ENVIRONMENTAL MONITORING

Phase-3 Project

DONE and PRESENTED BY:

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AS WE DISSCUED IN OUR EARLIER SUBMISSIONS, HERE WE GOING TO SIMULATE OUR PROJECT IN WOKWI SIMULATOR PLATFORM AS YOU MENTIONED.
THE FOLLOWING ARE THE DETAILS THAT DEPICTS ABOUT OUR PROJECT WORK. THANK YOU

SENSOR USED:HC-SR04,DHT22,NTC(temperature).

IMPLEMENTATION OF THE PROJECT

COMPONENTS USED:

- NodeMCU ESP32: This will be our microcontroller.
- DHT22: Sense the temperature and humidity.
- Wokwi Virtual Components: These are virtual components you can add in Wokwi for the web interface and simulation like button, resistor,LED bulb.

LIBRARIES USED:

- DHT sensor library for ESP32
- Pub Sub Client
- New Ping

ARDUINO CODE:

(applied to 'esp32' to sense the temperature and humidity of the environment)

```
 #include <WiFi.h>
#include "DHTesp.h"
#include "ThingSpeak.h"

const int DHT_PIN = 15;
const int LED_PIN = 13;
const char* WIFI_NAME = "Wokwi-GUEST";
const char* WIFI_PASSWORD = "";
const int myChannelNumber =2307358 ;
const char* myApiKey = "1U2N21SZEGP74GFZ";
const char* server = "api.thingspeak.com";

DHTesp dhtSensor;
WiFiClient client;

void setup()  {

  Serial.begin(115200);
  dhtSensor.setup(DHT_PIN, DHTesp::DHT22);
  pinMode(LED_PIN, OUTPUT);
  WiFi.begin(WIFI_NAME, WIFI_PASSWORD);
  while (WiFi.status() != WL_CONNECTED){
    delay(1000);
    Serial.println("Wifi not connected");
  }

  Serial.println("Wifi connected !");
  Serial.println("Local IP: " + String(WiFi.localIP()));
  WiFi.mode(WIFI_STA);
  ThingSpeak.begin(client);
}
void loop() {
  TempAndHumidity  data = dhtSensor.getTempAndHumidity();
  ThingSpeak.setField(1,data.temperature);
  ThingSpeak.setField(2,data.humidity);
  if (data.temperature > 35 || data.temperature < 12 || data.humidity > 70 || data.humidity < 40) {
    digitalWrite(LED_PIN, HIGH);
  }else{
    digitalWrite(LED_PIN, LOW);
  }
    int x = ThingSpeak.writeFields(myChannelNumber,myApiKey);
    Serial.println("Temp: " + String(data.temperature, 2) + "°C");
  Serial.println("Humidity: " + String(data.humidity, 1) + "%");
    if(x == 200){
    Serial.println("Data pushed successfull");
  }else{
    Serial.println("Push error" + String(x));
  }
  Serial.println("---");
  delay(10000);
}
```

