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

UE18CS256
MICROPROCESSOR AND COMPUTER ARCHITECTURE LABORATORY

MINI PROJECT REPORT

ON

Mini Weather Station

SUBMITTED BY

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ABSTRACT OF THE PROJECT:

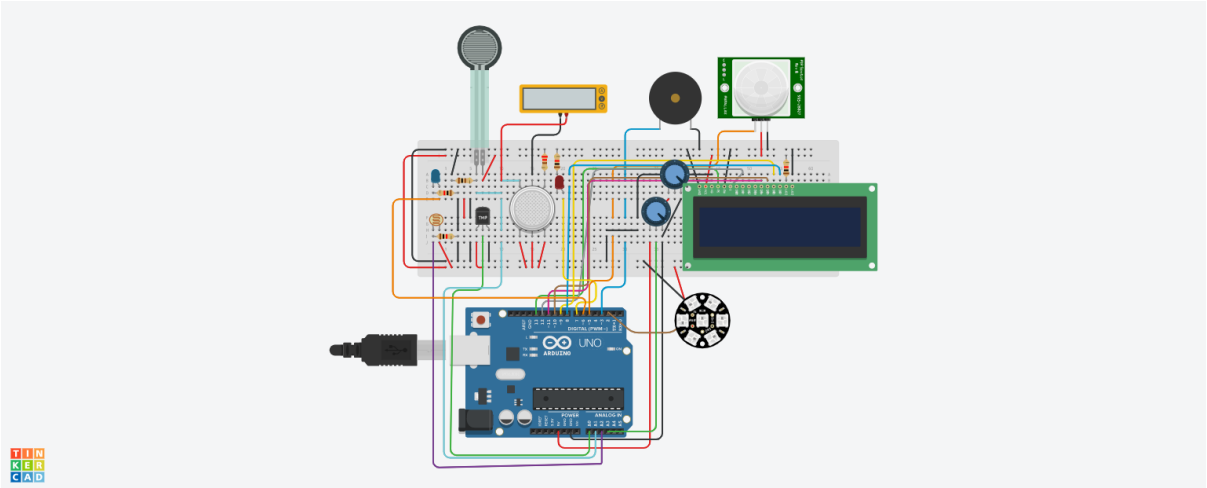
As the title suggests our project is based on building a simulation of Weather reports, which include temperature, pressure, gas in atmosphere, UV radiation, and also a security sensor as an add-on.

The weather station collects the above data related to the weather and environment using different sensors:

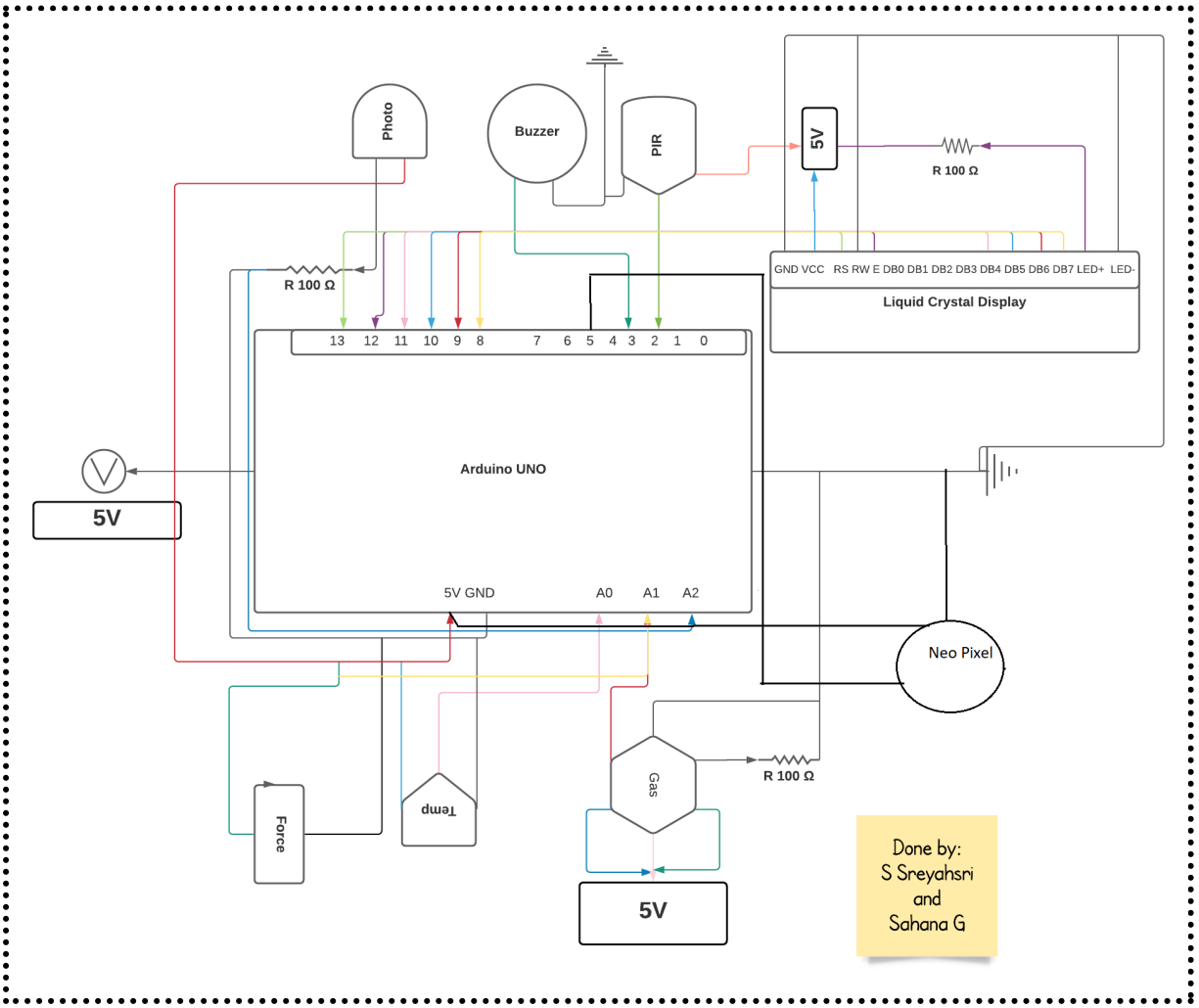
- Temperature
- Force
- Gas
- Photoresistor
- PIV

The aim is to make a small and simple weather station, using a tinkercad.

Here’s an Abstract View of our Project:



CIRCUIT DIAGRAM:



ARDUINO CODE:

```
#include <LiquidCrystal.h>
#include <Adafruit_NeoPixel.h>

#define PIN 2          // pin Neopixel is attached to
#define NUMPIXELS 1 // number of neopixels in strip
#define SENSOR A3                    //input pin for Potentiometer
#define dryThreshold 50 //below this value, begin alerting dry, turn red;
#define wetThreshold 200 //above this value, begin alerting wet,turn blue;
#define thresholdCenter (dryThreshold + wetThreshold)/2 //Brightest Green point
#define crossFade 20 //how much blue and red should fade in to green


#define PIR_In 2
#define buzzer 3
#define red 7
#define blue 6

 Adafruit_NeoPixel pixels = Adafruit_NeoPixel(NUMPIXELS, PIN, NEO_GRB +
NEO_KHZ800);
  int delayval = 100;
  int redColor = 0;
  int greenColor = 0;
  int blueColor = 0;

  int sensorValue  = 0;
  int transitionValue = 0;

  LiquidCrystal lcd(13, 12, 11, 10, 9, 8);

  int sensor_Input;
  int sensorPin;
  float temp;
  int Forcevalue=0;
  int value;
  float Lb=0.0;
  float N;
```

```
 void setup(void)
{

  pixels.begin();
  pinMode(SENSOR,INPUT);

  Serial.begin(9600);
  lcd.begin(16, 2);

  pinMode(buzzer, OUTPUT);
  pinMode(PIR_In, INPUT);

  pinMode(sensorPin,INPUT);
  pinMode(red,OUTPUT);

  pinMode(sensorPin,INPUT);
  pinMode(blue,OUTPUT);
 }

 void loop()
{
  lcd.setCursor(0,0);
  delay(100);
  lcd.print("ALL CLEAR :) ");

  check_For_Intruder();
  delay(3000);

  measure_Force();

  measure_Temp();
  display_Temp();

  check_For_Gas();

  display_Photo();
}
```

