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8. Temperature station (Celsius, Fahrenheit)

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Experiment 8: Temperature station (Celsius, Fahrenheit)

Short Description

Create a Temperature station that turns on a red LED when it is hot and a blue LED when it is cold, with Raspberry Pi Pico and DHT11 digital temperature and humidity sensor.

Extended Description

The Raspberry Pi Pico Temperature Station is a small-scale project designed to monitor temperature using the DHT11 digital temperature and humidity sensor. This project utilizes the Raspberry Pi Pico microcontroller board to read temperature data from the sensor and control the illumination of LEDs based on the temperature readings.

By incorporating two LEDs, a red LED for indicating hot temperatures and a white LED for cold temperatures, this temperature station provides a visual representation of the current temperature. The LEDs will be controlled by the Raspberry Pi Pico, which will process the temperature readings from the DHT11 sensor and determine which LED to illuminate accordingly.

This project aims to demonstrate how to interface a DHT11 sensor with the Raspberry Pi Pico and use it to create a simple temperature monitoring system.

Objectives:

Through this activity, the user will experiment with building a temperature system using the Raspberry Pi Pico board and DHT11 digital temperature and humidity Sensor. The user will acquire knowledge on:

- The ability of a DHT11 digital temperature and humidity Sensor to detect temperature and humidity.
- The basics of programming in Python and how to write code to control the Raspberry Pi Pico board.
- The principles of circuit design and how to wire components together on a rapid prototyping board to create a functional reversing radar system.

By completing this project, the user will better understand electronics, engineering, and programming. They will also have a practical and useful device that they can use to monitor the temperature conditions and notify when it is hot or cold.

Materials to be used:

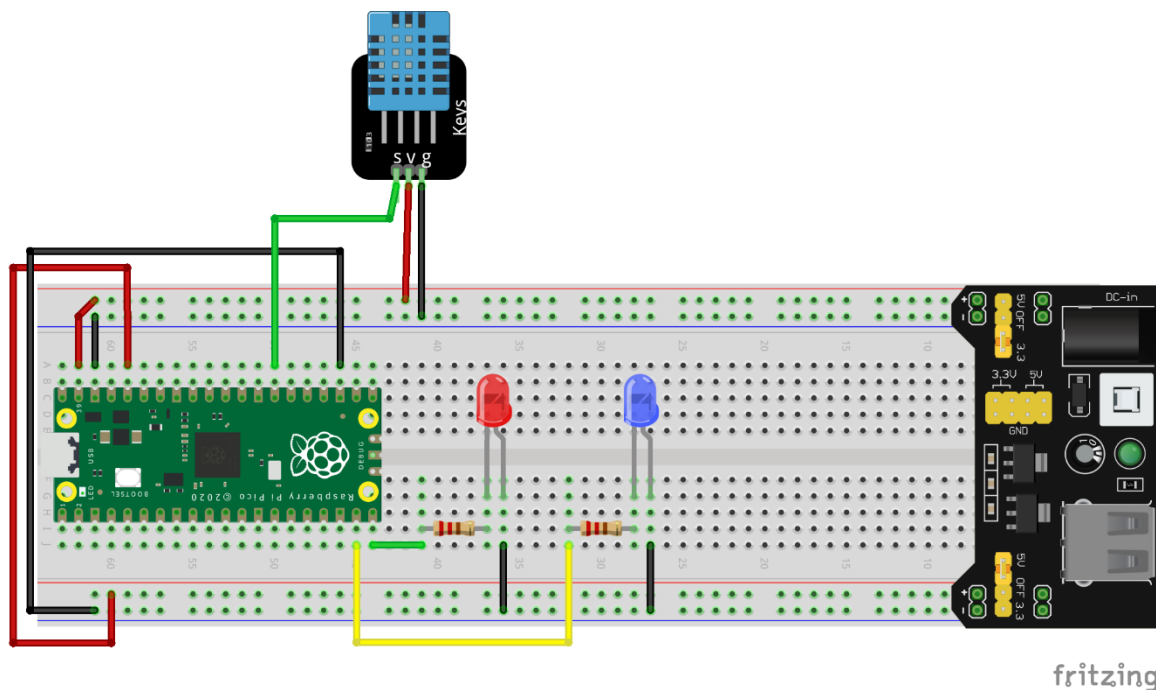
- 1 x Raspberry Pi Pico
- 1 x Pico breadboard kit

- 1 x Full-size breadboard
- 1 x DHT11 digital temperature and humidity sensor
- 2 x 220 Ohm resistor
- 1 x Blue LED
- 1 x Red LED
- Jumper wires

Steps to be followed:

1. Connect the VCC pin of the DHT11 sensor to the 3.3V pin on the Raspberry Pi Pico.
2. Connect the GND pin of the DHT11 sensor to the GND pin on the Raspberry Pi Pico.
3. Connect the DATA pin of the DHT11 sensor to any GPIO pin on the Raspberry Pi Pico. For this example, let's use GPIO pin 21.
4. Connect the cathode (shorter leg) of the red LED to GPIO pin 15 on the Raspberry Pi Pico using a 220-ohm resistor.
5. Connect the cathode (shorter leg) of the white LED to GPIO pin 14 on the Raspberry Pi Pico using a 220-ohm resistor.
6. Connect the anode (longer legs) of both LEDs to the 3.3V pin on the Raspberry Pi Pico.

Wiring diagram





Code

```
from machine import Pin
from time import sleep
import dht

sensor = dht.DHT11(Pin(21))

led_red = Pin(14, Pin.OUT)
led_white = Pin(15, Pin.OUT)

while True:
    sensor.measure()
    temp = sensor.temperature()
    fahr = temp * (9/5) + 32
    hum = sensor.humidity()
    print("Room temperature: ", temp, "Celsius")
    print("Room temperature: ", fahr, "Fahrenheit")
    print("Room humidity:", hum, "%")

    if temp > 40:
        led_red.on()
        led_white.off()
    else:
        led_red.off()
        led_white.on()

    sleep(2)
```