

The background features a light blue central area with red and gold geometric shapes at the top and bottom. A large gold triangle points downwards from the top edge. A red diamond shape is centered in the lower half of the page.

Individueel Project

IOT ESSENTIALS

YORICK PEETERS

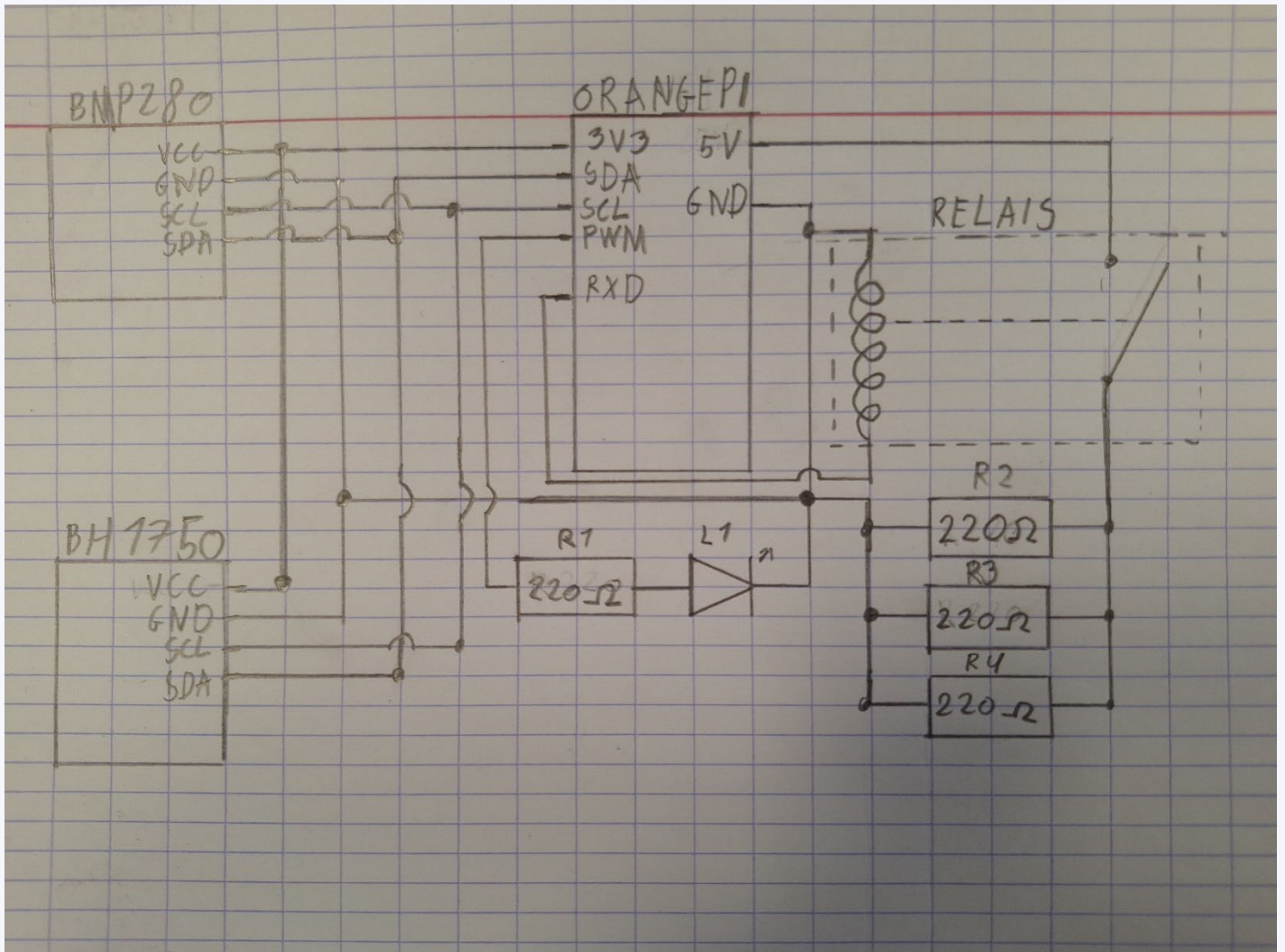