// Code for Photoresistor

```
void display_Photo()
 {
  value=analogRead(A2);
  Serial.print("Intensity of light : ");
  Serial.println(value);
  lcd.setCursor(0,0);

  if(value < 500)
  {
   digitalWrite(blue,HIGH);
   lcd.print("Low intensity");
   delay(3000);
  }
  else
  {
   digitalWrite(blue,LOW);
   lcd.print("High intensity");
   delay(3000);
  }
  lcd.clear();
 }
```

// Code for Force Sensor

```
 void measure_Force()
 {
  Forcevalue=analogRead(A1);
  P =(Forcevalue / 1.0);
  //pressure = Force / unit area

  if(P > 40.0)
  {
    digitalWrite(red, HIGH);
   }
  else
  {
   digitalWrite(red, LOW);
  }

  lcd.setCursor(0, 0);
  Serial.print("Pressure(N/m2):");
```

```
  Serial.print(P);
  Serial.println();
  lcd.setCursor(0, 0);
  lcd.print("Pressure(N/m2):");
  lcd.setCursor(5, 1);
  lcd.print(P);
  delay(3000);
  lcd.clear();
 }
```

//Code for Gas Sensor

```
 void check_For_Gas()
  {
   int val = analogRead(A1);
   Serial.print("Gas value: ");
   Serial.println(val);
   lcd.clear();
         if (val>0 && val <= 6){
                  lcd.print("Normal");
         delay(3000);
         }
   else if (val > 6 &&  val <= 9){
                  lcd.print("Gas Detected");
         delay(3000);
         }
   else if (val > 9 && val <= 12){
                  lcd.print("Dense Gas Det");
         delay(3000);
   }
   else if (val > 12){
                  lcd.print("EMERGENCY!");
         delay(3000);
   }
   lcd.clear();
  }
```

// Code for Temperature Sensor

```
void measure_Temp()
  {
   sensor_Input = analogRead(A0);
   temp = (float)sensor_Input / 1024;
```

```
  temp = temp * 5;
  temp = temp - 0.5;
  temp = temp * 100;
 }
  void display_Temp()
 {
  lcd.setCursor(0, 0);
  Serial.print("Temp. in Celsius: ");
  Serial.print(temp);
  Serial.println();
  lcd.print("Temp. in Celsius: ");
  lcd.setCursor(5, 1);
  lcd.print(temp);
  delay(3000);
 }

// Code for PIR Sensor

void check_For_Intruder()
 {
  boolean sensorvalue= digitalRead(PIR_In);
  if(sensorvalue==1)
   {
    digitalWrite(buzzer,HIGH);
    tone(buzzer,1000,10000);
    lcd.setCursor(0,0);
    lcd.print("Intruder in the ");
    lcd.setCursor(0,1);
    lcd.print("Station :( ");
    delay(3000);
    lcd.clear();
   }
  else
  {
    noTone(buzzer);
   digitalWrite(buzzer,LOW);
   }
   delay(2);
  }

// NeoPixel Jewel

void Rain_Pixel()
```

