

SMART SOIL MOISTURE CONTROLLING SYSTEM

Group 09

Group Members

E/18/323 HIRUSHI DEVINDI

E/18/330 ROSHILA SEWWANDI

E/18/375 AKITHA PATHIRANA

Introduction to the Project



Sensors

- Soil moisture sensor
- Temperature and humidity sensor- DHT11

Actuator

- Water-pump

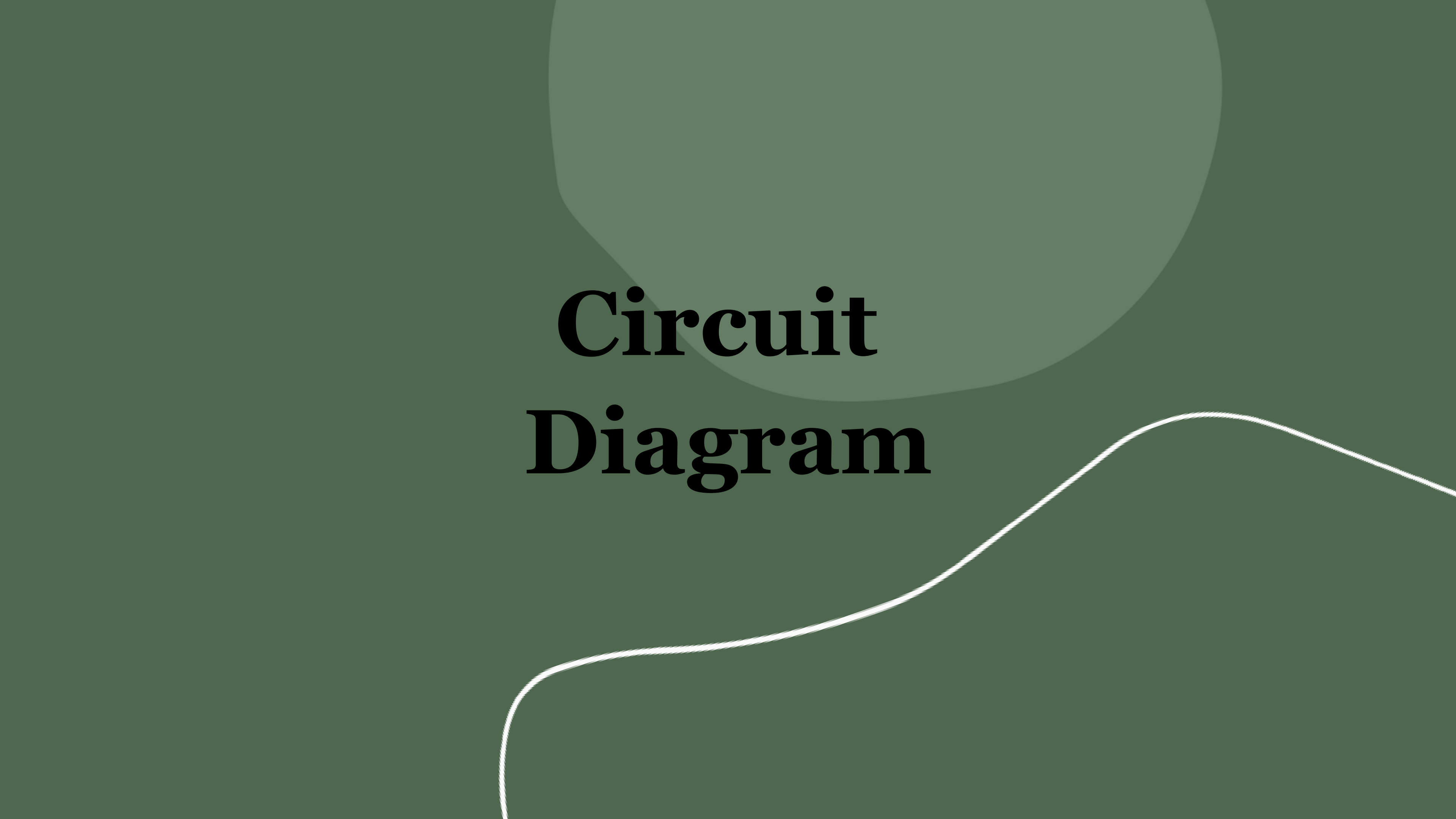
- Building an IoT-based Irrigation System using ESP8266 NodeMCU Module, sensors and actuator.
- Sprinkle water on the soil depending upon the environmental conditions such as **Soil Moisture, Temperature, and Humidity**
- The system will maintain the soil moisture based on the temperature of the environment.



