



Intelligent System

ISYS101

Semester 1. Academic Year 2022-2023

Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

Student Name	Alonso, Laira Gayeta, Junedale Ulat, Roma Alyanna M.	ID #
---------------------	---	-------------

Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

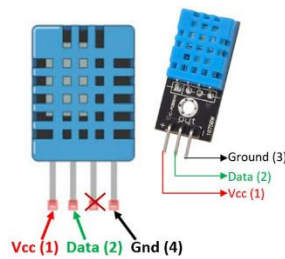
I. INTRODUCTION

In this lab, we will learn how to interface DHT11 with the ESP32 DevKit Development Board. With ESP32, you can build a Web-based Temperature and Humidity Monitoring System using DHT11 or DHT22 sensors. In addition, the DHT11 sensor is used to create a simple ESP32 Web Server that continuously displays humidity and temperature data.

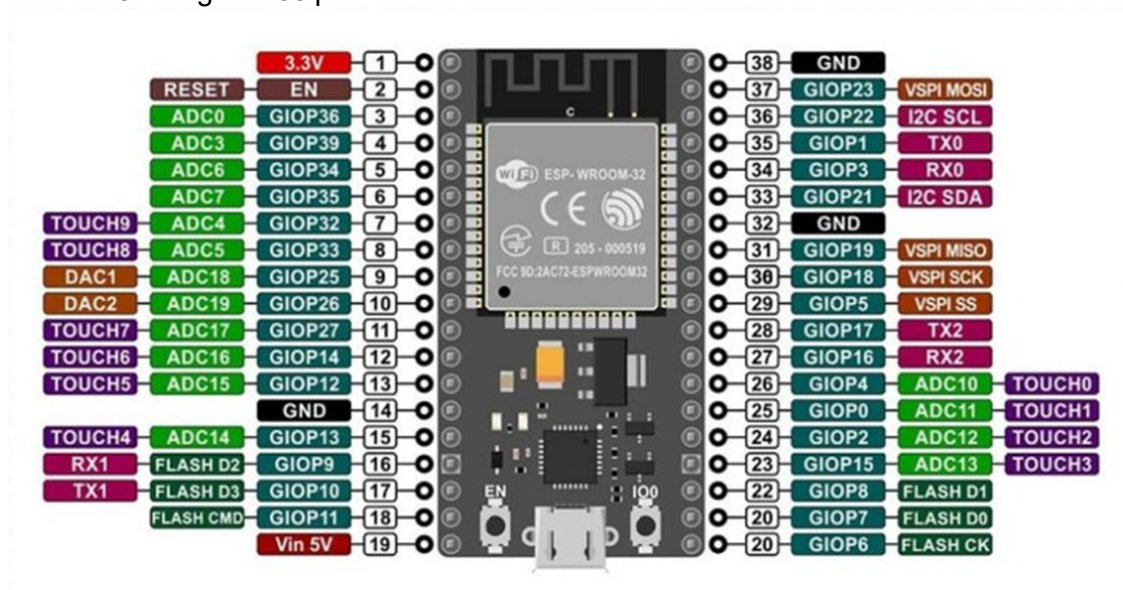
The DHT11 digital temperature and humidity sensors are very inexpensive and of a basic design. It measures the surrounding air using a capacitive humidity sensor and a thermistor and outputs a digital signal on the data pin (no analog input pins are required). While it's fairly simple to operate, it requires careful timing to capture data. When using the library from Adafruit, sensor readings can be up to 2 seconds old when the latest data is available once every 2 seconds.

Pin Diagram DHT11

The following image shows the pins of DHT 11



ESP32 Diagram 38 pins



Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

II. AIMS

- Create an ESP32 web server that displays temperature and humidity data from sensor
- Learn how to wire DHT temperature sensors to GPIO on ESP32
- Write sketch code to interact with the DHT sensor