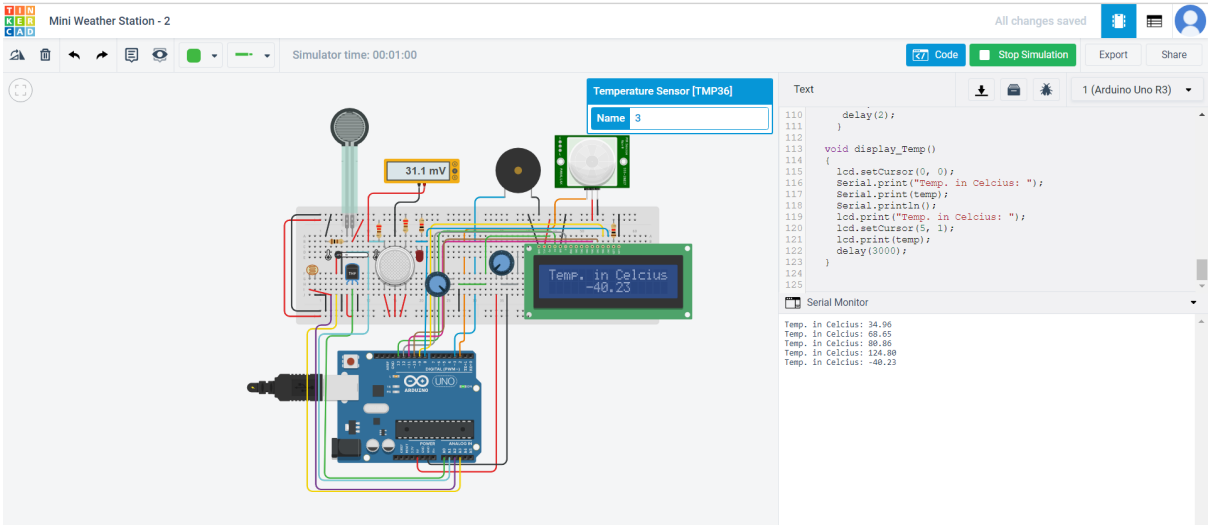
```
{
 sensorValue = analogRead(SENSOR);
 transitionValue = map(sensorValue,0,1023,0,255);
 setColor();
 pixels.setPixelColor(0,redColor,greenColor,blueColor);
 pixels.show();

 int value = analogRead(A3);
 Serial.print("Rain Sensor value: ");
 Serial.println(value);

 if (value <= 10) {
   lcd.setCursor(0, 0);
   lcd.print("  Dry Weather   ");
   Serial.println("Dry Weather");
   lcd.setCursor(0, 1);
   lcd.print("    No Rain    ");
  }

 if ((value > 10) && (value <= 17)) {
   Serial.println("Heavy Mist ");
   lcd.setCursor(0, 0);
   lcd.print("      ");
   lcd.setCursor(0, 1);
   lcd.print("   Heavy Mist   ");
  }

 if ((value > 328) && (value <= 511)) {
   Serial.println("    Drizzle   ");
   lcd.setCursor(0, 0);
   lcd.print("              ");
   lcd.setCursor(0, 1);
   lcd.print("   Drizzle   ");
 }

 if ((value > 512) && (value <= 700)) {
   Serial.println("Average Rainfall");
   lcd.setCursor(0, 0);
   lcd.print("              ");
   lcd.setCursor(0, 1);
   lcd.print("Average Rainfall ");
 }
```

```
  if ((value > 700) && (value <= 800)) {
    Serial.println("Heavy Rain");
    lcd.setCursor(0, 0);
    lcd.print("              ");
    lcd.setCursor(0, 1);
    lcd.print("   Heavy Rain   ");
  }

  if (value > 800) {
    Serial.println("Extreme Rain");
    lcd.setCursor(0, 0);
    lcd.print("     Very      ");
    lcd.setCursor(0, 1);
    lcd.print("  Extreme Rain    ");
   }
   delay(3000);
   lcd.clear();
}

  void setColor()
 {

  redColor = ((transitionValue <= dryThreshold + crossFade) && (transitionValue >= 0
))? map(transitionValue,0,dryThreshold + crossFade,255,0) : 0;
  blueColor = (transitionValue >= wetThreshold - crossFade && transitionValue <=
255)? map(transitionValue,wetThreshold - crossFade,255,0,255):0;

  if(transitionValue >= dryThreshold && transitionValue <= thresholdCenter)
  {
    greenColor = map(transitionValue,dryThreshold,thresholdCenter,0,255);
  }
  else if(transitionValue > thresholdCenter && transitionValue < wetThreshold)
  {
    greenColor = map(transitionValue,dryThreshold,thresholdCenter,255,0);
  }
  else{
    greenColor = 0;
  }
  }
```

SCREENSHOTS OF THE OUTPUT:

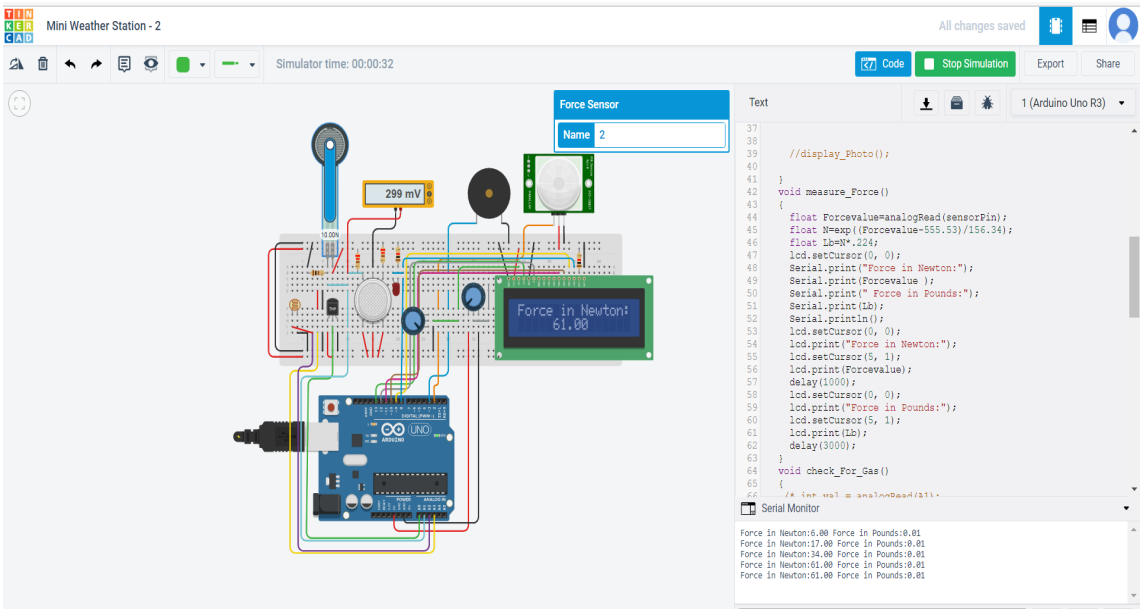
I.TEMPERATURE SENSOR

A Temperature sensor is an electronic device that measures the temperature of its environment and analog output from the temperature sensor is converted to celsius (SI unit of Temperature).



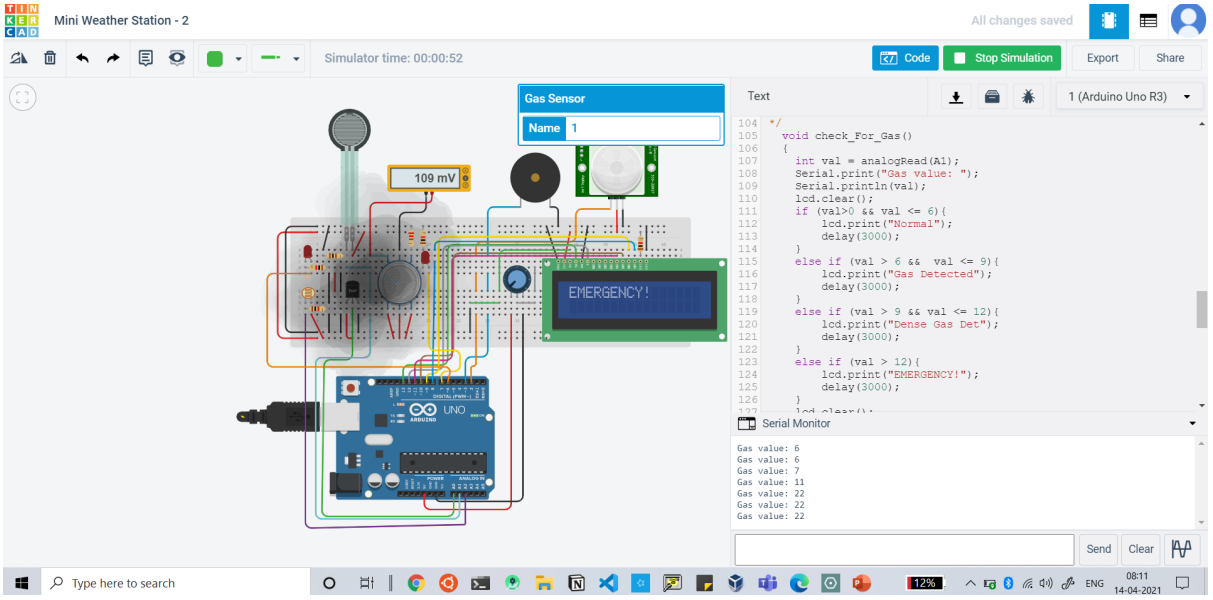
II.FORCE SENSOR

Force sensors are devices that are designed to translate applied mechanical forces , such as tensile and compressive forces,and pressure into output signals and this analog output from force sensor i.e, force in newton (SI unit of Force) is converted to pressure (F/A) in Nm2 and value is displayed in led.