PYTHON CODE :
(applied to ‘esp32’ to sense the temperature and humidity of the environment)

```
import machine
import time
from dht import DHT22
import network
import urequests

DHT_PIN = 2  # GPIO pin 2
LED_PIN = 13  # GPIO pin 13

WIFI_NAME = "Wokwi-GUEST"
WIFI_PASSWORD = ""
CHANNEL_NUMBER = 2307358
API_KEY = "1U2N21SZEGP74GFZ"

dhtSensor = DHT22(machine.Pin(DHT_PIN))
led = machine.Pin(LED_PIN, machine.Pin.OUT)

wifi = network.WLAN(network.STA_IF)
wifi.active(True)
wifi.connect(WIFI_NAME, WIFI_PASSWORD)
while not wifi.isconnected():
    pass

print("Wifi connected!")
print("Local IP:", wifi.ifconfig()[0])

def read_dht():
    dhtSensor.measure()
    temperature = dhtSensor.temperature()
    humidity = dhtSensor.humidity()
    return temperature, humidity

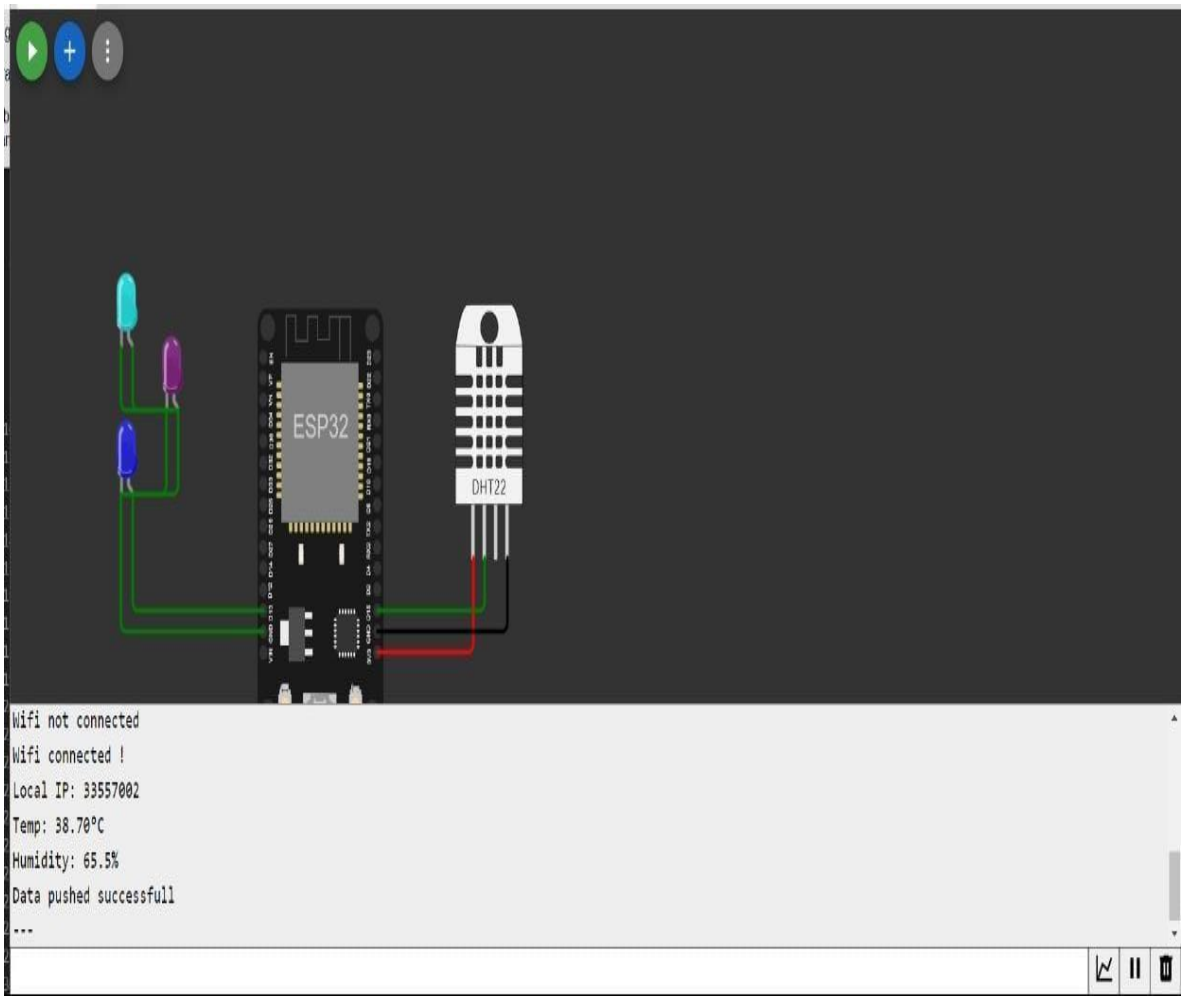
while True:
    temperature, humidity = read_dht()
    print("Temp: {:.2f}°C".format(temperature))
    print("Humidity: {:.1f}%".format(humidity))

    if temperature > 35 or temperature < 12 or humidity > 70 or
humidity < 40:
        led.on()
    else:
        led.off()
```

```
    response =
urequests.get("https://api.thingspeak.com/update?api_key={}&field1={:.2
f}&field2={:.1f}".format(API_KEY, temperature, humidity))
    print("Response:", response.status_code)
    response.close()

    time.sleep(10)  # Wait for 10 seconds before the next reading
```

