1 = 2; //Trigger pin of 1st Sensor
const int echo1 = 3; //Echo pin of 1st Sensor
const int trigger2 = 4; //Trigger pin of 2nd Sensor
const int echo2 = 5;//Echo pin of 2nd Sensor
long time_taken;
int dist,distance_L,distance_R;
void setup()
{
    Serial.begin(9600);

    pinMode(trigger1, OUTPUT);
    pinMode(echo1, INPUT);
    pinMode(trigger2, OUTPUT);
    pinMode(echo2, INPUT);
}
void calculate_distance(int trigger, int echo)
{
    digitalWrite(trigger, LOW);
    delayMicroseconds(2);
    digitalWrite(trigger, HIGH);
    delayMicroseconds(10);
    digitalWrite(trigger, LOW);
    time_taken = pulseIn(echo, HIGH);
    dist= time_taken*0.034/2;
    if (dist>50)
        dist = 50;
}
void loop()   //infinite loopy
{
    calculate_distance(trigger1,echo1);
    distance_L =dist; //get distance of left sensor
    calculate_distance(trigger2,echo2);
    distance_R =dist; //get distance of right sensor
//Uncomment for debudding
//*Serial.print("L=");
    Serial.println(distance_L);
    Serial.print("R=");
    Serial.println(distance_R);
    if ((distance_L >30 && distance_R>30) && (distance_L <50 &&
            distance_R<50))
    {
        Serial.println("Play/Pause");
        delay (500);
    }
    calculate_distance(trigger1,echo1);
    distance_L =dist;
    calculate_distance(trigger2,echo2);
    distance_R =dist;
    if (distance_L>=10 && distance_L<=20)
    {
        delay(100); //Hand Hold Time
        calculate_distance(trigger1,echo1);
        distance_L =dist;
        if (distance_L>=10 && distance_L<=20)
        {
            Serial.println("Left Locked");
            while(distance_L<=40)
            {
                calculate_distance(trigger1,echo1);
                distance_L =dist;
                if (distance_L<10) //Hand pushed in
                {
                    Serial.println ("Vup");
                    delay (300);
                }
                if (distance_L>20) //Hand pulled out
                {
                    Serial.println ("Vdown");
                    delay (300);
                }
            }
        }
    }
    if (distance_R>=10 && distance_R<=20)
    {
        delay(100); //Hand Hold Time

        calculate_distance(trigger2,echo2);
        distance_R =dist;
        if (distance_R>=10 && distance_R<=20)
        {
            Serial.println("Right Locked");
            while(distance_R<=40)
            {
                calculate_distance(trigger2,echo2);
                distance_R =dist;
                if (distance_R<10) //Right hand pushed in
                {
                    Serial.println ("Rewind");
                    delay (300);
                }
                if (distance_R>20) //Right hand pulled out
                {
                    Serial.println ("Forward");
                    delay (300);
                }
            }
        }
    }
    delay(200);
}
```

**Python code:**

```
# gesture control python program for controlling certain functions in
windows pc


import serial                                      # add Serial library
for serial communication
import pyautogui                                   # add pyautogui library
for programmatically controlling the mouse and keyboard.

Arduino_Serial = serial.Serial('com4',9600)       # Initialize serial and
Create Serial port object called Arduino_Serial

while 1:
    incoming_data = str (Arduino_Serial.readline()) # read the serial data
and print it as line
    print (incoming_data)                            # print the incoming
Serial data


    if 'next' in incoming_data:                    # if incoming data is
'next'
        pyautogui.hotkey('ctrl', 'pgdn')           # perform "ctrl+pgdn"
operation which moves to the next tab

    if 'previous' in incoming_data:                # if incoming data is
'previous'
        pyautogui.hotkey('ctrl', 'pgup')           # perform "ctrl+pgup"
operation which moves to the previous tab
```

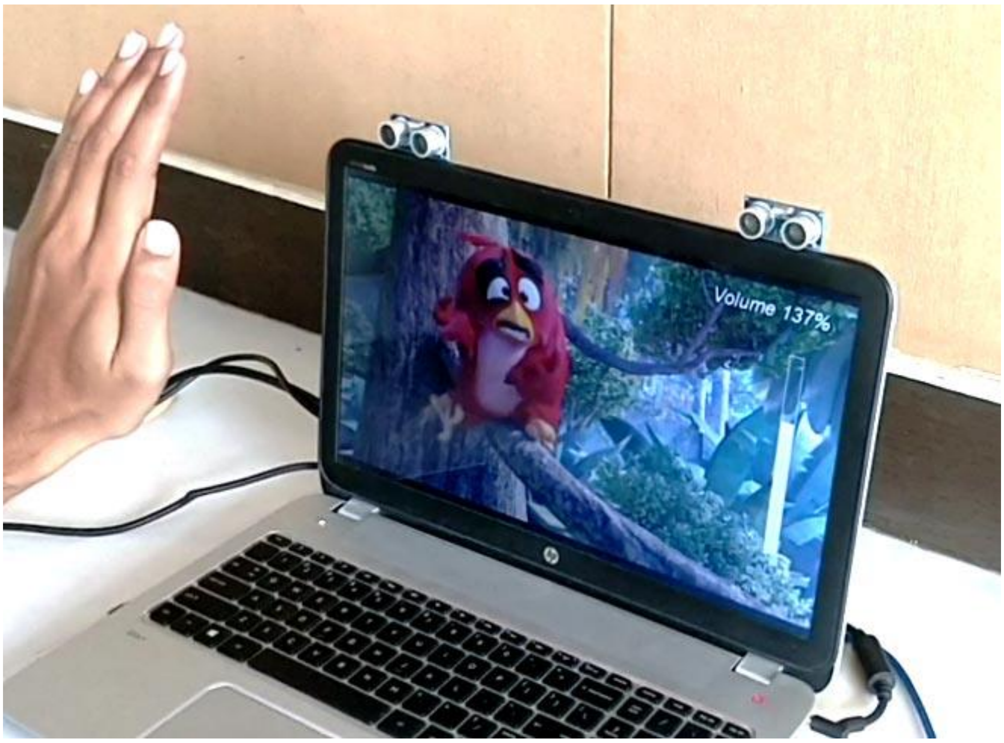
```
    if 'down' in incoming_data:                    # if incoming data is
'down'
        #pyautogui.press('down')                   # performs "down arrow"
operation which scrolls down the page
        pyautogui.scroll(-100)

    if 'up' in incoming_data:                      # if incoming data is
'up'
        #pyautogui.press('up')                      # performs "up arrow"
operation which scrolls up the page
        pyautogui.scroll(100)

    if 'change' in incoming_data:                  # if incoming data is
'change'
        pyautogui.keyDown('alt')                   # performs "alt+tab"
operation which switches the tab
        pyautogui.press('tab')
        pyautogui.keyUp('alt')

    incoming_data = "";                            # clears the data
```

Project Figure:



**Discussion**:

Hand gesture laptop uses an Arduino Uno, Ultrasonic sensors and a laptop to carry out the operation of controlling media playback and volume. It is mainly aimed at reducing the effort of interaction with computers through input devices using simple gestures. It is also done to increase the interactivity with computers.