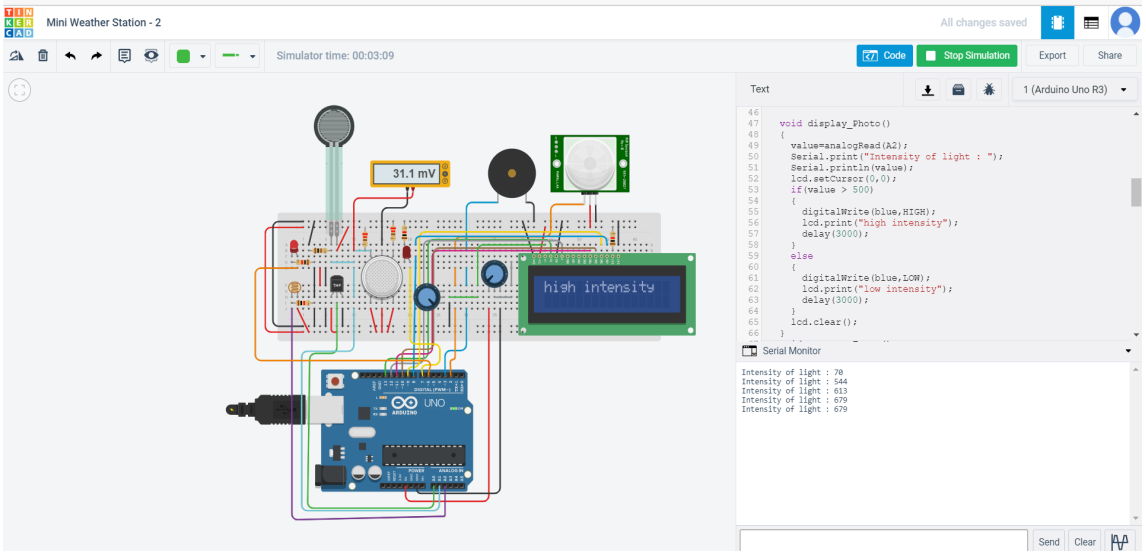
III. GAS SENSOR

A gas sensor is a device that detects the presence of gases in an area,often as a part of a safety system. These kinds of sensors are very useful when there is a gas leakage, output from the gas sensor is noted and compared. The result is displayed in LCD .



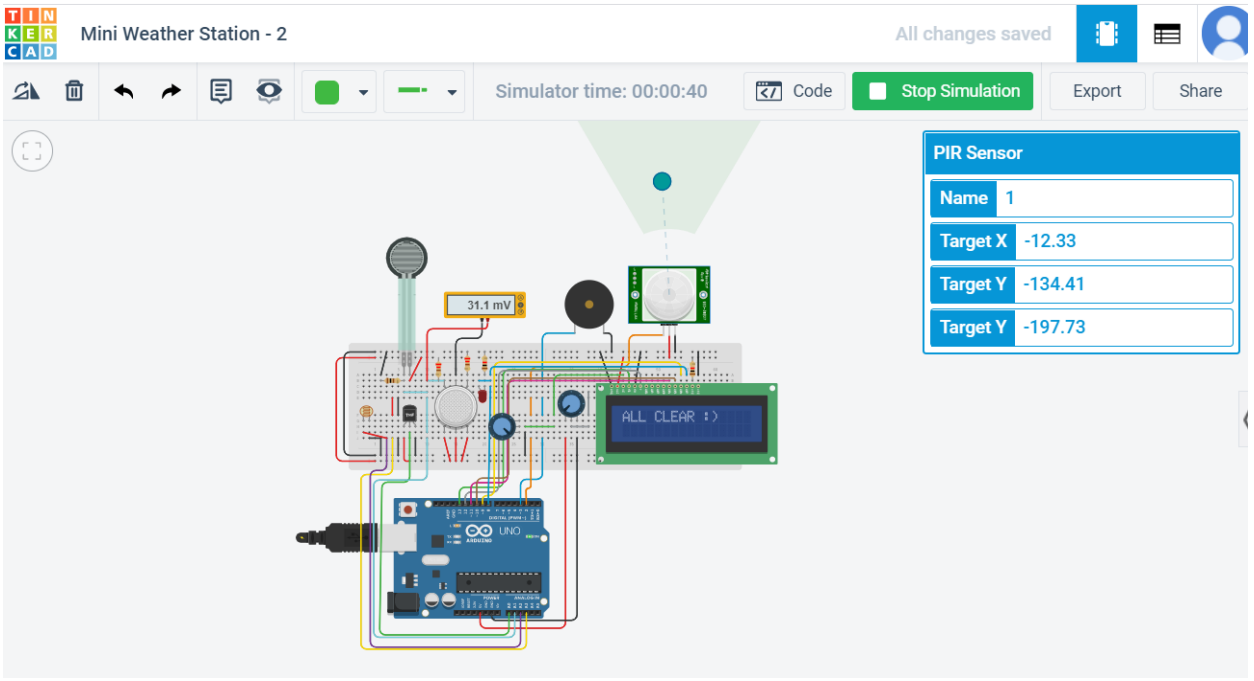
IV.PHOTORESISTOR SENSOR:

Photoresistor sensors are light sensitive devices most often used to indicate the presence or absence of light or to measure light intensity, output from a photoresistor sensor is measured (i.e, intensity of light) and output is compared. The result is displayed in LCD, and also the led light glows when low intensity is detected.

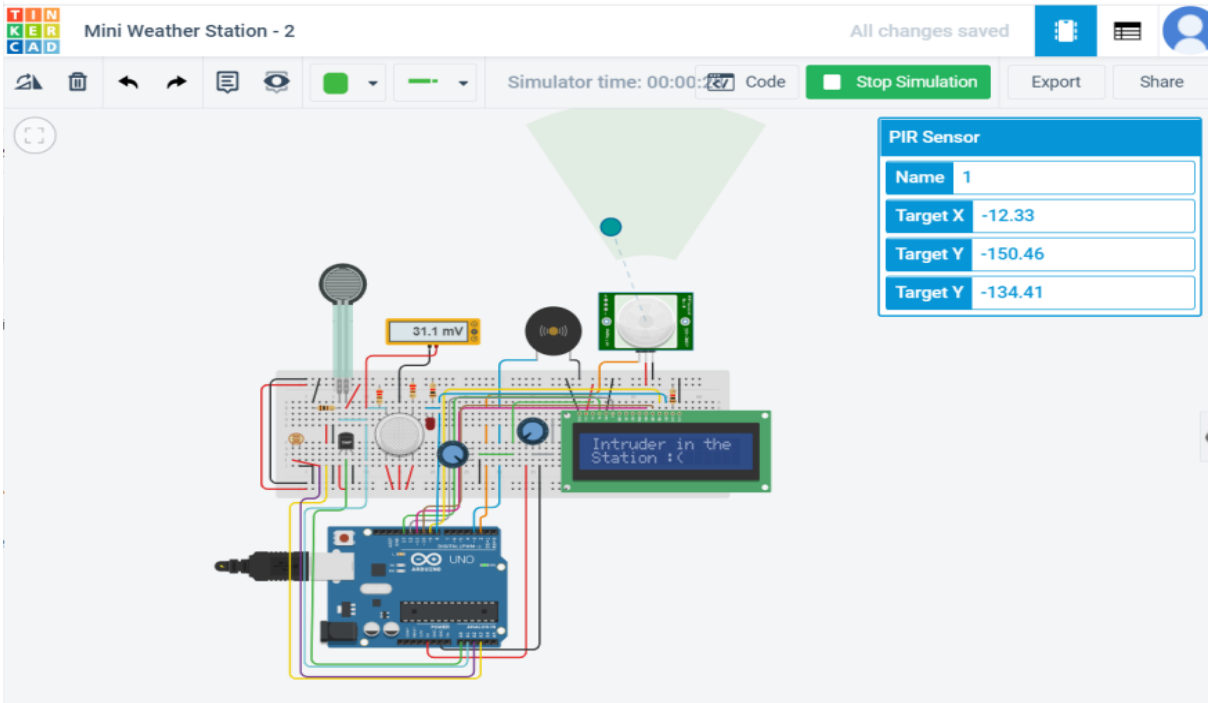


V. PIR SENSOR :

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensor's range. The PIR acts as a digital output so all you need to do is listen for the pin to flip high or low. The motion can be detected by checking for a high signal on a single I/O pin.



