Southeast University (SEU)
Department of Computer Science & Engineering (CSE)

Smart Room

Introduction
to
Embedded Systems Lab (CSE3028.1)

Group Members

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Introduction:
In our modern day to day life, easier control over the things related to us has become a major need. Human kind is always searching for an easier life. For this modern automated devices are introduced and revolution is going on throughout the world for automated machines and technology. For example, automated driving cars, artificial intelligence based automated robots etc. These automated things and technologies are helping us to work efficiently from a perspective to time and cost. Using automated controls over things from the range of industry level to individual level will provide more ease and benefit to our life.

Why our project:
We are introducing a project entitled as, "Smart Room System", which will provide automated and easier control over the electrical devices of the room. It will help the dweller of the room to be pressure free to switching his/her room's electrical devices on and off. Implementation of this project to one's room can also prevent wastage of electricity .The idea of automatization of things to every part of our life will be materialized with this project.

Idea:
If any object comes in front of the door of the room, the door will be automatically opened and lights will be turned on. Depending on the temperature of the room the AC or Fan will turn On.

Components:
There are three components. As a microcontroller we use Arduino Uno, As input Component we use ultrasonic sonar sensor, Temperature Sensor, Gas sensor. As Output components we use Servo motor, LED, DC Motor, Buzzer

Techniques:
By Ultrasonic sensor we check the object. If any object comes in front of the door, the door will be opened by servo motor. Then LED(light) will turn ON. By using a Temperature sensor, the room temperature will be detected. And depending on room temperature AC or Fan will be ON. A Gas sensor will be used to detect smoke. If there is any gas in the room a buzzer will alarm.

Arduino Uno:
It is an open source microcontroller which is used to develop our project. It is based on ATmega328P and developed by Arduino. It consists of digital and analog input and output pins. It also has interfaces to add expansion boards.

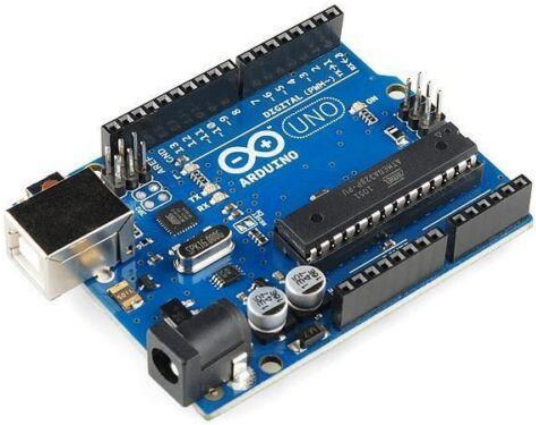


Figure: Arduino Uno

Ultrasonic Sonar Sensor:
It is a device to measure the distance. It has four pins. The pins are VCC, GND, trigger pin and echo pin. Trigger pin throws an ultrasonic wave and echo pin receives the wave reflected by any obstacles in front of it. The duration between sending and receiving of the waves helps to calculate the distance of the obstacles in front of the sensor.

Figure: Ultrasonic Sonar Sensor

Servo Motor:
It is actually a rotatory actuator which consists of three pins which are GND, VCC, Control pin. It has control for angular position, velocity and acceleration. It consists of a motor and a sensor to give the desired position.

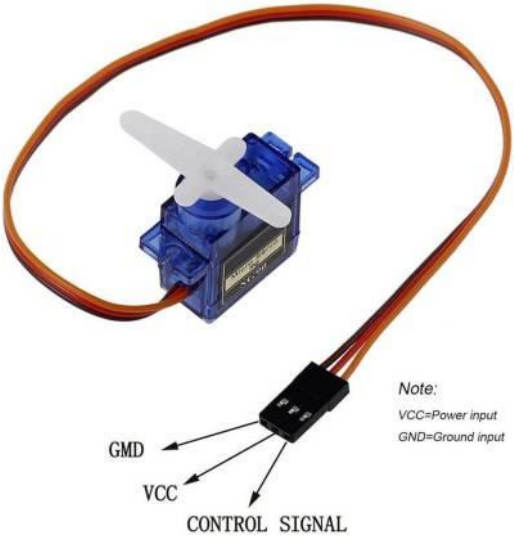


Figure: Servo Motor

Temperature Sensor:
It is basically an environmental sensor which allows us to measure the environmental parameters. It consists of VCC, GND and Data pins. DHT sensor can measure temperature as well as humidity.