OUTPUT:



CODE FOR CONNECTING THE ULTRASONIC SENSOR (HC-SP04) TO THE ARDUINO UNO BOARD

- Used to detect the number of people entered the environment we've provided certainly.

```
#include <NewPing.h>

#define TRIGGER_PIN 9
#define ECHO_PIN 10
#define MAX_DISTANCE 200 // Maximum distance we want to detect in centimeters (cm)

NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE); // NewPing setup of pins and maximum distance.

void setup() {
  Serial.begin(9600); // Open a serial connection for debugging purposes.
}

void loop() {
  delay(50); // Wait 50ms between pings (about 20 pings/sec). 29ms should be the shortest delay between pings.
  unsigned int distance = sonar.ping_cm(); // Send ping, get distance in centimeters.

  if (distance <= 200 && distance >= 2) { // Check if the distance is within the valid range.
    Serial.print("Number of people detected: ");
    Serial.println(distance); // Print the distance to the serial monitor.
  } else {
erial.println("No people detected!"); // Print a message indicating no people are detected.
  }
  delay(1000); // Wait for a second before taking the next reading.
}
```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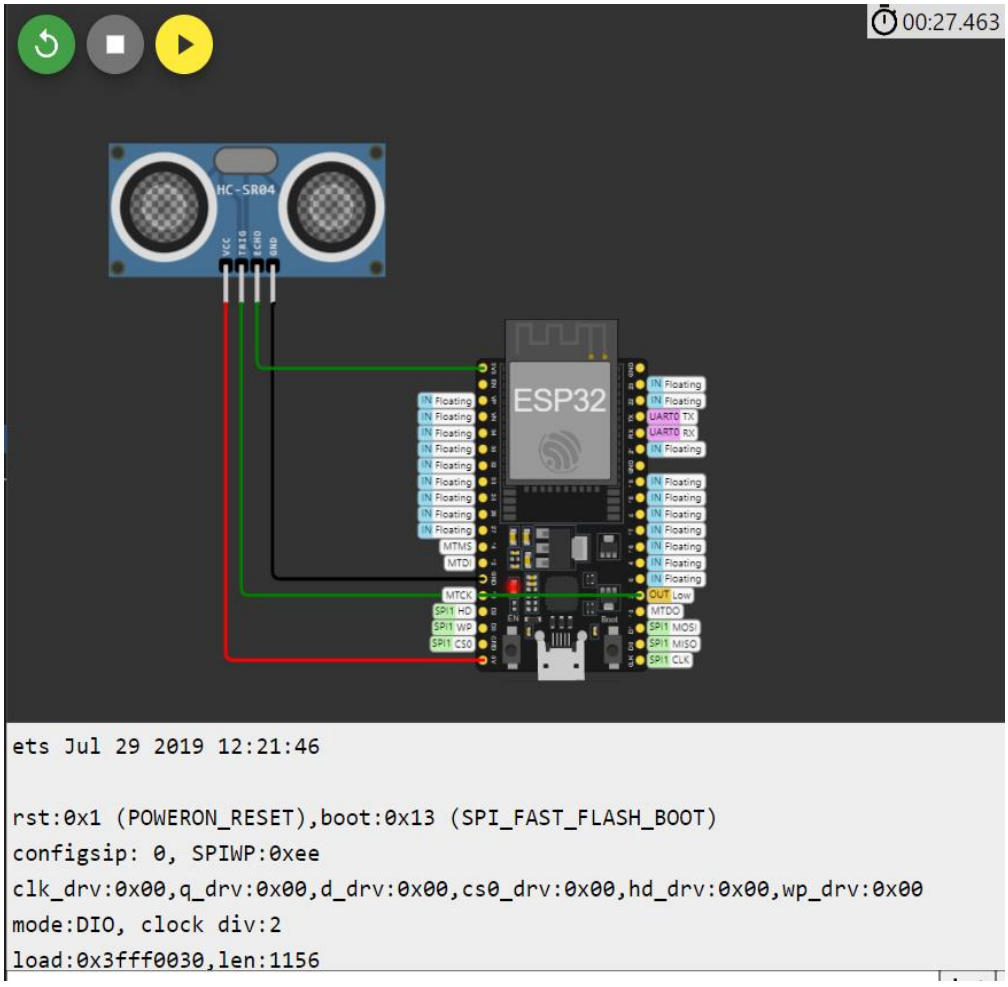
monitor.
  } else {
erial.println("No people detected!"); // Print a message indicating no
people are detected.
  }
  delay(1000); // Wait for a second before taking the next reading.
}
```

OUTPUT:



THE ENVIRONMENTAL PROJECT ;
COMBINED ARDUINO CODE FOR THE ALL SENSORS USED :

