



END SEMESTER ASSESSMENT (ESA)
B.TECH. (CSE)
IV SEMESTER

**UE19CS256 – MICROPROCESSOR AND COMPUTER
ARCHITECTURE LABORATORY**

PROJECT REPORT

ON

**Mall Entry Monitoring System
Using Arduino and Sensors**

SUBMITTED BY

- | | |
|------------------------------|---------------|
| 1) Rongali Lalith Vardhan | PES2UG19CS337 |
| 2) Sai Kalyaan Palla | PES2UG19CS354 |
| 3) Sai Gruheeth N | PES2UG19CS352 |
| 4) Satyam Rudradutta Dwivedi | PES2UG19CS370 |

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

ELECTRONIC CITY CAMPUS,

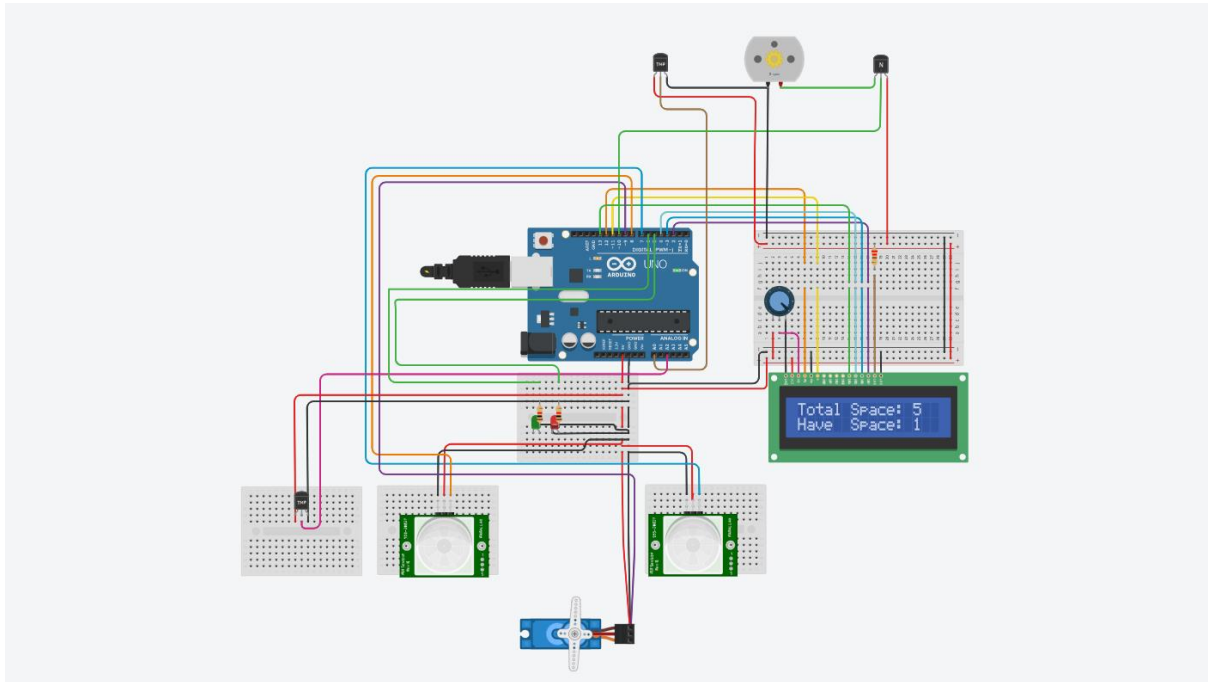
BENGALURU – 560100, KARNATAKA, INDIA

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ABSTRACT OF THE PROJECT:

- This project works on the idea of making the shopping experience smoother and safer amidst a raging pandemic COVID 19 by automating the system that maintains a count of the number of people in the mall and allows only a set number of people inside the premises of the mall if his/her temperature is below the normal body temperature.
- Smart system allows the person to enter by opening the lock on the door which is initiated by a servo motor and this motor opens only when the temperature of the person is below the normal acceptable temperature and opens the door only when there is enough capacity to hold more people inside the mall.
- Our system employs 4 sensors, 2 of which are ultrasonic sensors which track the ingress and egress of the people in the mall and reduces the count appropriately which is shown at the entrance of the shopping complex.
- Another 2 sensors used are temperature sensors that serve the purpose of temperature screening before ingress and allows the door latch to open once the candidate's temperature is below the set upper bound given by health bodies regulatory information.
- Another sensor is for temperature control in the shopping complex and it senses that the ambient temperature inside the mall is well below temperatures for a comfortable shopping experience, if the temperature crosses the threshold, we ramp up the exhaust fans to circulate air and cool the building complex as soon as possible.
- We have a servo motor as the controlling agent for ingress and a fan to run the exhaust channel fans and also a display with a greeting message and the live count of the number of people allowed to enter.
- We have implemented 3 subparts of the project on a single Arduino board and did no compromise on the functional abilities of each subpart.