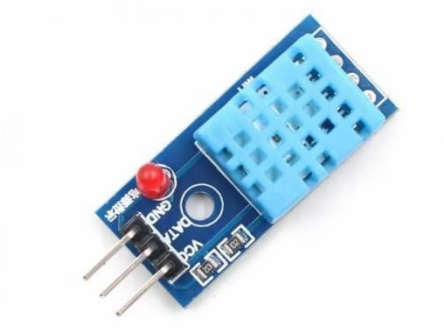


Figure: Temperature Sensor

DC Motor:
It is a rotatory device which rotates in a constant rpm with a fixed value of rpm.It is used in fans, wheels etc. It does not have precise control of its rotation. It has two terminals to be connected to the VCC and GND of the arduino microcontroller.

Figure: DC Motor

Gas Sensor:
It can detect the presence of gas near to it. It is used as a part of the security system. It consists of analogue out, digital out, VCC and GND pin.

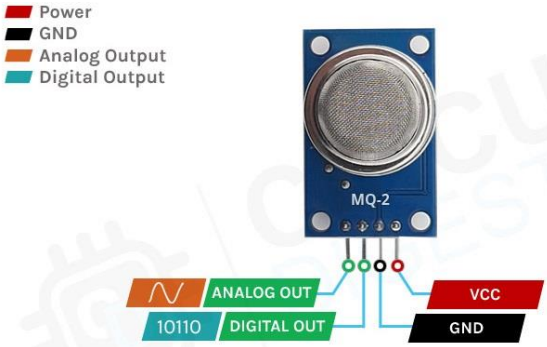


Figure: Gas Sensor

Buzzer:
It is an audio signaling device which consists of GND, VCC and i/o pins. Buzzers can be mechanical, electrical or piezoelectric. It is used in alarm devices, timers, confirmation of input like mouse click or keystrokes etc.

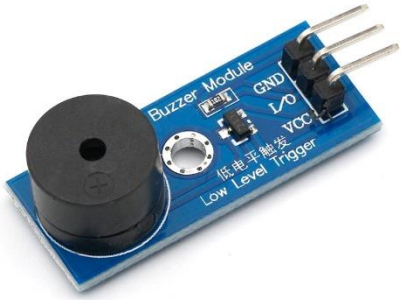


Figure: Buzzer

Circuit Diagram:

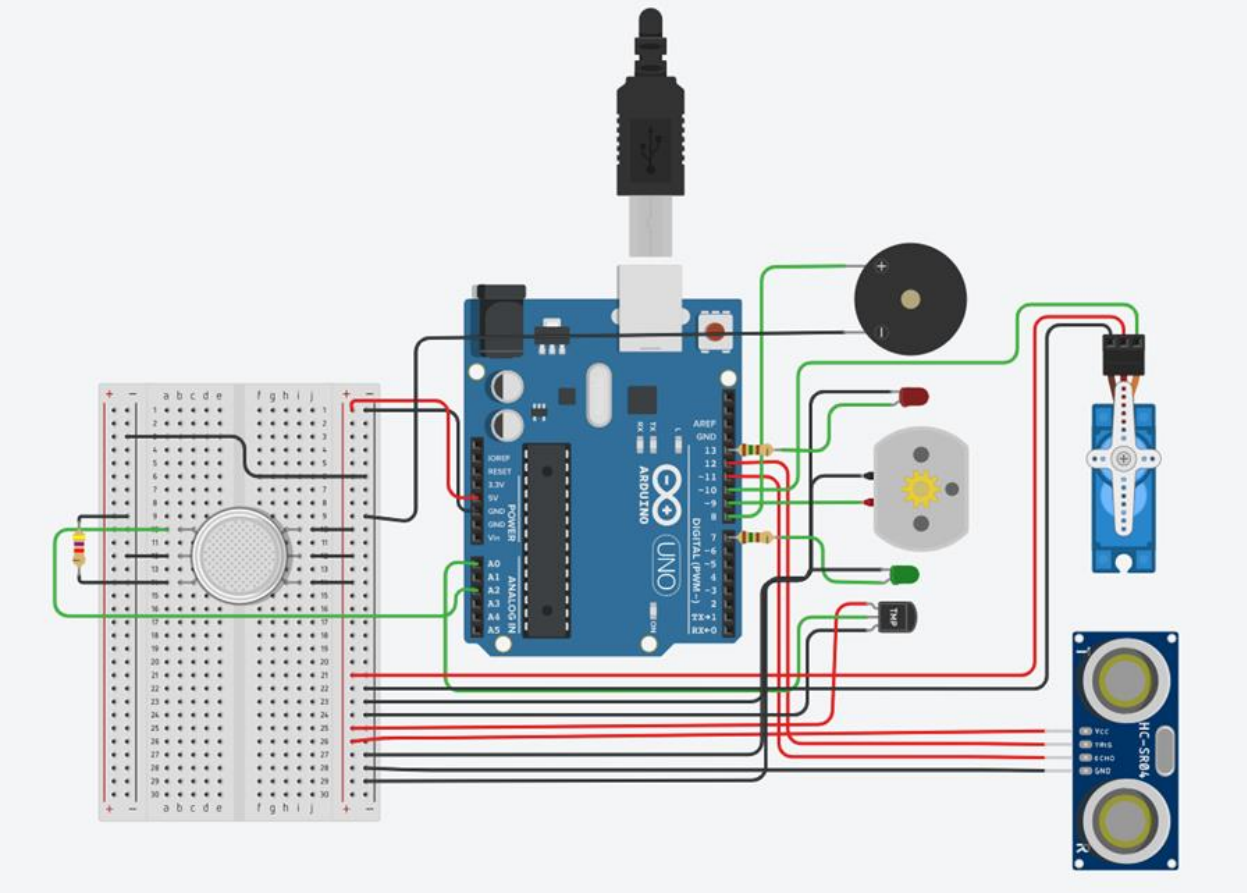


Figure: Circuit diagram for Smart Room

Code:

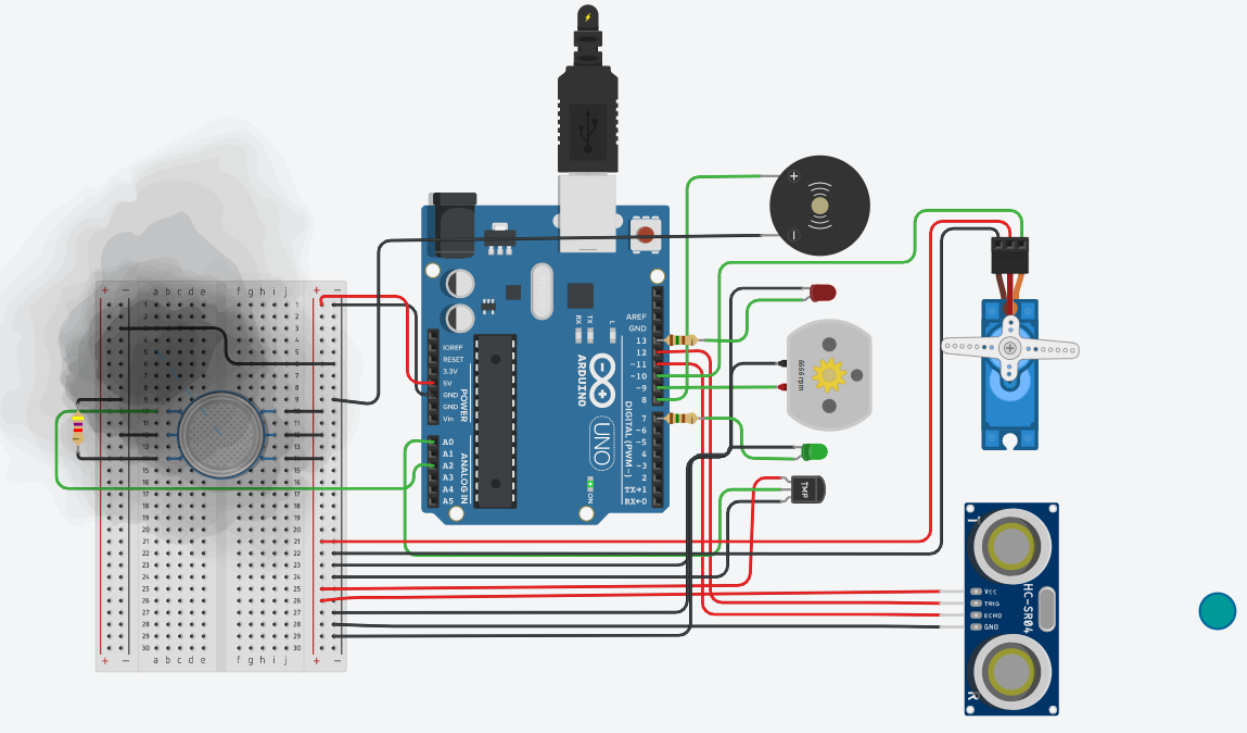
```
#include<Servo.h>
Servo myServo;
int ledPin = 13;
int ledPin2 = 7;
int triggerPin=12;
int echoPin=11;
int i=0;

int test = 0;
int temperature;
int baselineTemp = 0;
int celsius = 0;

int DCmotorpin = 9;
```

```
int gas_input = A2;
int gas;
int buzzer = 8;

float distance;
float duration;

void setup()
{
  Serial.begin(9600);
  myServo.attach(10);
  pinMode(triggerPin,OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(ledPin, OUTPUT);
  pinMode(DCmotorpin, OUTPUT);
}

void loop()
{
  sonarSensor();
  tempSensor();
  gasSensor();

  delay(100);

}

void sonarSensor()
{
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);

  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(10);

  digitalWrite(triggerPin, LOW);


  duration=pulseIn(echoPin, HIGH);
  distance=(duration*0.034)/2;

  Serial.print("\n Distance: ");
  Serial.print(distance);
  Serial.print(" cm\n");
  if(distance <= 100)
  {
    //digitalWrite(ledPin, HIGH);
```

```
    for(;i<=90;i++)
    {
      myServo.write(i);
      delay(15);
    }
    digitalWrite(ledPin2, HIGH);
    delay(1000);

  }
  else
  {
     //digitalWrite(ledPin, LOW);
    for(;i>=0;i--)
    {
      myServo.write(i);
      delay(15);
    }
  }
}

void tempSensor()
{
  baselineTemp = 40;
  celsius = map(((analogRead(A0) - 20) *
                 3.04), 0, 1023, -40, 125);
  Serial.print(celsius);
  Serial.print(" C, \n");
  Serial.print(analogRead(A0));
  Serial.print("\n");

  digitalWrite(DCmotorpin, LOW);
  digitalWrite(ledPin, LOW);
  if(celsius >=20 && celsius <=30)
  {
    digitalWrite(DCmotorpin, HIGH);
  }
  else if(celsius > 30)
  {
    digitalWrite(DCmotorpin, LOW);
    digitalWrite(ledPin, HIGH);
  }
}

void gasSensor()
{
  gas  = analogRead(A2);
  gas = map(gas, 300, 750, 0, 100);
```

```
  Serial.println(gas);
  if(gas>30){
    tone(buzzer,200);
    delay(100);
  }
  else{
    noTone(buzzer);
  }
}
```

After Simulation:



Result and Conclusion:

All the components of our project responses according to the code provided in the previous section. When a thing comes to a range (less than or equals to 100 cm), it will rotate the servo motor by 90 degrees which indicates the door's opening. Otherwise, the servo motor goes to its default position which indicates the door's closing. While opening the door, the light inside the room turns on (indicated as green led in circuit diagram). If the temperature is from 20 degree Celsius to 30 degree Celsius, then DC motor rotates which indicates fan rotation. For above 30 degree Celsius of temperature, AC is on which is indicated as red LED. And finally, if the gas sensor detects gas at the amount above 30, the buzzer alarms properly.

This project is simple and easy to install in a room. It can introduce ease and automatization to anyone's day to day life.