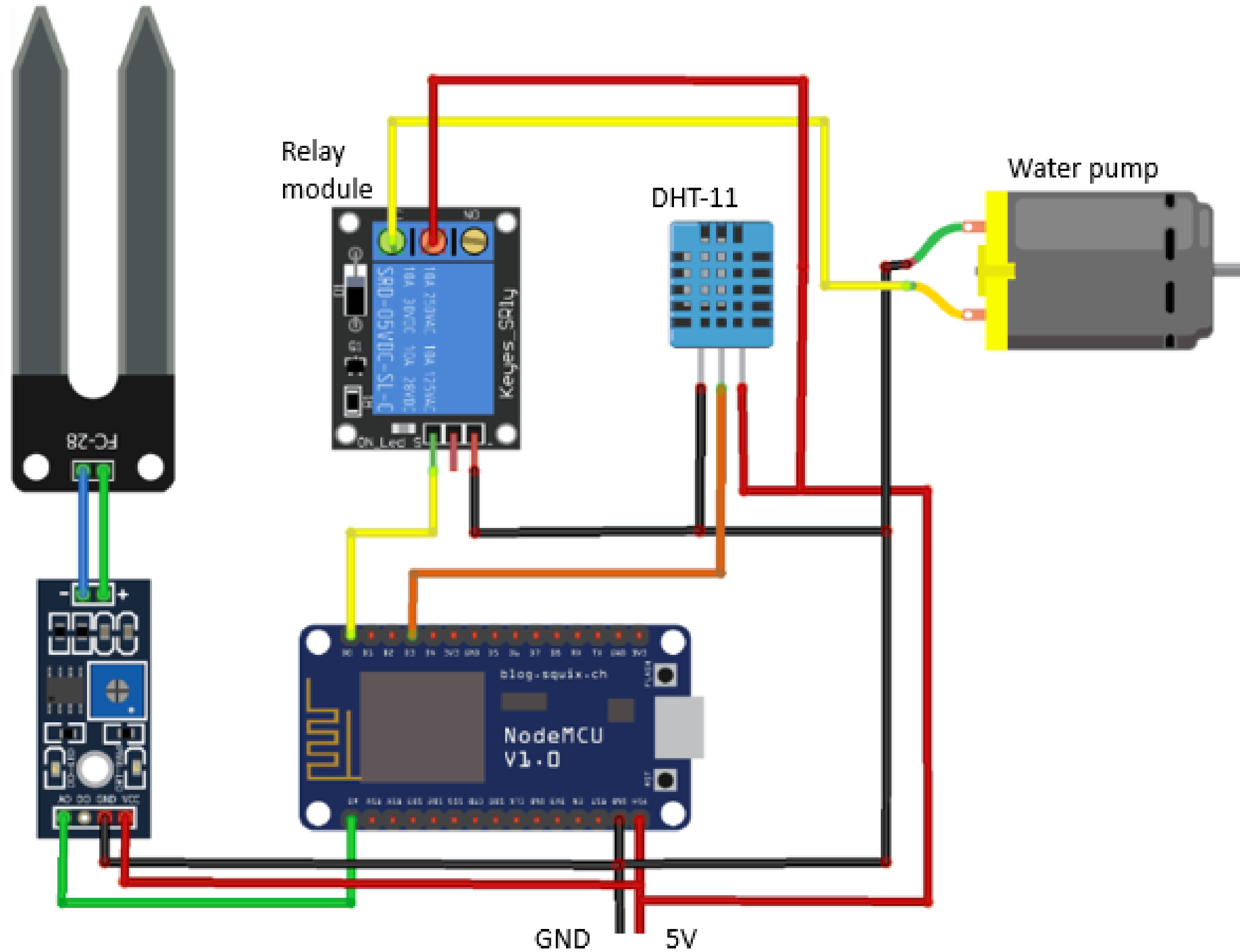
Components Used

- NodeMCU ESP8266
- Soil Moisture Sensor Module
- Water Pump Module
- Relay Module
- DHT11
- Connecting Wires