```
#include <DHT.h>
#include <WiFi.h>
#include <LiquidCrystal_I2C.h>
DHT dht(26,DHT11);
const int trigPin=5;
const int echopin=18;
#define SOUND_SPEED 0.034
#define CM_TO_INCH 0.393701
long duration;
float distanceCm;
float distanceInch;
const int numLeds = 3;
const int ledPins[numLeds] = {2, 4, 5};  // Pins to which the LEDs are
connected
const int numSensors = 4;
const int sensors[numSensors] = {32, 33, 34, 35};  // ADC input pins
int values[numSensors];  // Array to store potentiometer values
int choice = 0;  // Variable to store the choice
int total = 0;  // Variable to store the total of the values
int percent = 0;
LiquidCrystal_I2C lcd(0x27,16,2);


void setup() {
  Serial.begin(115200);
  dht.begin();
  delay(2000);
  pinMode(5,OUTPUT);
  pinMode(18,INPUT);
   Serial.begin(9600);

  // Set the LED pins as outputs
  for (int i = 0; i < numLeds; i++) {
    pinMode(ledPins[i], OUTPUT);
  }
  Wire.begin(23, 22);
  Serial.begin(9600);
  lcd.init();
  lcd.backlight();
}

void loop() {
  delay(2000);  // Delay between sensor readings

  float humidity = dht.readHumidity();
```

```
  float temperature = dht.readTemperature();
    Serial.print("Humidity: ");
    Serial.print(humidity);
    Serial.print("%  Temperature: ");
    Serial.print(temperature);
    Serial.println("°C");
     // Clears the trigPin
  digitalWrite(5, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(5, HIGH);
  delayMicroseconds(10);
  digitalWrite(5, LOW);

  // Reads the echoPin, returns the sound wave travel time in
microseconds
  duration = pulseIn(18, HIGH);

  // Calculate the distance
  distanceCm = duration * SOUND_SPEED/2;

  // Convert to inches
  distanceInch = distanceCm * CM_TO_INCH;

  // Prints the distance in the Serial Monitor
  Serial.print("Distance (cm): ");
  Serial.println(distanceCm);
  Serial.print("Distance (inch): ");
  Serial.println(distanceInch);

  delay(1000);
   for (int j = 0; j < numSensors; j++) {
    values[j] = analogRead(sensors[j]);
  }
  total = values[0] + values[1] + values[2] + values[3];

percent = map(total,0,16383,0,100);

