DHT11 Exploration Project

By: Ahmed Elag (210510030)

1. Overview

This project demonstrates how to interface a DHT11 temperature/humidity sensor with a Raspberry Pi. When sensor readings exceed (temperature > 30°C or humidity > 60%), the Raspberry Pi triggers a Red LED and prints a warning message to the terminal. Otherwise, a Green LED lights up and the script prints normal temperature and humidity readings.

2. Hardware & Wiring

- **Raspberry Pi**
- **DHT11 Sensor**

  -VCC –> 3.3 V

  -DATA –> GPIO4 (BCM)

  -GND –> Pi's GND

  -A 10 kΩ resistor between DATA and VCC for pull-up

- **Green LED** GPIO20(BCM):
  -GPIO20 –> 220 ohm resistor –> LED anode –> LED cathode –> GND
- **Red LED** GPIO21(BCM):

  -GPIO21 –> 220 ohm resistor –> LED anode –> LED cathode –> GND

3. Software Requirements

- Raspberry Pi OS (Debian-based)
- Python 3
- Adafruit_DHT library (install with):

```
sudo apt-get update
sudo apt-get install python3-pip
sudo pip3 install Adafruit_DHT
```

4. How to Run

1. Connect your Raspberry Pi to the internet (needed to install any missing packages).
2. Wire the DHT11 sensor and LEDs as described.
3. Run it by typing: `python exploration.py`
4. Every second, the script checks the sensor:

   -If the temperature is above 30°C or the humidity is above 60%, it lights the Red LED and prints a warning.

   -Otherwise, it lights the Green LED and prints normal readings.

5. Challenges & Issues Encountered

- **Accuracy**: The DHT11 is less accurate than the DHT22 and has a narrower measurement range.
- **Pull-Up Resistor**: The raw DHT11 module did not include a built-in resistor, so I had to add a 10 kΩ pull-up between DATA and VCC (3.3v).
- **Library Installation**: Needed an internet connection to install the `Adafruit_DHT` Python library.

6. References

1. How to Set Up the DHT11 on the Raspberry Pi

   -Provided a straightforward wiring diagram and a sample Python script for testing.

2. Raspberry Pi with DHT11/DHT22

   -Includes clear explanations of the differences between DHT11 and DHT22, along with code samples.

3. Raspberry Pi Documentation - Configuration

   -Explains how to configure various settings on the Raspberry Pi, including network and other system options that were useful for installing libraries.

4. DATASHEET

   -This is the datasheet for my specific device that I used, it is useful because it shows the specifications of it such as voltage, current, etcetera.

7. Video Demonstration

- This is my video and it shows the setup in action. It displays normal temperature/humidity readings with the Green LED lit, and triggers the Red LED plus a warning message when the temperature or humidity crosses the threshold.
- For a more integrated setup that is more meaningful, please refer to my integration project which is shown in this link

Conclusion

This simple project goes beyond the basic “print temperature” example by adding a threshold-based LED alert and a clear warning message. It demonstrates the fundamental steps of reading from a DHT11 on a Raspberry Pi, handling a pull-up resistor for a raw sensor module, and installing the Adafruit_DHT library.