Circuit Diagram



Soil moisture sensor



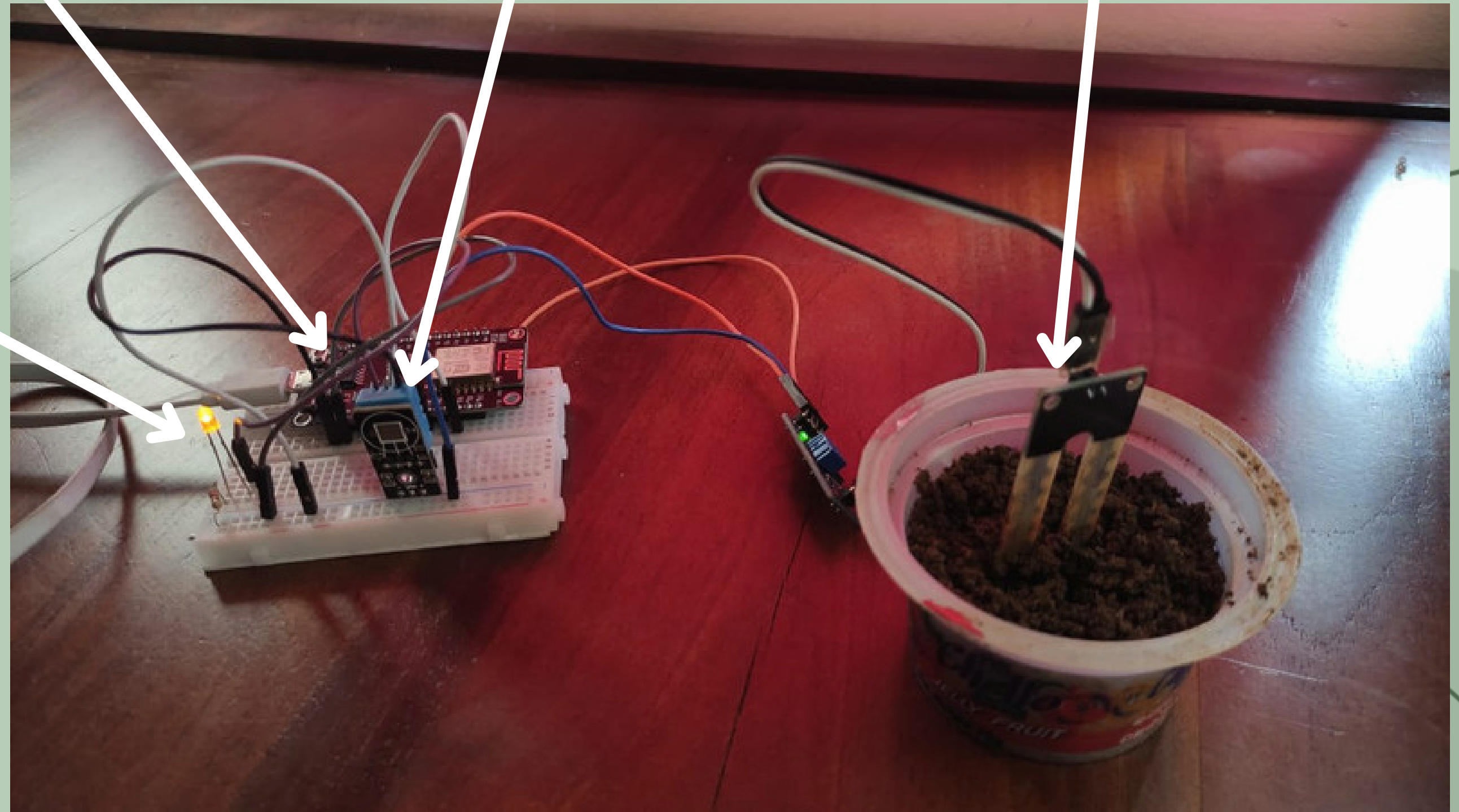
Hardware Implementation

NodeMCU ESP8266

DHT11 Sensor

Soil Moisture Sensor Module

Actuator -LED
(Indicate the status of the
pump)



Sensors & Actuators

Control Logic Explanation



Functions

- void readDHTSensor()
- void readMoistureSensor()
- void controlMotor()
- void connectToMQTTBroker()
- void publishHumidity()
- void publishTemperature()
- void publishMoisture()

```
void readMoistureSensor() {  
    moisturePercentage = (100.00 - ((analogRead(moisturePin) / 1023.00) * 100.00));  
}
```