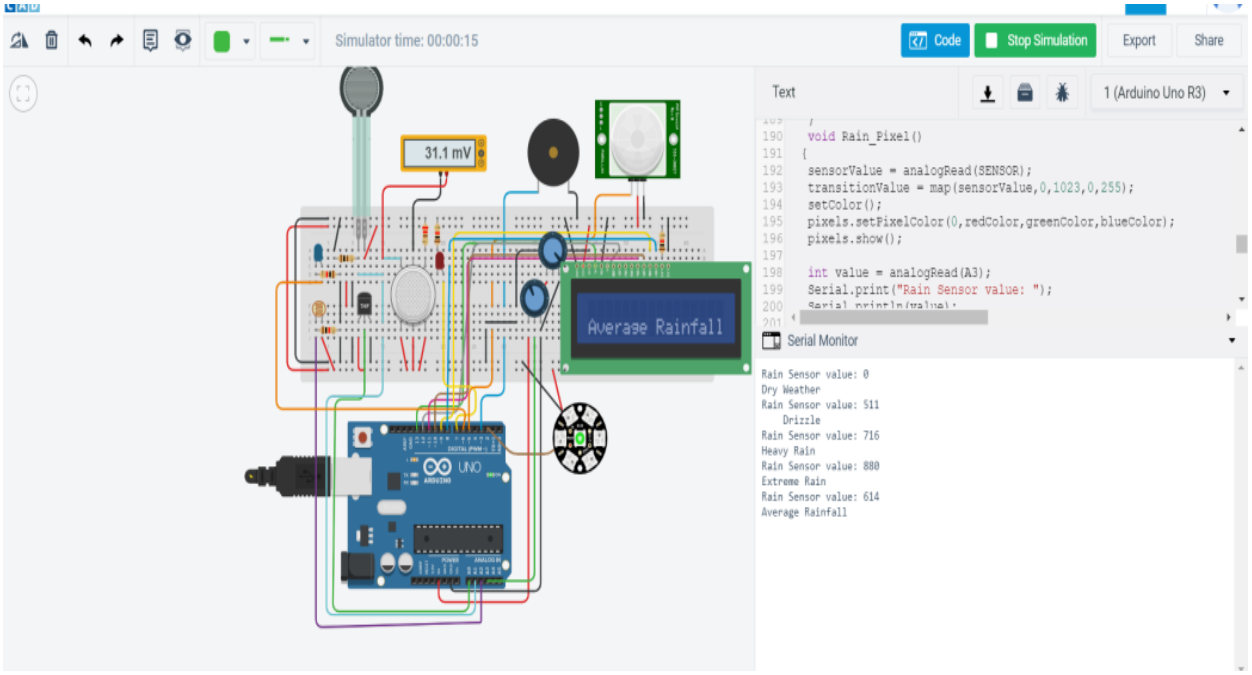
- **In absence of Intruder**



- **In presence of Intruder(Buzzer beeps)**

VI. NeoPixel Jewel:

A NeoPixel is just a name that Adafruit uses to refer to a bunch of different RGB (and RGBW) individually addressable LEDs. We're using a NeoPixel that is using a WS2812 RGB individually addressable LED. The LED itself has three inputs and three outputs. Power, ground, and data are the three inputs, and they are passed through to the next LED in the strip, allowing you to set the Red, Green, and Blue intensities for each LED in the strip individually. The data signal to control the LEDs brightness is timing dependent, in this implementation the RGB values vary according to the potentiometer value, and depending on the range the LCD will display the information regarding rainfall.



REFERENCES

These wonderful websites helped us build this project:

1. www.arduino.cc
2. www.instructortables.com
3. www.bluedot.space
4. www.scientiffic.medium.com
5. www.youtube.com
6. LucidCharts to draw the circuit