CIRCUIT DIAGRAM:



COMPONENTS LIST

Name	Quantity	Component
PIR1	1	162.89075803512208 , -55.42566770582937 , 38.55170405651472 PIR Sensor
PIR2	1	84.22258400504177 , -210.69925768597886 , 228.54384155693936 PIR Sensor
SERVO1	1	Positional Micro Servo
U1	1	Arduino Uno R3
U2	1	LCD 16 x 2
Rpot2	1	250 k Ω Potentiometer
R1	1	220 Ω Resistor
D1	1	Green LED
R2 R3	2	1 k Ω Resistor
D2	1	Red LED
M1	1	DC Motor
T1	1	NPN Transistor (BJT)
U3 U4	2	Temperature Sensor [TMP36]

ARDUINO CODE:

```
#include <LiquidCrystal.h> // initialize the library with the numbers of the
interface pins
LiquidCrystal lcd(12, 11, 13, 4, 3, 2);
#define TEMPERATURE A0 //this is analog port in lower right half
#define MOTOR 10
#include <Servo.h> //includes the servo library
//An analog signal can take on any number of values. A digital signal, on the
other hand, has only two values: HIGH and LOW
Servo myservo1; //declaring the servo motor object for controlling the attribut
e
const int cold = 102; //human temp parameter, used in loop2()
int ir_s1 = 8; //used in setup later
int ir_s2 = 7; //used in setup later in pinmode commands
int flag; //serves for primary testing and screening of temperature

int Total = 50; //total number of people allowed in mall
int Space; //later used to decrease and increase the live count of occupants of
the mall

void setup()
{
    pinMode(ir_s1, INPUT); //defining which is input and which is output
    pinMode(ir_s2, INPUT); //defines these ports as input ports
    pinMode(MOTOR, OUTPUT); //refer line 4, port 10
    pinMode(A2, INPUT); //sensor input refer line 3
    pinMode(6, OUTPUT); //green led
    pinMode(5, OUTPUT); //red led output
    myservo1.attach(9); //attach the motor to a pin number 9 (9 & 10 are the allowe
d ones)
    myservo1.write(100); //angle 100 degree
    lcd.begin(16, 2); //Initializes the interface to the LCD screen, and specif
ies the dimensions (width and height) of the display.
    //needs to be called before any other LCD library commands.
    //all greeting are carried out here with delays of 2s
    lcd.setCursor (0,0); //basic displaying of greeting
    lcd.print(" Welcome ");
    lcd.setCursor (0,1);
    lcd.print(" To The Mall ");
    delay (2000);
    lcd.setCursor (0,0);
    lcd.print(" Mall Entry ");
    lcd.setCursor (0,1);
    lcd.print(" System ");
    delay (2000);
```

```

    lcd.clear();
    Space = Total;//assign the variable to max space available
}
int speed_decider(int temp)
{
    if(temp<20)
        return 0;//no action needed to be taken,in control temperature
    else if(temp>40)
        return 255;//if temp is greater than 40,we crank fan to maximum speed
    else
        //Re-maps a number from one range to another. That is,
        //a value of fromLow would get mapped to toLow, a value of fromHigh to toHigh
        //used to get appropriate speed by mapping on a relative 0-255 scale
        return map(temp, 20, 40, 0, 255);//between 20 and 40 need to be rescaled
}

void loop()
{
    int temperature = analogRead(TEMPERATURE);//pin is 10 and reads the value
    //This means that it will map input voltages between 0 and the operating
    voltage(5V or 3.3V) into integer values between 0 and 1023.
    temperature = map(temperature, 20, 358, -40, 125);//re-scales
    Serial.println(speed_decider(temperature));//gets the speed value from the
    func and
    analogWrite(MOTOR, speed_decider(temperature));//analogWrite values from 0
    to 255
    loop2();//this is called and sets flag variable and turns on the LED to display the
    if(flag==1)//this flag variable is a check of temperature first,if temp is
    valid we let the entry happen
    {
        if(digitalRead (ir_s1) == HIGH)//If someone wants to cross over and enter,s1 is entry
        {
            if(Space>0)//checks for availability of space
            {
                myservo1.write(0);//if space is there we turn from 100 to 0
                delay(1000);//1 second delay
                Space = Space-1;//decrease to depict ingress
                myservo1.write(100);//close the gate again to previous position
                delay(1000);//wait for another 1s
            }
            else//in case space is less
            {
                //basic input output formatting
            }
        }
    }
}