Control Logic

```
void controlMotor() {  
  if (t <= 15) {  
    if (moisturePercentage < 10) {  
      digitalWrite(motorPin, HIGH); // Turn on motor  
    } else {  
      digitalWrite(motorPin, LOW); // Turn off motor  
    }  
  }  
  
  if (t <= 25 && t > 15) {  
    if (moisturePercentage < 20) {  
      digitalWrite(motorPin, HIGH); // Turn on motor  
    } else {  
      digitalWrite(motorPin, LOW); // Turn off motor  
    }  
  }  
  
  if (t <= 35 && t > 25) {  
    if (moisturePercentage < 30) {  
      digitalWrite(motorPin, HIGH); // Turn on motor  
    } else {  
      digitalWrite(motorPin, LOW); // Turn off motor  
    }  
  }  
  
  if (t > 35) {  
    if (moisturePercentage < 40) {  
      digitalWrite(motorPin, HIGH); // Turn on motor  
    } else {  
      digitalWrite(motorPin, LOW); // Turn off motor  
    }  
  }  
}
```

Sending Data to the MQTT Broker





Humidity

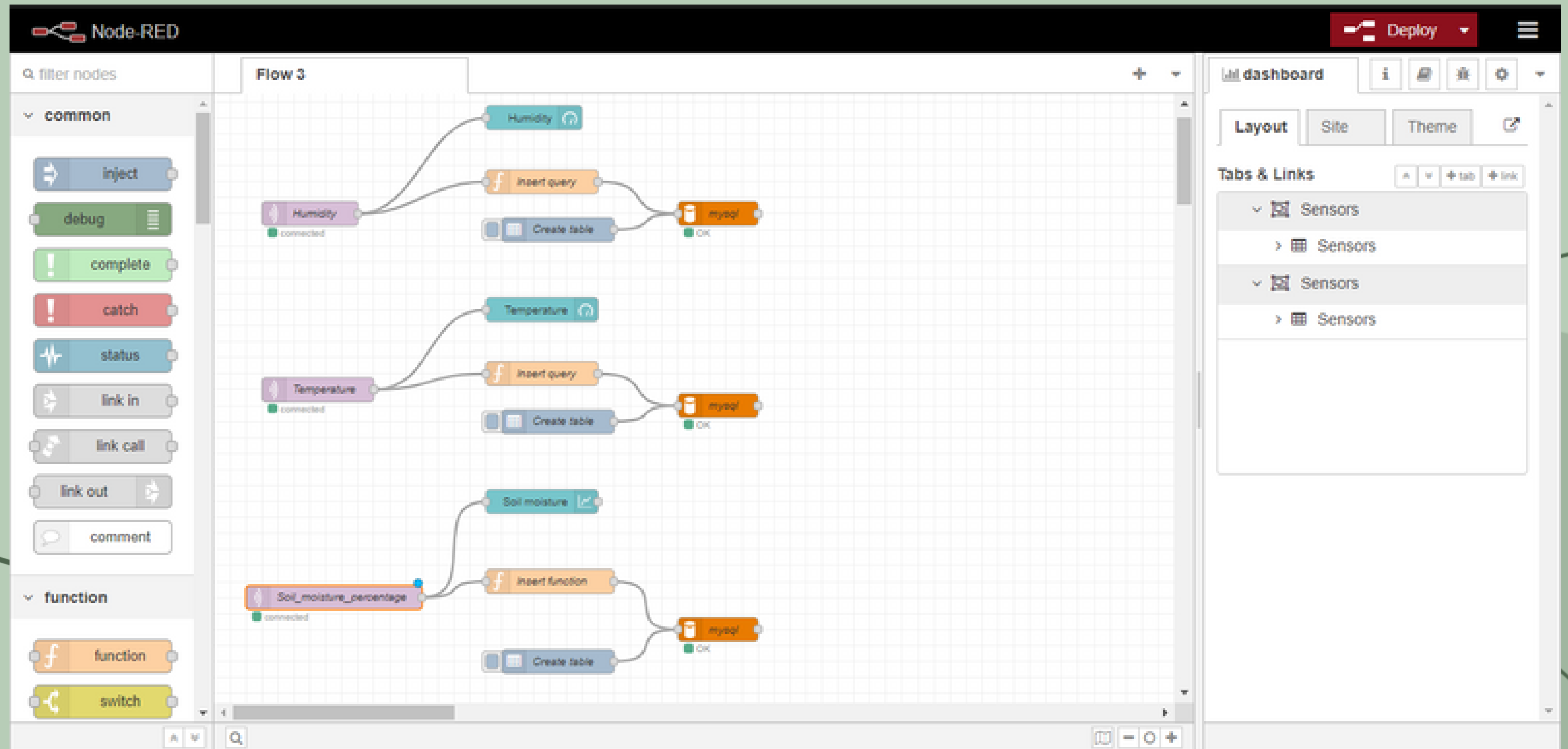
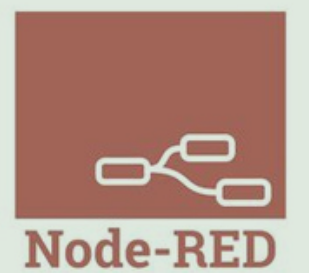
Soil Moisture Percentage

```
C:\Windows\System32\cmd.exe - mosquito_sub -t UoP_CO_326_E18_09_soil_moisture -h test.mosquitto.org
Microsoft Windows [Version 10.0.19045.3086]
(c) Microsoft Corporation. All rights reserved.

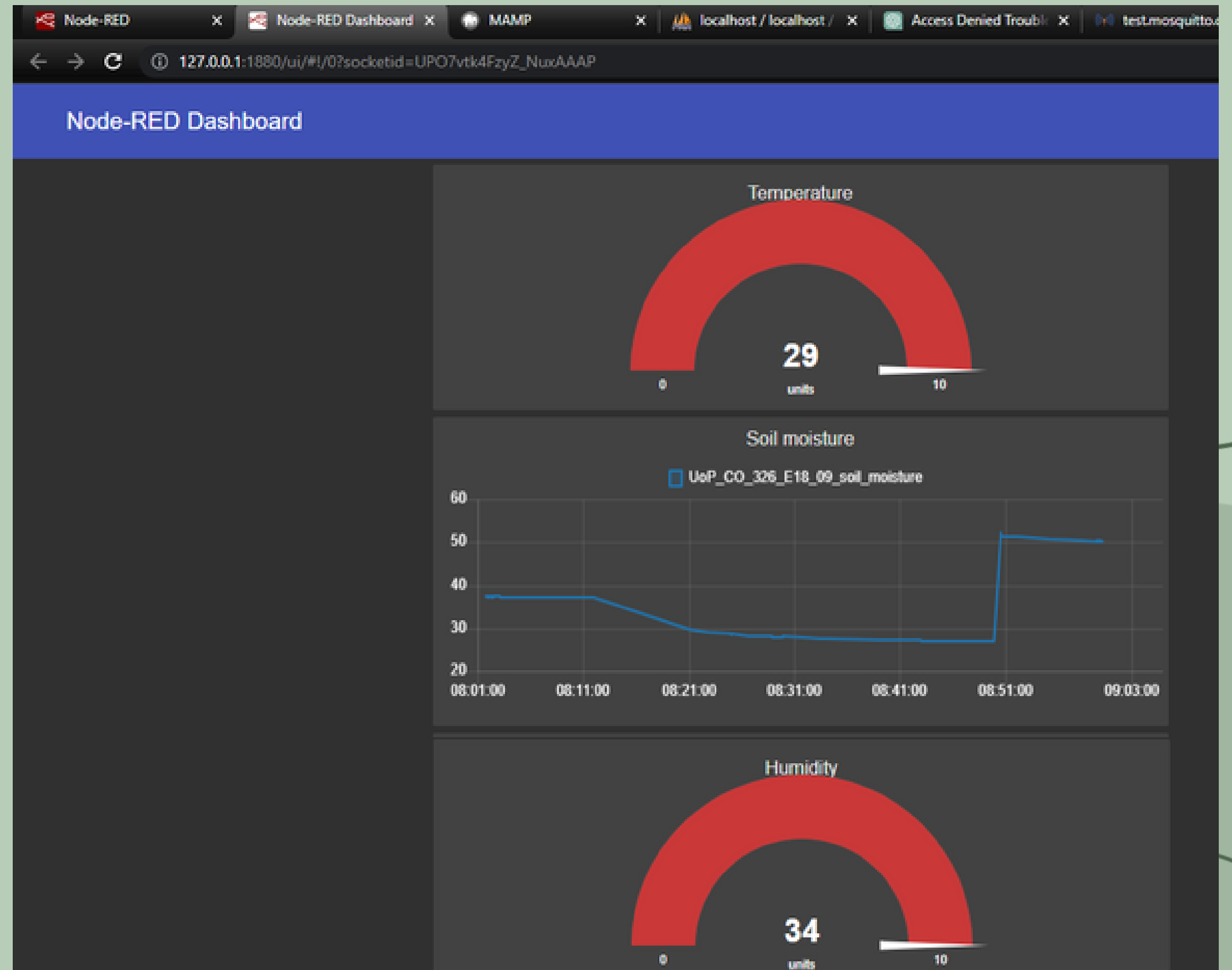
C:\Program Files\mosquitto>mosquitto_sub -t UoP_CO_326_E18_09_soil_moisture -h test.mosquitto.org
^C
C:\Program Files\mosquitto>mosquitto_sub -t UoP_CO_326_E18_09_soil_moisture -h test.mosquitto.org
36.66
35.68
37.54
36.85
36.56
37.24
37.34
37.24
37.44
37.24
37.44
37.24
37.44
37.34
37.44
37.24
37.44
37.24
37.34
37.44
37.24
37.15
```