III. RISK AND SAFETY WARNING

Always bear in mind the LABORATORY / WORKSHOP SAFETY RULES

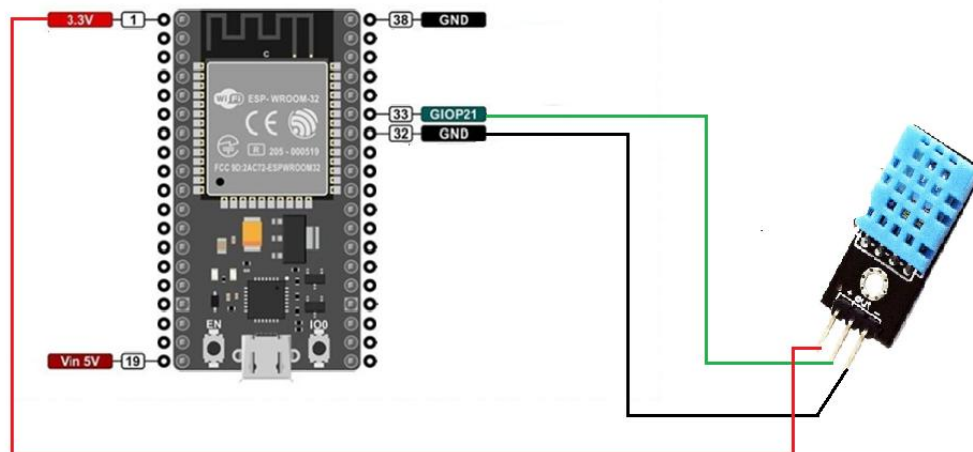
IV. TOOLS / EQUIPMENT/ SKILLS TESTING

- 1 x ESP32 and USB cable
- 6 x 5mm/3mm Red LED
- 1 x 220 Ω resistor or 330 ohms
- 1 x breadboard
- DHT11