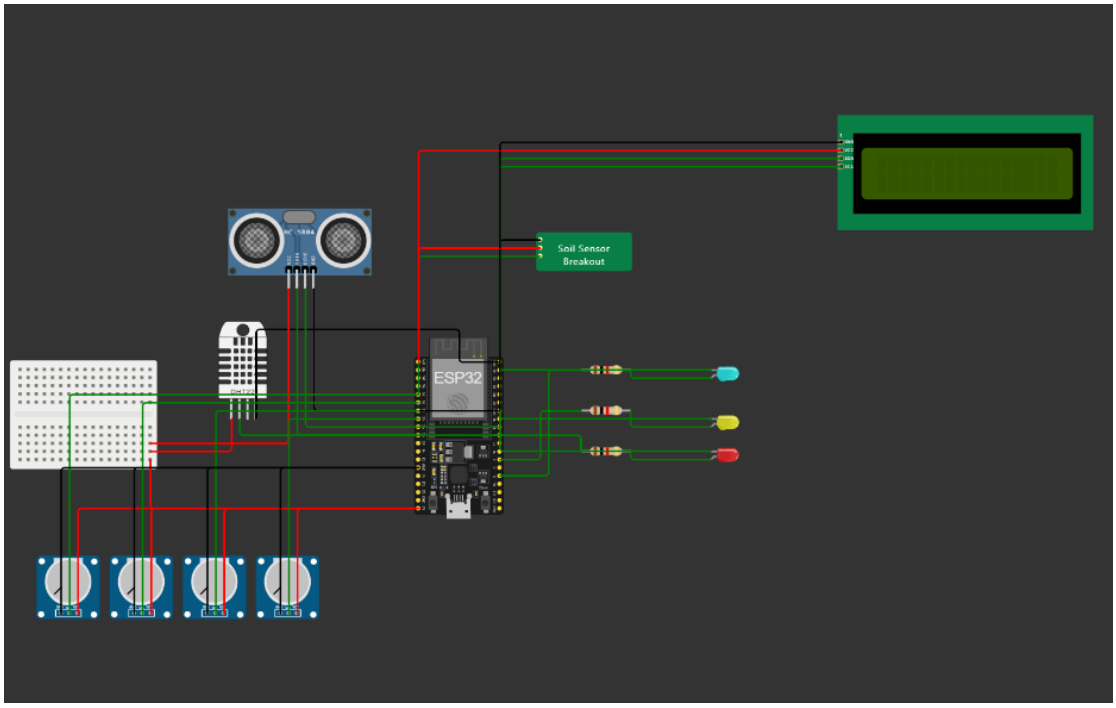
  // Print the total to the serial console
  Serial.printf("The value is: %d %% \n", percent);

  // Determine the choice based on the potentiometer values
  if (percent > 70) {
    Serial.println("Heavy");
    choice = 1;
  } else if (percent <30) {
    Serial.println("Drizzle");
    choice = 2;
```