```

```

        lcd.setCursor (0,0);
        lcd.print(" Sorry no Space ");
        lcd.setCursor (0,1);
        lcd.print("    Available    ");
        delay (1000);
        lcd.clear();
    }
}
lcd.setCursor (0,0); //return to our old screen ehich shows the total o
ccupants and free space
lcd.print("Total Space: ");
lcd.print(Total);
lcd.setCursor (0,1);
lcd.print("Have Space: ");
lcd.print(Space);
delay(2000);
}
else
{
    //flag !=1,nobody has the permission to enter as they failed the tempe
rature screening,it won't show anything but it won't open
    digitalWrite(8,LOW); //recalling ir_s1 = 8,the output is made low as a
precautionary step to prevent opening of gate
    lcd.setCursor (0,0);
    lcd.print("Total Space: ");
    lcd.print(Total);
    lcd.setCursor (0,1);
    lcd.print("Have Space: ");
    lcd.print(Space);
}
//exit is triggered by sensor 2 and that allows the exit and increases the
vacancy controlled by space variable
if(digitalRead (ir_s2) == HIGH)
{
    if(Space<Total)//increase only if value is less than total or it will
cross the max and give false output
    {
        delay(1000);
        Space = Space+1; //increment to depict egress
        delay(1000);
    }
}
}
void loop2() //responsible for temperature screening of people before entering
{
    int sensor = analogRead(A2); //reads from the temp sensor of screening 0-
1023

```

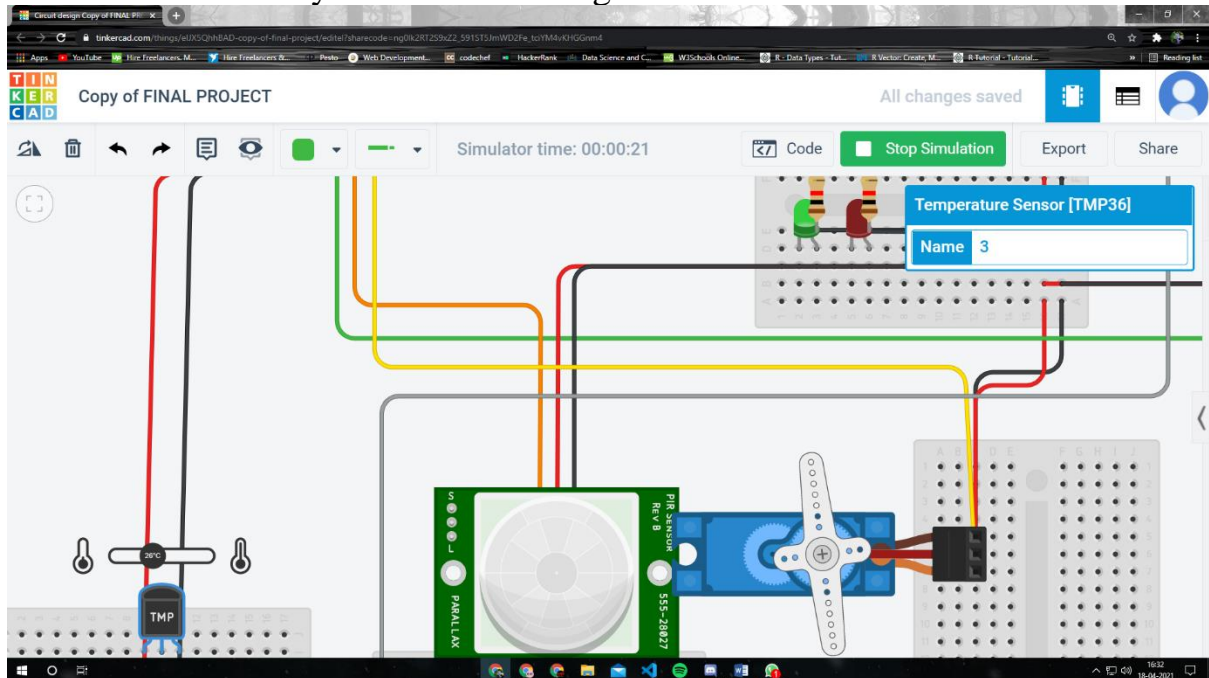
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    float voltage = (sensor / 1024.0) * 5.0; //the sensor will report a value of 0 to 1023.
    //If you divide that by 1024 we will get a percentage that you can multiply to give you an output of 0 to 5 volts.
    //It is just converting the sensor output to a value that you can work with to control things.
    float tempC = (voltage - .5) * 100; //in degree celcius
    float tempF = (tempC * 1.8) + 32; //in degree fahrenheit
    Serial.print("temp: "); //Prints data to the serial port as human-readable ASCII text
    Serial.print(tempF); //prints ultimately "temp: x"
    //6 is GREEN LED port
    //5 is RED LED port
    if (tempF < cold) //refer line 8 for declaration
    {
        digitalWrite(6, HIGH); //if in range of normal allowed temp, make green led glow
        digitalWrite(5, LOW); //make red turn off
        flag=1; //this tells other function that it is safe to open the gate
    }
    else
    {
        digitalWrite(6, LOW); //green is turned off
        digitalWrite(5, HIGH); //red is turned on telling it is danger, and does not allow to enter
        flag=0; //tells that not safe to open the gate
    }
    delay(10);
}