V. PROCEDURE / RESULTS

Task 1. DHT11 and ESP32 wiring

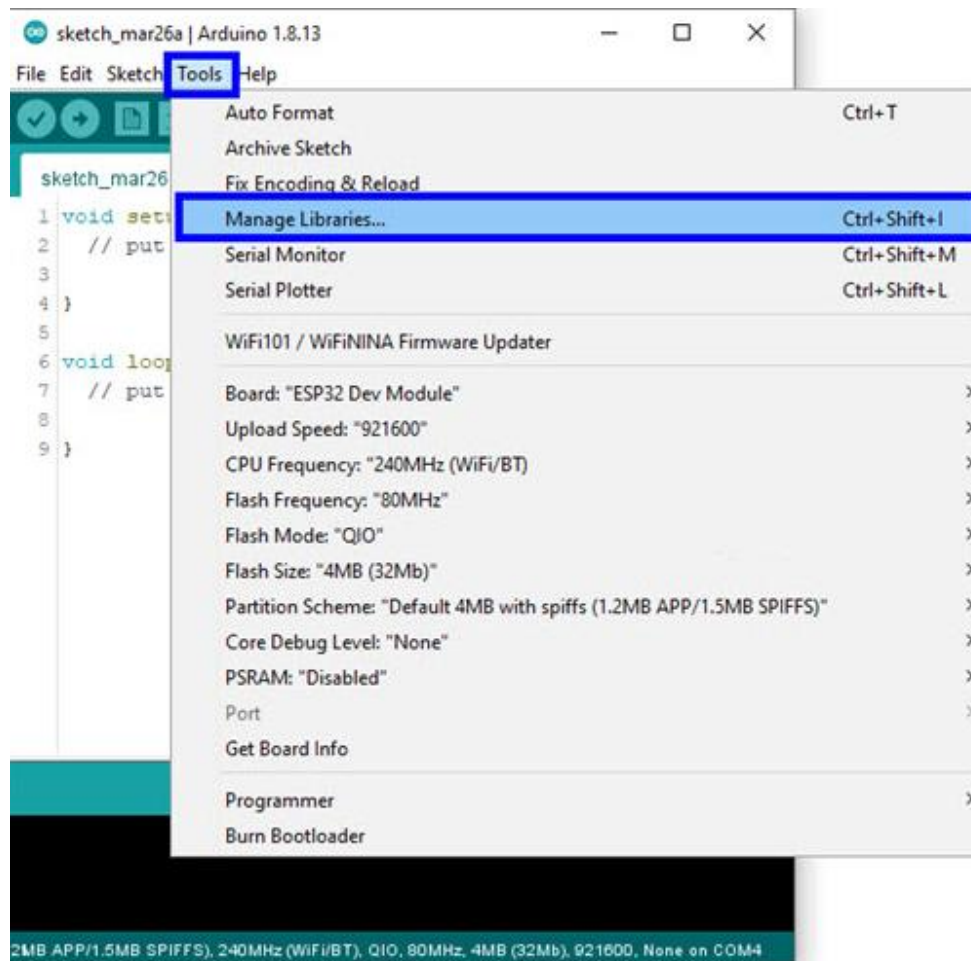
Circuit Diagram



Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

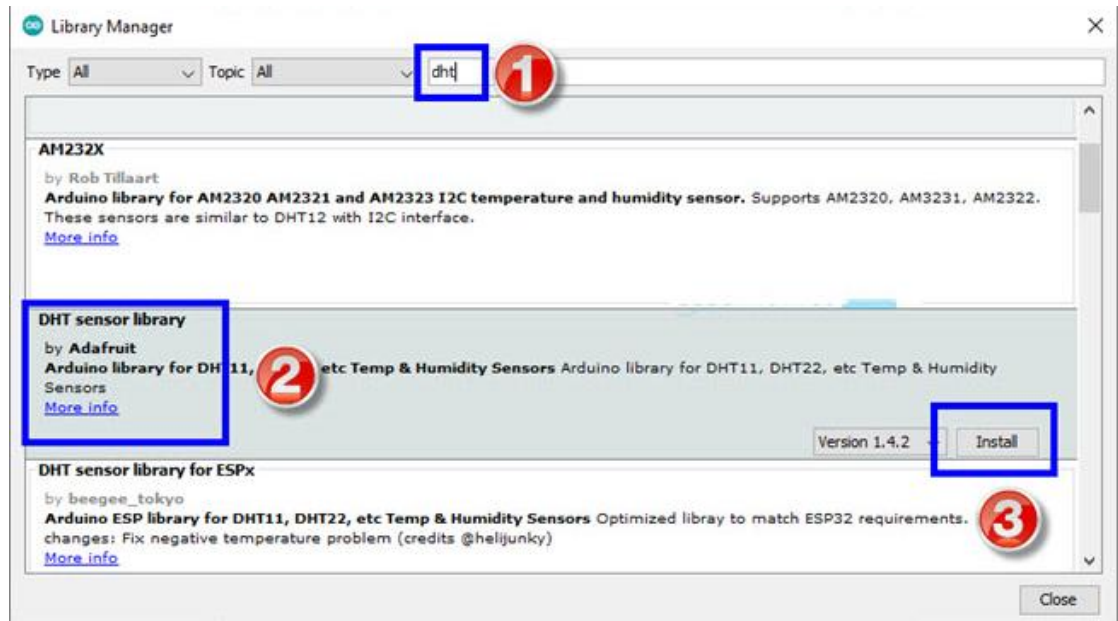
Preparing Arduino IDE

Need to download a couple of libraries so that ESP32 will properly communicate with DHT11 Sensor. First is the main DHT11 Sensor Library. Go to Tools -> Manage Libraries... in Arduino IDE.