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2023 - 2024

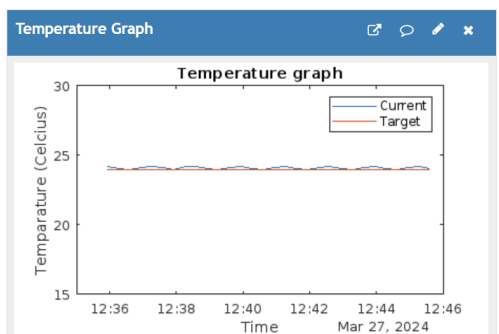
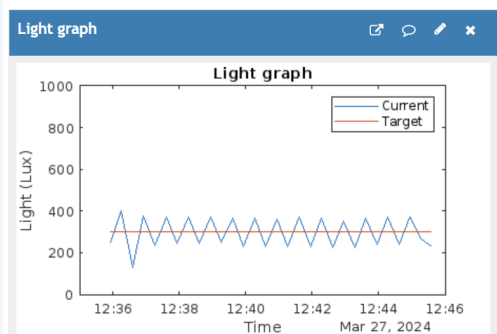
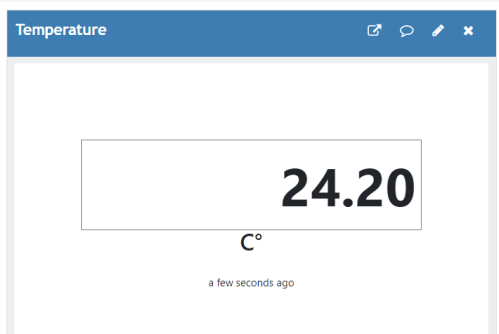