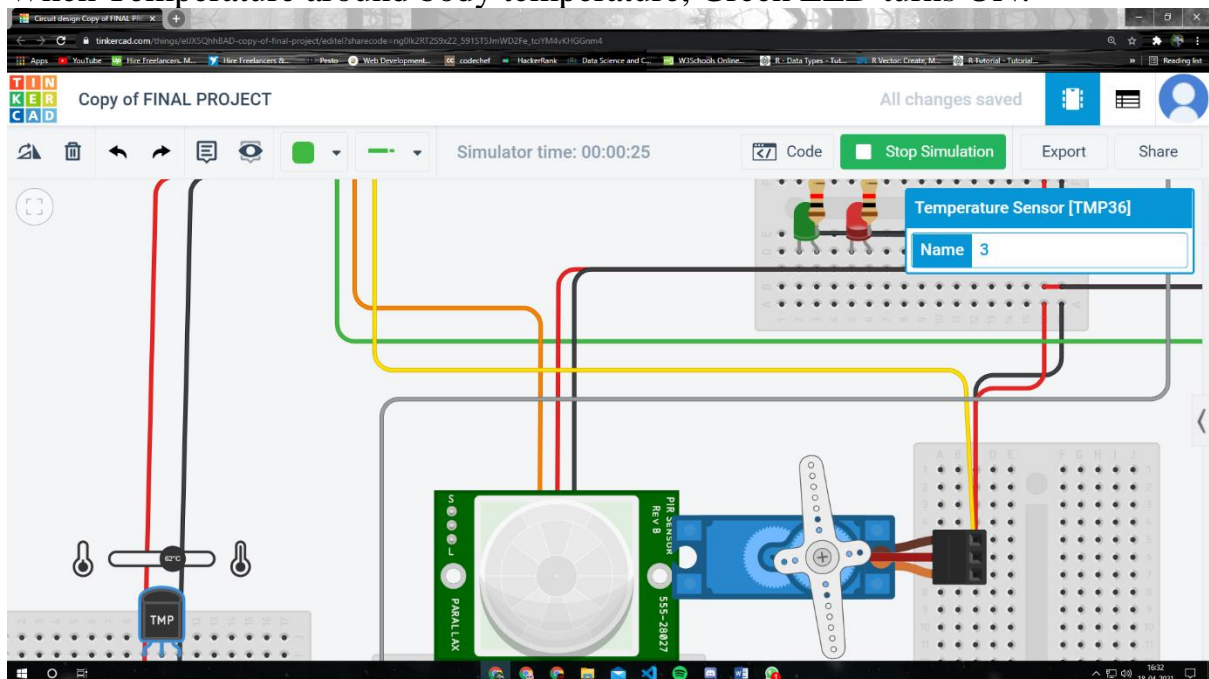
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SCREEN SHOTS OF THE OUTPUT:

When Temperature around body temperature, Green LED turns ON.
The servo motor only rotates when the green LED is ON.