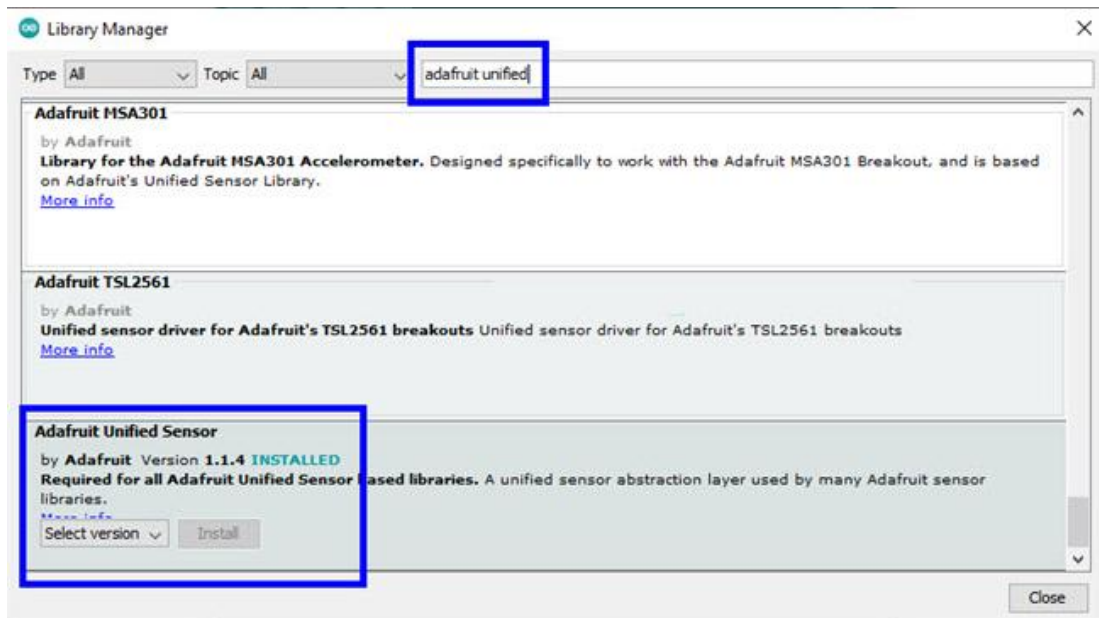


Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

In the search bar, enter 'DHT'. Scroll through the options and install the 'DHT sensor library' by Adafruit.



The next library is associated with the Adafruit itself. Search for 'adafruit unified', scroll down and install the 'Adafruit Unified Sensor' library.



Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

Sample code:

```
#include <DHT.h>
#define DHT_SENSOR_PIN 21 // ESP32 pin GPIO21 connected to DHT11 sensor
#define DHT_SENSOR_TYPE DHT11

DHT dht_sensor(DHT_SENSOR_PIN, DHT_SENSOR_TYPE);

void setup() {
  Serial.begin(9600);
  dht_sensor.begin(); // initialize the DHT sensor
}

void loop() {
  // read humidity
  float humi = dht_sensor.readHumidity();
  // read temperature in Celsius
  float tempC = dht_sensor.readTemperature();
  // read temperature in Fahrenheit
  float tempF = dht_sensor.readTemperature(true);

  // check whether the reading is successful or not
  if (isnan(tempC) || isnan(tempF) || isnan(humi)) {
    Serial.println("Failed to read from DHT sensor!");
  } else {
    Serial.print("Humidity: ");
    Serial.print(humi);
    Serial.print("%");

    Serial.print("  |  ");

    Serial.print("Temperature: ");
    Serial.print(tempC);
    Serial.print("°C ~ ");
    Serial.print(tempF);
    Serial.println("°F");
  }

  // wait 2 seconds between readings
  delay(2000);
}
```

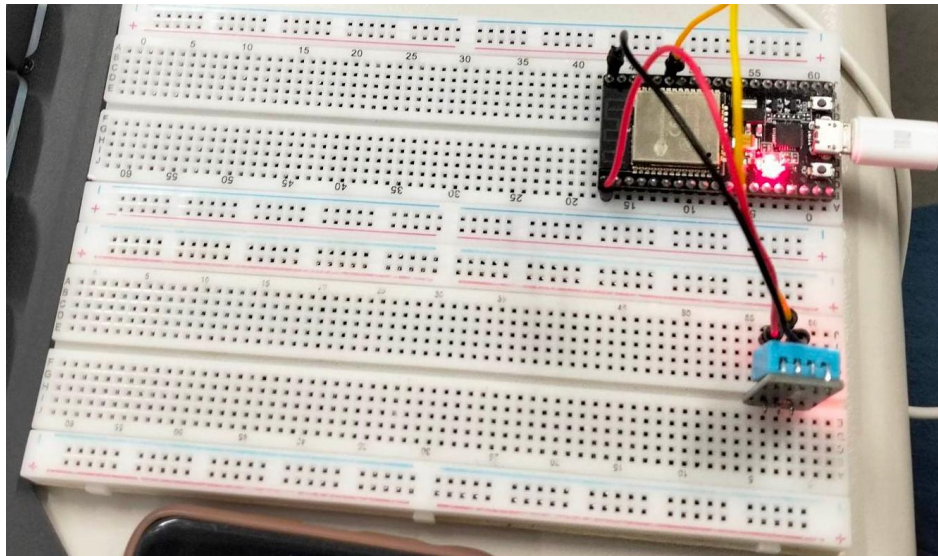
Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

