SPRINT 1

HARDWARE SENSORS INTEGRATION WITH ESP32 MICROCONTROLLER ALONG WITH WIFI CONNECTIVITY

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Team ID	PNT2022TMID12810
Project Name	SmartFarmer – IoT Enabled Farming Application
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COMPONENTS USED:

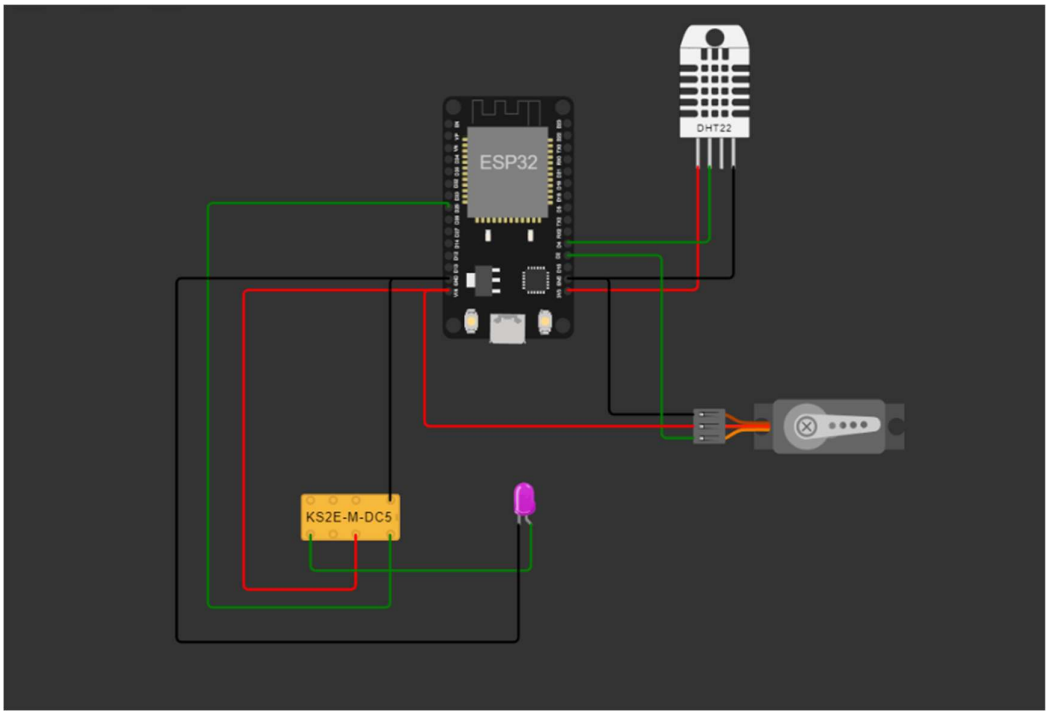
- ESP32 – Microcontroller
- DHT22 – Temperature and Humidity Sensor
- Servo Motor – For tap controlling water flow
- DPDT relay switch (to control the motor)
- Violet Led – (instead of motor as it is not available in WOKWI platform)

Note: Soil moisture sensor and other environmental sensors are not available in wokwi platform but available in tinkercad. The demerit in using tinkercad is that wifi connectivity module – esp8266 is disabled in that platform due to some security reasons

PLATFORM USED:

- WOKWI – Online Electronics Simulator

CIRCUIT DESIGN:



LINK FOR PROJECT: https://wokwi.com/projects/348487506111496786

PROGRAM (ESP32 CODE - .ino file) :

```
// Importing the necessary libraries
#include <Adafruit_Sensor.h>
#include <DHT.h>
#include <DHT_U.h>
#include <WiFi.h>
#include <ESP32Servo.h>
#define L LOW
#define H HIGH
#define DHTPIN 4
#define DHTTYPE DHT22
#define servoPin 2
#define voiletPin 25
// Since motor is not available in wokwi platform,
// violet led is used instead of motor. However the connections
// remains same for motor if used.

DHT_Unified dht(DHTPIN, DHTTYPE);
uint32_t delayMS;

// Temperature and humidity variables
int temperature = 0;
int humidity = 0;

// SSID and Password for WiFi connection
char SSID[] = "Wokwi-GUEST";
char PASSWORD[] = "";

Servo servo;
```

```
// angle position of servo motor
int deg = 0;

// Setup function - run only once
void setup() {
  Serial.begin(115200);
  WiFi.mode(WIFI_STA);
  WiFi.begin(SSID, PASSWORD);
  pinMode(voiletPin, OUTPUT);
  digitalWrite(voiletPin, LOW);

  // Connecting to WiFi
  Serial.print("Trying to connect to WiFi.");
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println();

  Serial.print("Connected to ");
  Serial.print(SSID);
  Serial.print("(IP Address: ");
  Serial.print(WiFi.localIP());
  Serial.println(")");

  Serial.print("MAC Address: ");
  Serial.println(WiFi.macAddress());

  // DHT22 sensor and Servo motor configuration
  dht.begin();
```

```
  servo.attach(servoPin, 500, 2400);
  sensor_t sensor;
  dht.temperature().getSensor(&sensor);
  Serial.println("------------------------------------");
  Serial.print("Temperature Sensor - Resolution : ");
  Serial.print(sensor.resolution);
  Serial.println("°C");
  Serial.println("------------------------------------");
  dht.humidity().getSensor(&sensor);
  Serial.print("Humidity Sensor - Resolution : ");
  Serial.print(sensor.resolution);
  Serial.println("%");
  Serial.println("------------------------------------");
  delayMS = sensor.min_delay / 1000;

}

// Loop function - run continuously
void loop() {
  // Getting temperature and humidity values at the moment
  sensors_event_t event;
  dht.temperature().getEvent(&event);
  Serial.println("====================================");
  Serial.println("------------------------------------");
  if (isnan(event.temperature))
  {
    temperature = 0;
    Serial.println("Got error while reading temperature!");
  }
  else
```

```
{
  temperature = event.temperature;
  Serial.print("Current Temperature: ");
  Serial.print(event.temperature);
  Serial.println("°C");
}

dht.humidity().getEvent(&event);
if (isnan(event.relative_humidity))
{
  humidity = 0;
   Serial.println("Got error while reading humidity!");
}
else
{
  humidity = event.relative_humidity;
  Serial.print("Current Relative Humidity: ");
  Serial.print(event.relative_humidity);
  Serial.println("%");
}

Serial.println("------------------------------------");

// Controlling tap and motor based on certain conditions
if ( ((temperature < 27)||(temperature == 0)) && ((humidity > 30)||(humidity == 0)) )
{
  digitalWrite(voiletPin, LOW);
  Serial.println("Now tap is closed and irrigation stopped!");
  Serial.println("Also MOTOR IS OFF (Shown by non-glowing voilet led)");
  for (; deg >= 0; deg -= 1)
```

```
    {
      servo.write(deg);
      delay(15);
    }
  }
  else
  {
    digitalWrite(voiletPin, HIGH);
    Serial.println("Now tap is open and irrigation occurs!");
    Serial.println("Also MOTOR IS ON (Shown by glowing voilet led)");
    for (; deg <= 90; deg += 1)
    {
      servo.write(deg);
      delay(15);
    }
  }
  Serial.println("-----------------------------------");
  delay(delayMS + 1000);
}
```

PROGRAM (diagram.json):

```
{
  "version": 1,
  "author": "20L432 - PRADEIP B",
  "editor": "wokwi",
  "parts": [
    { "type": "wokwi-esp32-devkit-v1", "id": "esp", "top": 24.17, "left": 37.5, "attrs": {} },
    {
      "type": "wokwi-dht22",
      "id": "dht1",
```

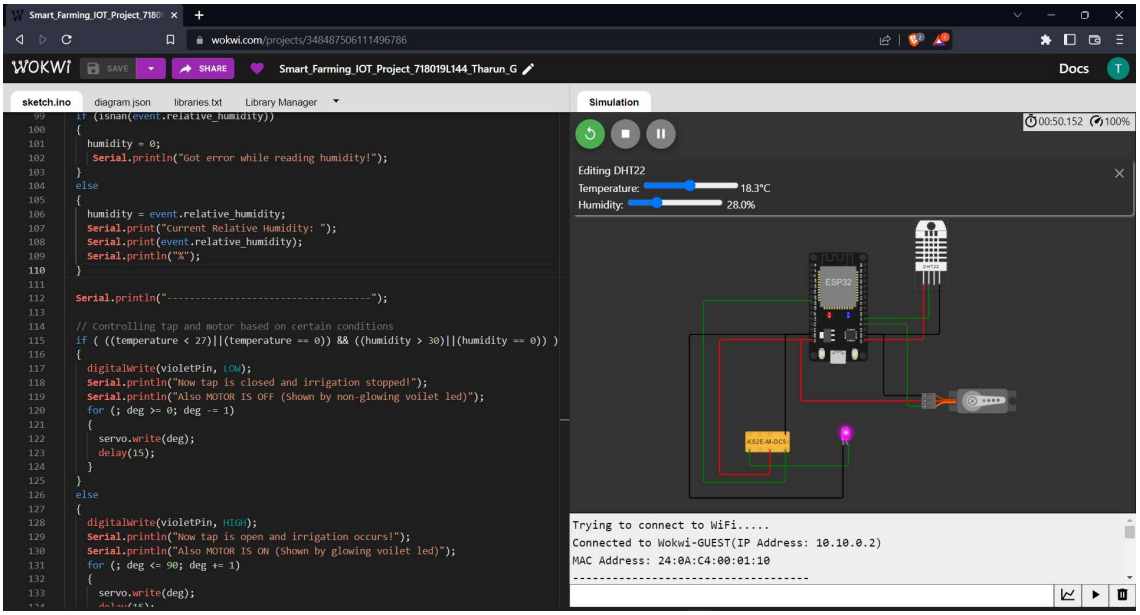
```
      "top": -31.86,
      "left": 228.83,
      "attrs": { "temperature": "18.3", "humidity": "28" }
    },
    { "type": "wokwi-servo", "id": "servo1", "top": 233.1, "left": 240.17, "attrs": {} },
    { "type": "wokwi-ks2e-m-dc5", "id": "relay2", "top": 347.39, "left": -76.55, "attrs": {} },
    {
      "type": "wokwi-led",
      "id": "led2",
      "top": 329.98,
      "left": 83.99,
      "attrs": { "color": "magenta" }
    }
  ],
  "connections": [
    [ "esp:TX0", "$serialMonitor:RX", "", [] ],
    [ "esp:RX0", "$serialMonitor:TX", "", [] ],
    [ "dht1:VCC", "esp:3V3", "red", [ "v0" ] ],
    [ "dht1:GND", "esp:GND.1", "black", [ "v0" ] ],
    [ "dht1:SDA", "esp:D4", "green", [ "v0" ] ],
    [ "esp:GND.1", "servo1:GND", "black", [ "h33.39", "v113.33" ] ],
    [ "esp:D2", "servo1:PWM", "green", [ "h75.75", "v51.61" ] ],
    [ "servo1:V+", "esp:VIN", "red", [ "h-217.1", "v-110.54" ] ],
    [ "relay2:P1", "esp:VIN", "red", [ "v44.28", "h-90.57", "v-237.11" ] ],
    [ "relay2:COIL2", "esp:GND.2", "black", [ "v0" ] ],
    [ "relay2:COIL1", "esp:D25", "green", [ "v58.68", "h-147.17", "v-326.38", "h17.28" ]
],
    [ "led2:A", "relay2:NO1", "green", [ "v36.98", "h-199.63" ] ],
    [ "led2:C", "esp:GND.2", "black", [ "v94.72", "h-276.21", "v-293.53" ] ]
  ]
}
```