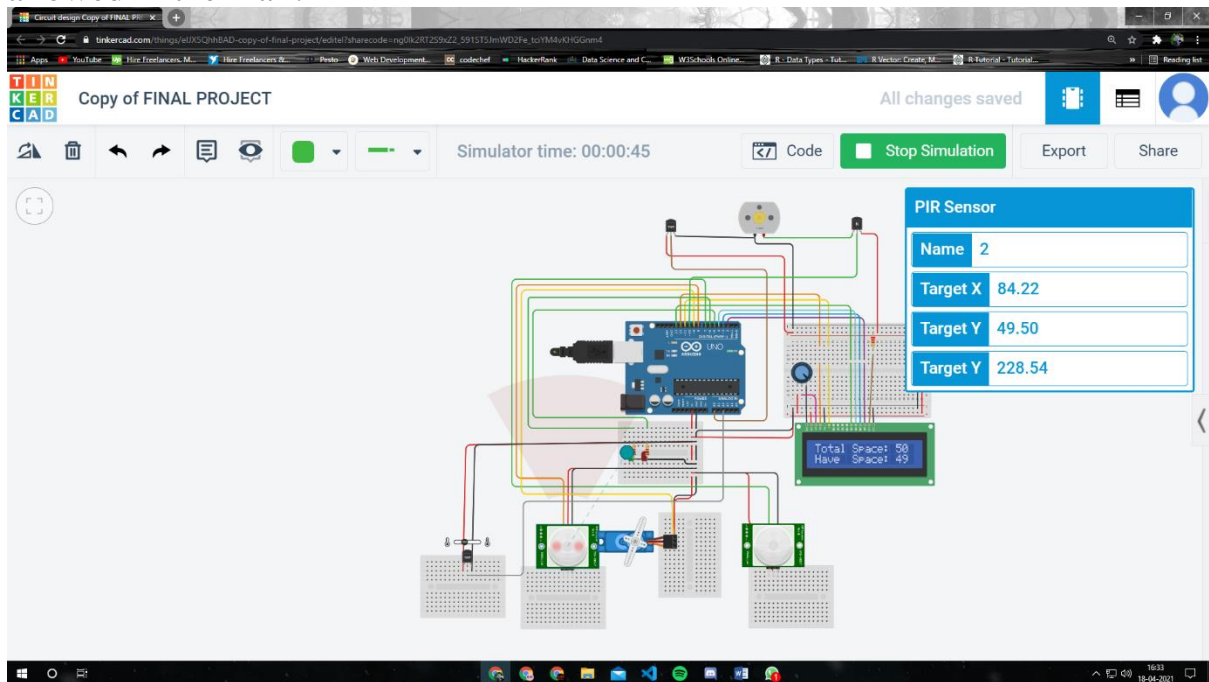


When Temperature around body temperature, Green LED turns ON.



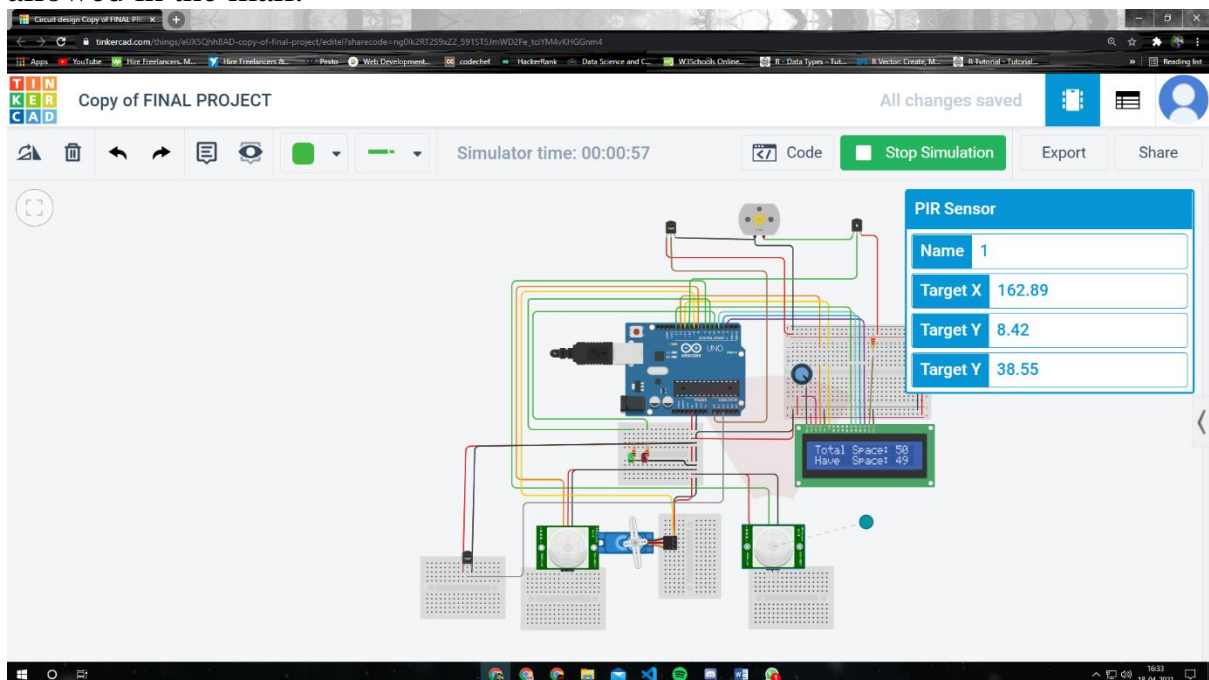
1st PIR sensor :