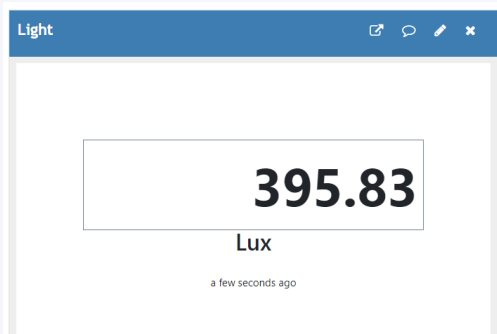
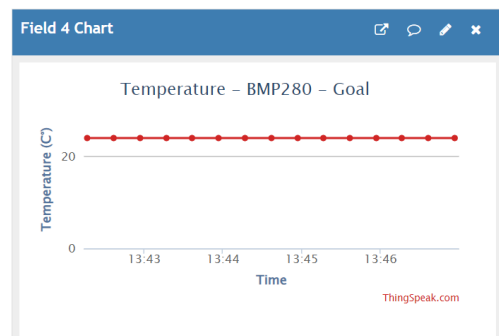
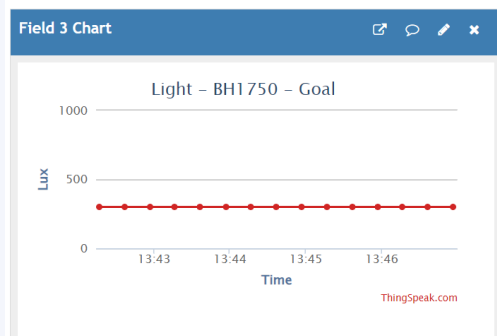
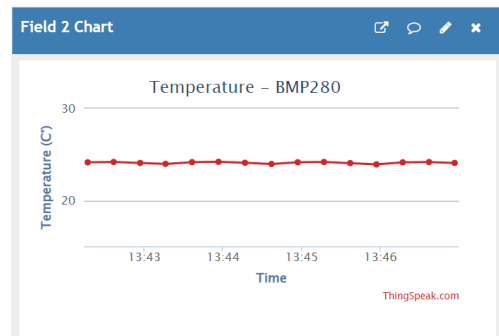