Visualize Data on SCADA

Design on Node-Red



Dashboard



Storing Data in the Database



Tables created in Database

Node-RED x Node-RED x MAMP x localhost / x testmosql x Separate S x Green Nat x e18-CO32 x New Tab x

localhost/phpMyAdmin/db_structure.php?server=1&db=co326_project

phpMyAdmin

Server: localhost:3306 Database: co326_project

Structure SQL Search Query Export Import Operations Privileges Routines

Filters

Containing the word:

Table	Action	Rows	Type	Collation	Size	Over
<input type="checkbox"/> humidity	★ Browse Structure Search Insert Empty Drop	525	InnoDB	utf8_general_ci	48.0 KiB	
<input type="checkbox"/> moisture	★ Browse Structure Search Insert Empty Drop	~156,936	InnoDB	utf8_general_ci	6.5 MiB	
<input type="checkbox"/> temperature	★ Browse Structure Search Insert Empty Drop	506	InnoDB	utf8_general_ci	48.0 KiB	
3 tables	Sum	~157,967	InnoDB	utf8_general_ci	6.6 MiB	

☐ Check all With selected:

Print Data dictionary

Create table

Name: Number of columns: 4



Data Records Inserted into Tables

Showing rows 0 - 24 (85 total, Query took 0.0017 seconds.)

```
SELECT * FROM `humidity`
```

Options: ☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

	hum_id	time	humidity
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	2023-06-30 07:49:34	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	2023-06-30 07:49:35	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	2023-06-30 07:49:35	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	2023-06-30 07:49:36	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	2023-06-30 07:49:36	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	2023-06-30 07:51:21	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	2023-06-30 07:51:33	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	2023-06-30 07:51:33	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	2023-06-30 07:51:33	36
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	2023-06-30 07:52:53	36
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	2023-06-30 07:52:53	36
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	2023-06-30 07:54:23	36
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	2023-06-30 07:55:45	36

Showing rows 0 - 24 (150 total, Query took 0.0055 seconds.)

```
SELECT * FROM `moisture`
```

Options: ☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

	moisture_id	time	moisture
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	2023-06-30 07:49:34	36.66
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	2023-06-30 07:49:35	35.68
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	2023-06-30 07:49:36	37.54
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	2023-06-30 07:49:36	36.85
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	2023-06-30 07:49:36	36.56
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	2023-06-30 07:51:21	37.24
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	2023-06-30 07:51:33	37.34
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	2023-06-30 07:51:33	37.24
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	2023-06-30 07:51:33	37.44
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	2023-06-30 07:52:53	37.54
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	2023-06-30 07:52:53	37.54
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	2023-06-30 07:54:23	37.05
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	2023-06-30 07:55:45	37.44

Showing rows 0 - 24 (139 total, Query took 0.0020 seconds.)

```
SELECT * FROM `temperature`
```

Options: ☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

	temp_id	time	temperature
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	2023-06-30 07:54:23	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	2023-06-30 07:55:45	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	2023-06-30 07:55:45	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	2023-06-30 07:55:45	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	2023-06-30 07:55:45	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	2023-06-30 08:01:49	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	2023-06-30 08:01:49	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	2023-06-30 08:01:59	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	2023-06-30 08:01:59	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	2023-06-30 08:02:09	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	2023-06-30 08:02:09	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	2023-06-30 08:02:19	28
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	2023-06-30 08:02:19	28

Demonstration

GITHUB REPO



<https://github.com/cepdnack/e18-CO326-Smart-Soil-Moisture-Controlling-System>

Q N A



THANK YOU!