When the PIR sensor senses motion in the range, It reduces the total strength allowed in the mall.

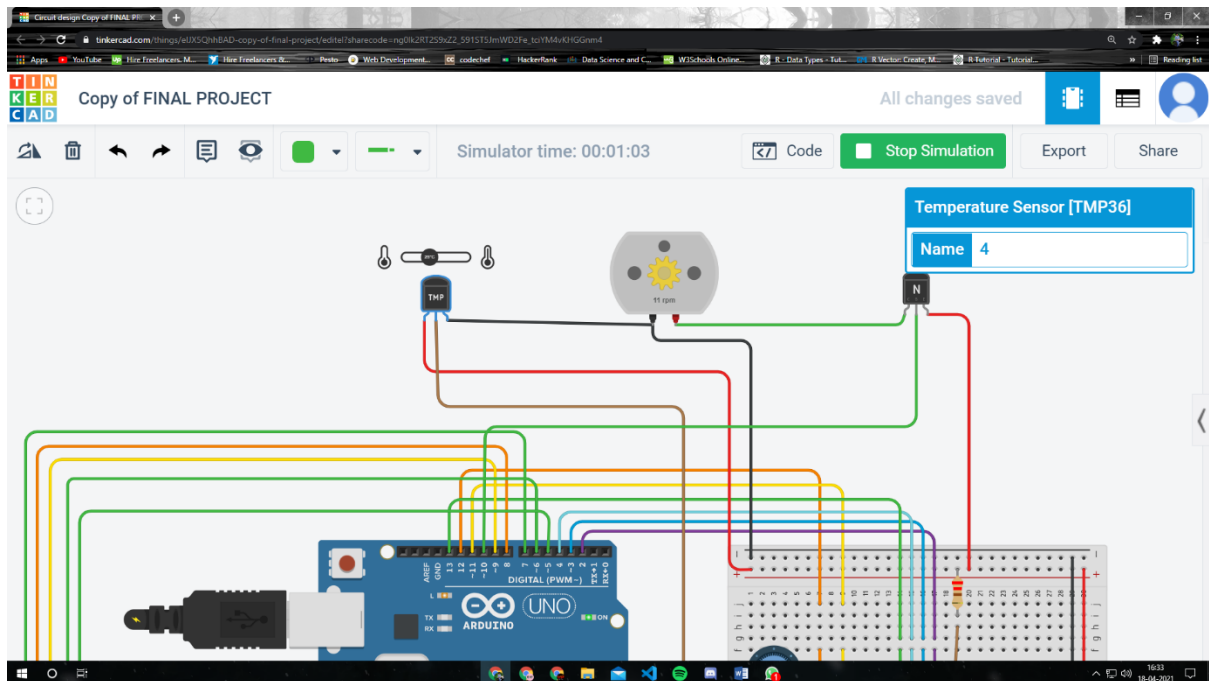


2nd PIR sensor :

When the PIR sensor senses motion in the range, It increases the total strength allowed in the mall.



This temperature sensor is for maintaining the mall's ambient temperature. After exceeding 32 degree centigrade it goes on full speed to reduce the temperature, else it stay in a low speed.



REFERENCES

Video Reference:

<https://drive.google.com/file/d/1QPDEKh7oTCqSHaro3GVyPYMAPkIlmLbL/view?usp=sharing>

www.arduino.cc

<https://www.tutorialspoint.com/arduino/index.htm>