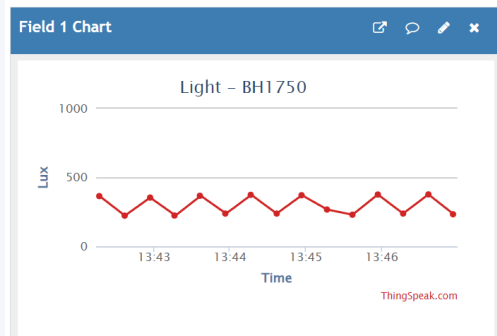
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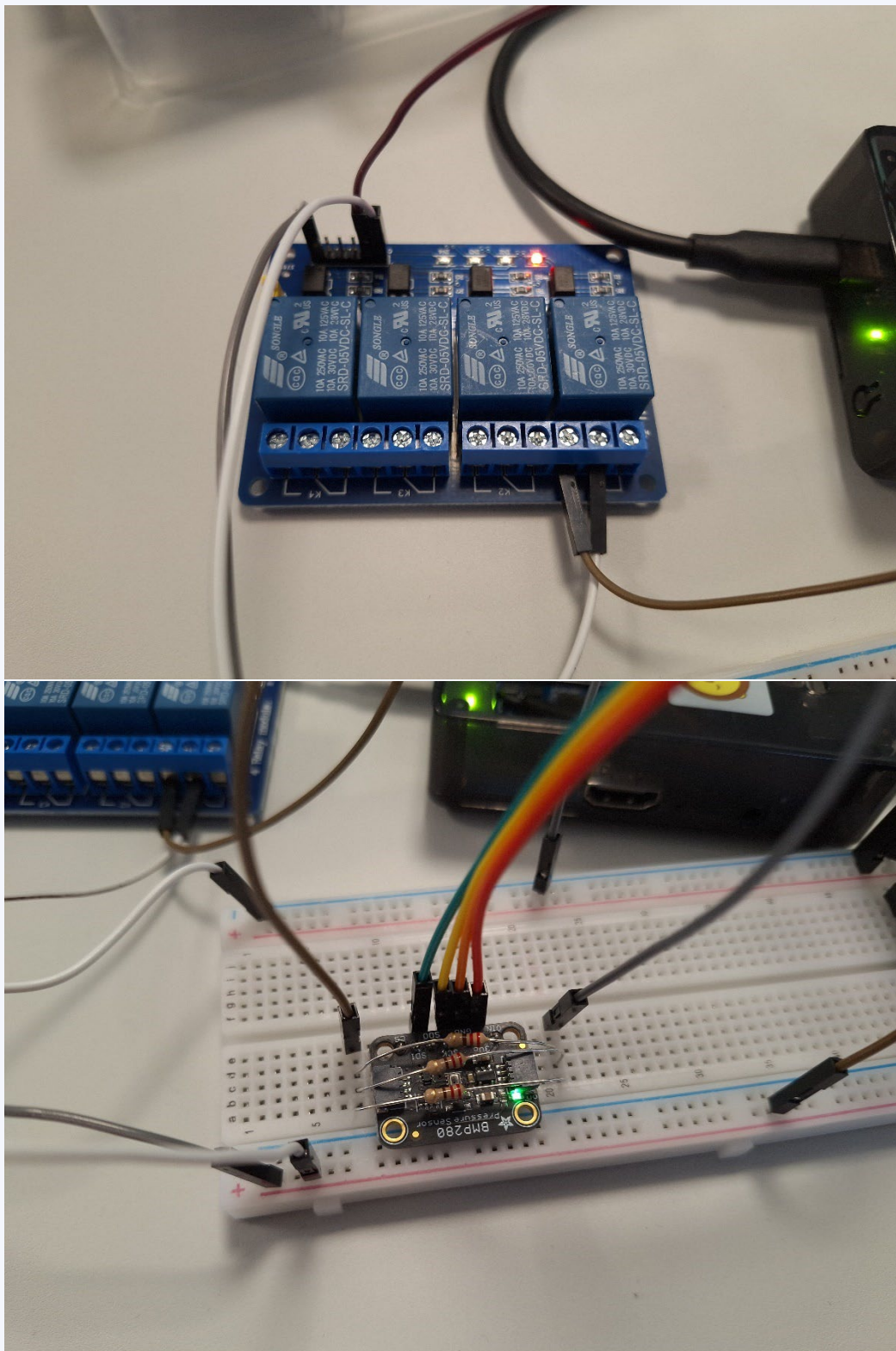
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