```
} else {
  Serial.println("Medium");
  choice = 3;
}

// Turn on the appropriate LEDs based on the choice
switch (choice) {
  case 1:
    // Turn on all LEDs
    for (int k = 0; k < 3; k++) {  // Loop 10 times
    digitalWrite(ledPins[2], HIGH);  // Turn the LED on
    delay(500);  // Delay for 1 second
    digitalWrite(ledPins[2], LOW);  // Turn the LED off
    delay(500);  // Delay for 1 second
    }
    break;
  case 2:
    // Turn on only the first and second LEDs
    for (int k = 0; k < 3; k++) {  // Loop 10 times
    digitalWrite(ledPins[0], HIGH);  // Turn the LED on
    delay(500);  // Delay for 1 second
    digitalWrite(ledPins[0], LOW);  // Turn the LED off
    delay(500);  // Delay for 1 second
    }
    break;
  case 3:
    // Turn on only the third LED
    for (int k = 0; k < 3; k++) {  // Loop 10 times
    digitalWrite(ledPins[1], HIGH);  // Turn the LED on
    delay(500);  // Delay for 1 second
    digitalWrite(ledPins[1], LOW);  // Turn the LED off
    delay(500);  // Delay for 1 second
    }
    break;
}
delay(1000);  // Delay for 1 second
int16_t i = analogRead(34);
String msg = i < 2165 ? "WET" : i > 3135 ? "DRY" : "OK";
lcd.clear();
lcd.print("Soil: ");
lcd.print(msg);
delay(500);
}
```

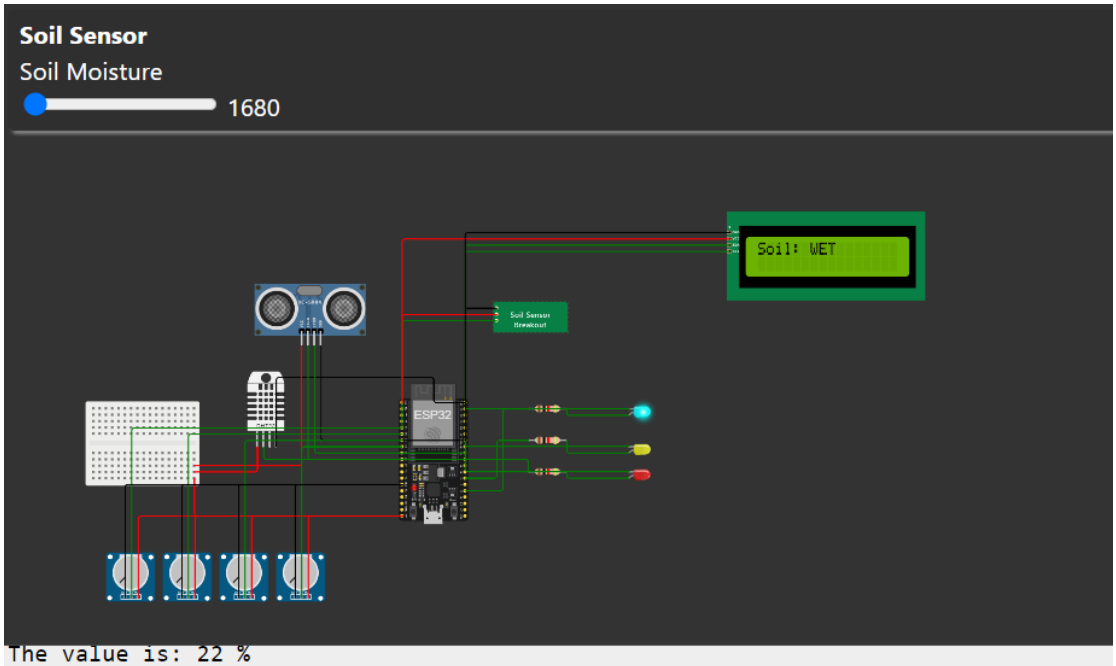
CIRCUIT BOARD:



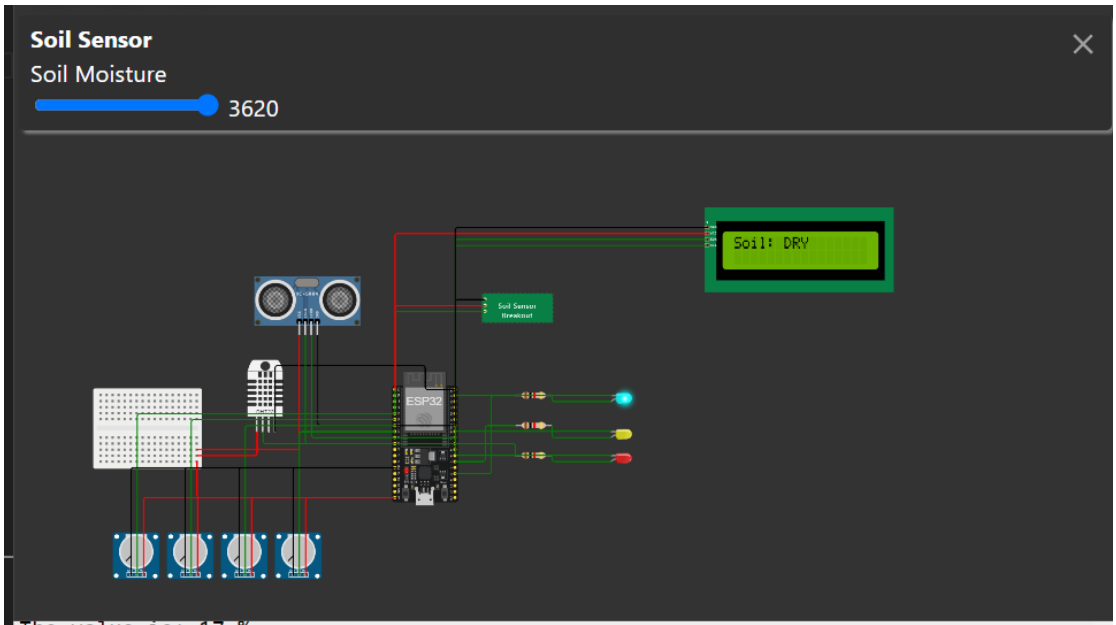
OUTPUT:

```
ets Jul 29 2019 12:21:46

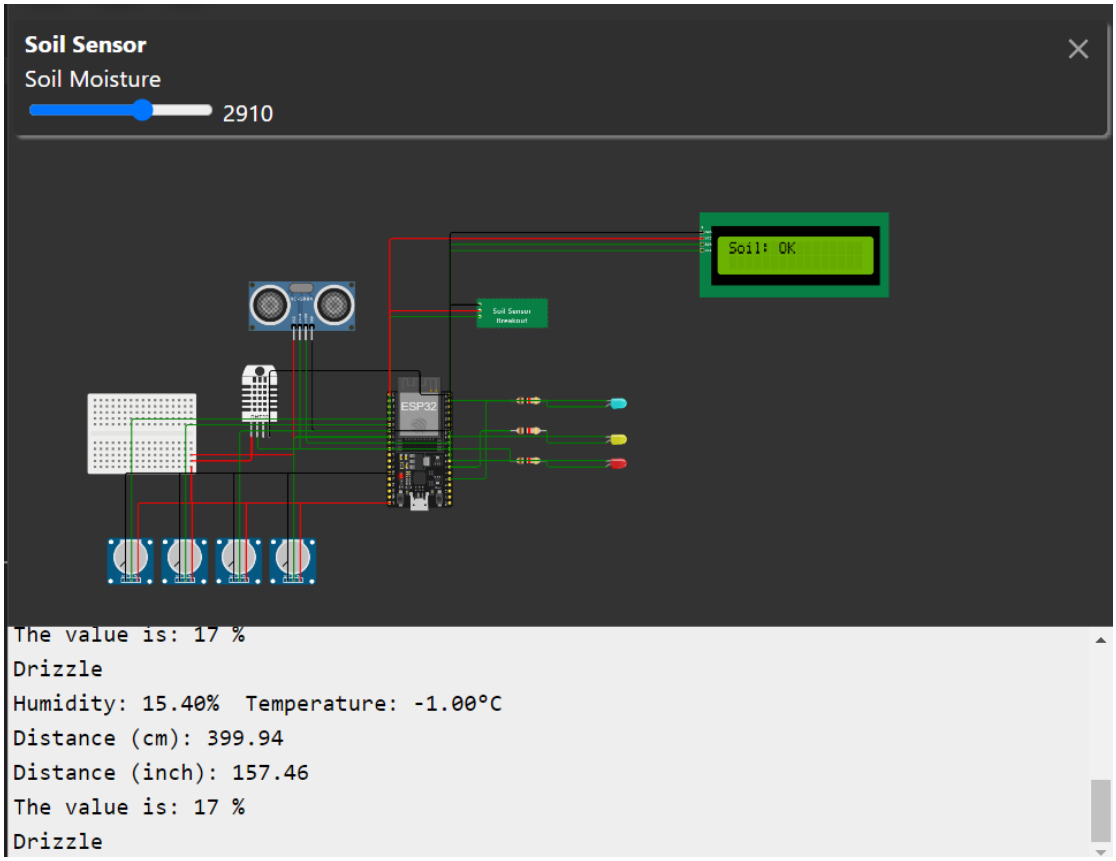
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x40078000,len:11456
ho 0 tail 12 room 4
load:0x40080400,len:2972
entry 0x400805dc
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 17 %
Drizzle
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 17 %
Drizzle
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 17 %
```




```
The value is: 22 %
Drizzle
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 10 %
Drizzle
```




```
The value is: 17 %
Drizzle
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 22 %
Drizzle
```




```
The value is: 17 %
Drizzle
Humidity: 15.40%  Temperature: -1.00°C
Distance (cm): 399.94
Distance (inch): 157.46
The value is: 17 %
Drizzle
```