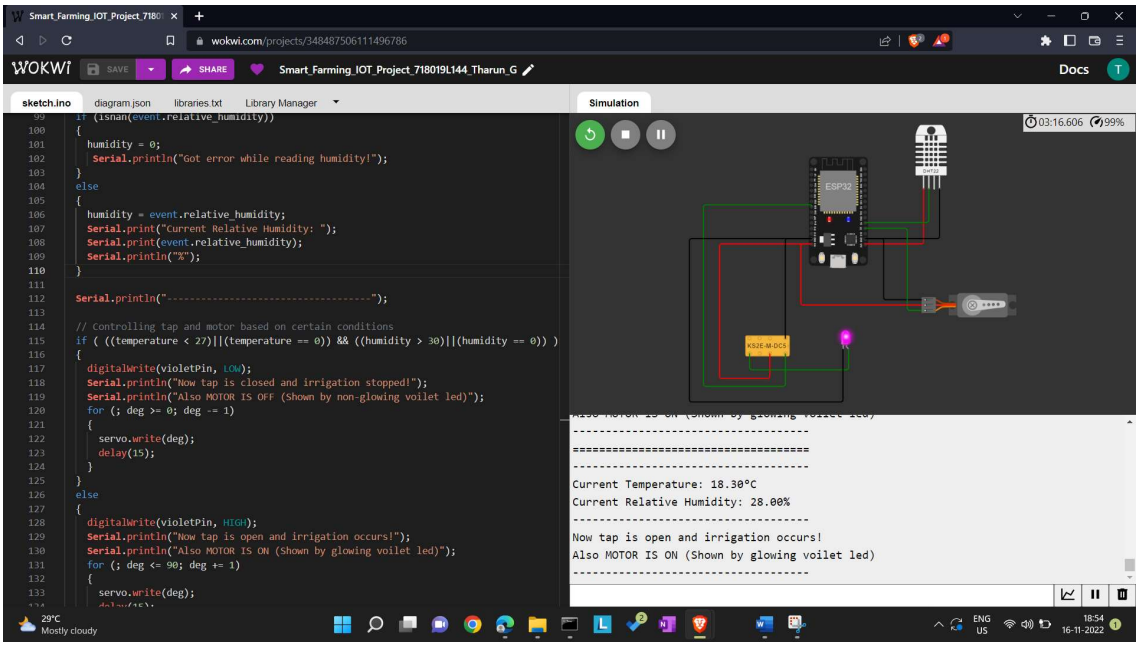
SERIAL MONITOR:

```
Trying to connect to WiFi.....
Connected to Wokwi-GUEST(IP Address: 10.10.0.2)
MAC Address: 24:0A:C4:00:01:10
-----------------------------------
Temperature Sensor - Resolution : 0.10°C
-----------------------------------
Humidity Sensor - Resolution : 0.10%
-----------------------------------
===================================
-----------------------------------
Current Temperature: 18.30°C
Current Relative Humidity: 28.00%
-----------------------------------
Now tap is open and irrigation occurs!
i.e. MOTOR IS ON (Shown by glowing voilet led)
-----------------------------------
===================================
-----------------------------------
```

OUTPUTS:

- From the below screenshot, we can understand that the ESP32 gets connected to WiFi and since humidity is less than threshold (30%), the tap is open and the motor is turned on i.e. violet led glows.





- In below screenshot, since the both temperature and humidity are in acceptable ranges, the tap is closed and the motor is turned off i.e. violet led does not glow.