Proof of performing task 1:

A.) Link for video -

https://drive.google.com/file/d/1rLDc72Pap6bytan6HBXStl2S88fp1ZWH/view?usp=share_link

B.) Picture



VI. Skill Test:

Write a sketch program that will display on the serial monitor the following conditions:

- If the temperature is less than 20 Celcius, display “cold”
- If the temperature is less than 30 Celcius, display “warm”
- If the temperature is more than 30 Celcius, display “Hot”

Answers:

A.) Code

```
#include <DHT.h>
#define DHT_SENSOR_PIN 21 // ESP32 pin GIOP21 connected to DHT11 sensor
#define DHT_SENSOR_TYPE DHT11
```

```
DHT dht_sensor(DHT_SENSOR_PIN, DHT_SENSOR_TYPE);
```

```
void setup() {
  Serial.begin(115200);
```


Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

```
dht_sensor.begin(); // initialize the DHT sensor
}

void loop() {

    float tempC = dht_sensor.readTemperature();

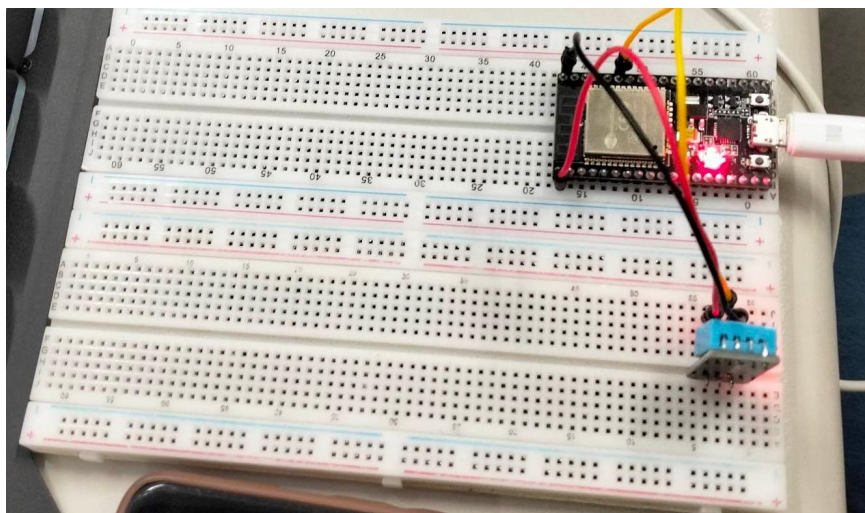
    // check whether the reading is successful or not
    if (isnan(tempC)) {
        Serial.println("Failed to read from DHT sensor!");
    } else {
        if(tempC < 20){
            Serial.println("cold");
        }
        else if (tempC < 30){
            Serial.println("warm");
        } else {
            Serial.println("hot");
        }
    }
}

// wait 2 seconds between readings
delay(2000);
}
```

B.) Link for video -

https://drive.google.com/file/d/1y6RqstvLoOu2KQBEdRWQ3B02ABeUwyYr/view?usp=share_link

C.) Picture



Experiment # 4 DHT 11 (Temp. and Humidity Sensor)

VII. CONCLUSIONS (Write below, the main concepts / main ideas that you have learned after performing each of the tasks in the exercise.)

For this activity, we learned how to connect DHT11 to the ESP32 DevKit Development Board. One can use DHT11 sensors with ESP32 to create a web-based temperature and humidity monitoring system. Additionally, the DHT11 sensor is used to build a basic ESP32 Web Server that continuously shows temperature and humidity data. When utilizing the Adafruit library, sensor readings could be up to two seconds old when the most recent data is only available once every 2 seconds. For the task 1 and skill test, we were able to display the needed output. Task 1 displays the humidity and temperature on the serial monitor. Skill test displays whether the temperature is warm, cold, or hot on the serial monitor. While doing the tasks, we did not encounter any problems. We were able to create a code that will read and display the needed output from DHT sensor.

REFERENCE

www.arduino.cc
<http://www.esp32learning.com/>