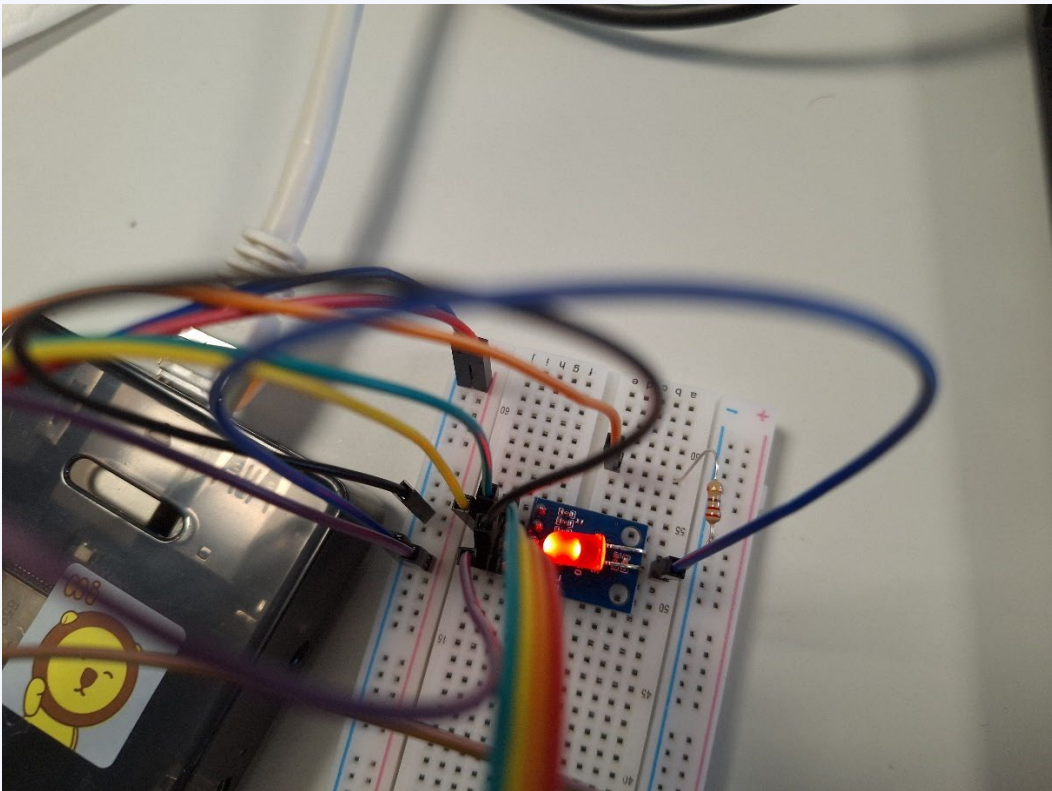
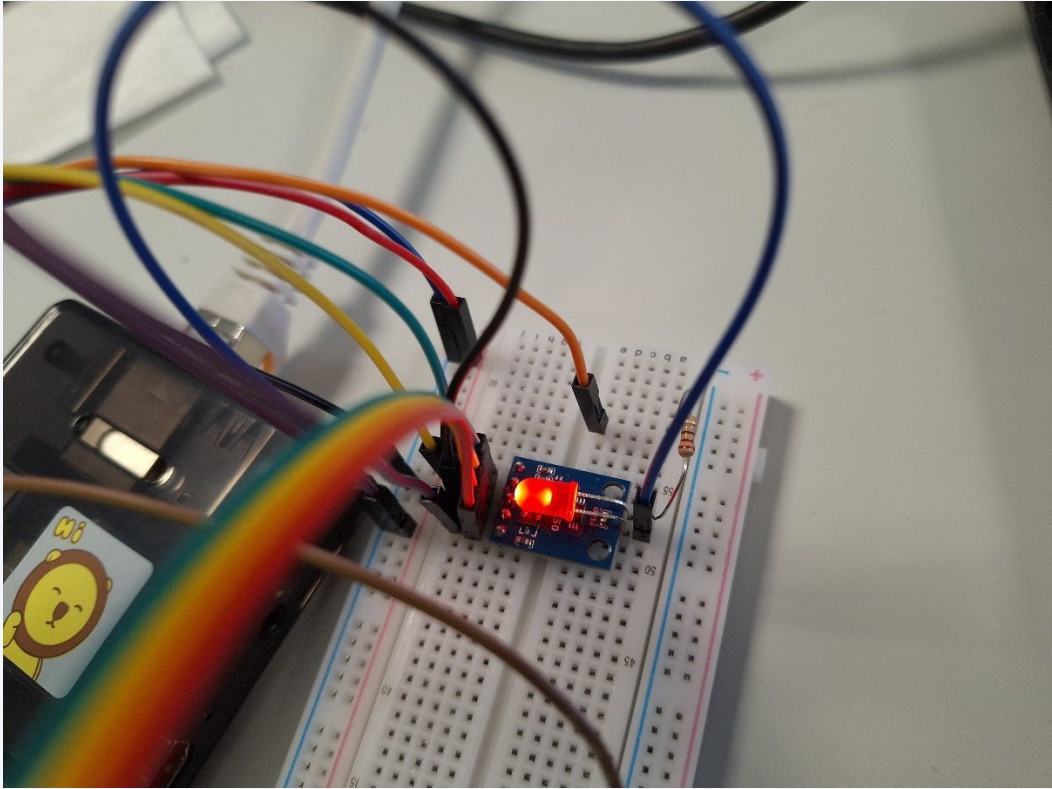
1. Schematic

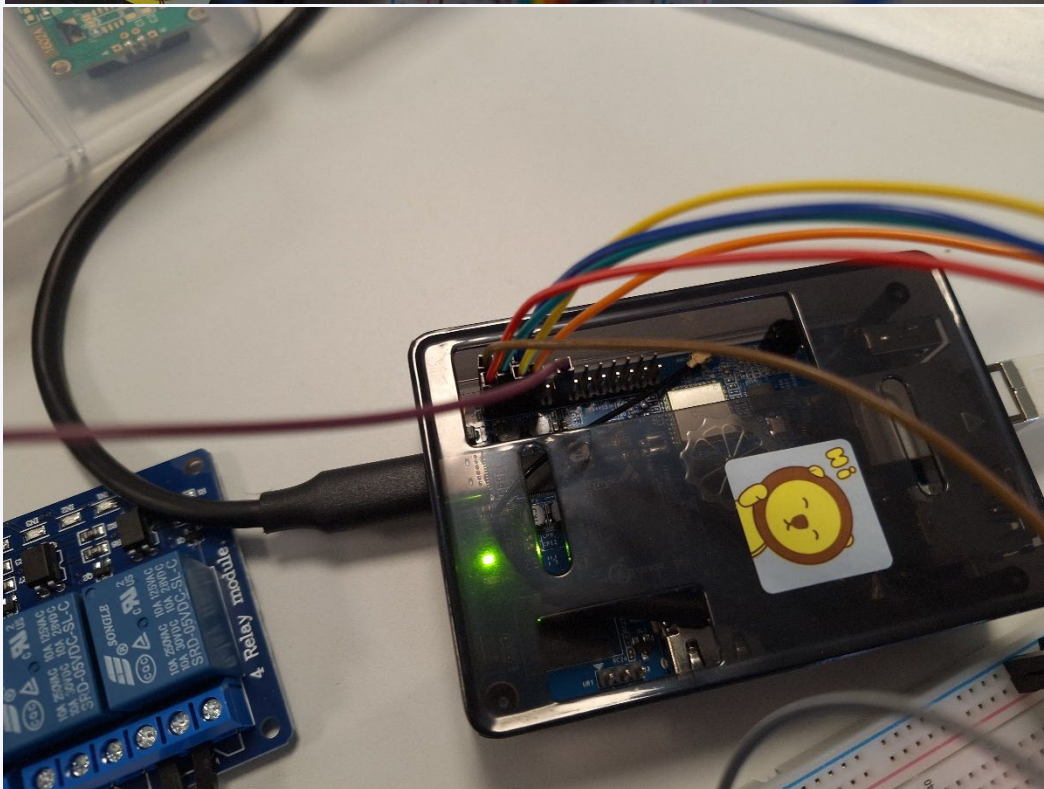
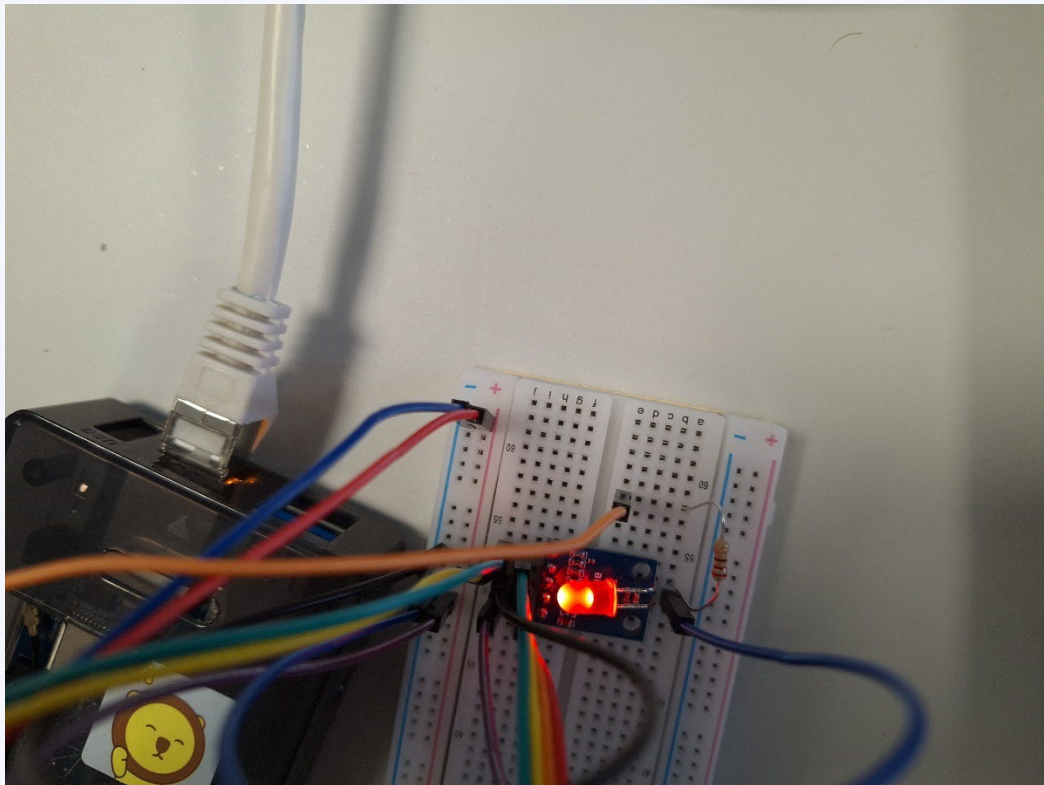


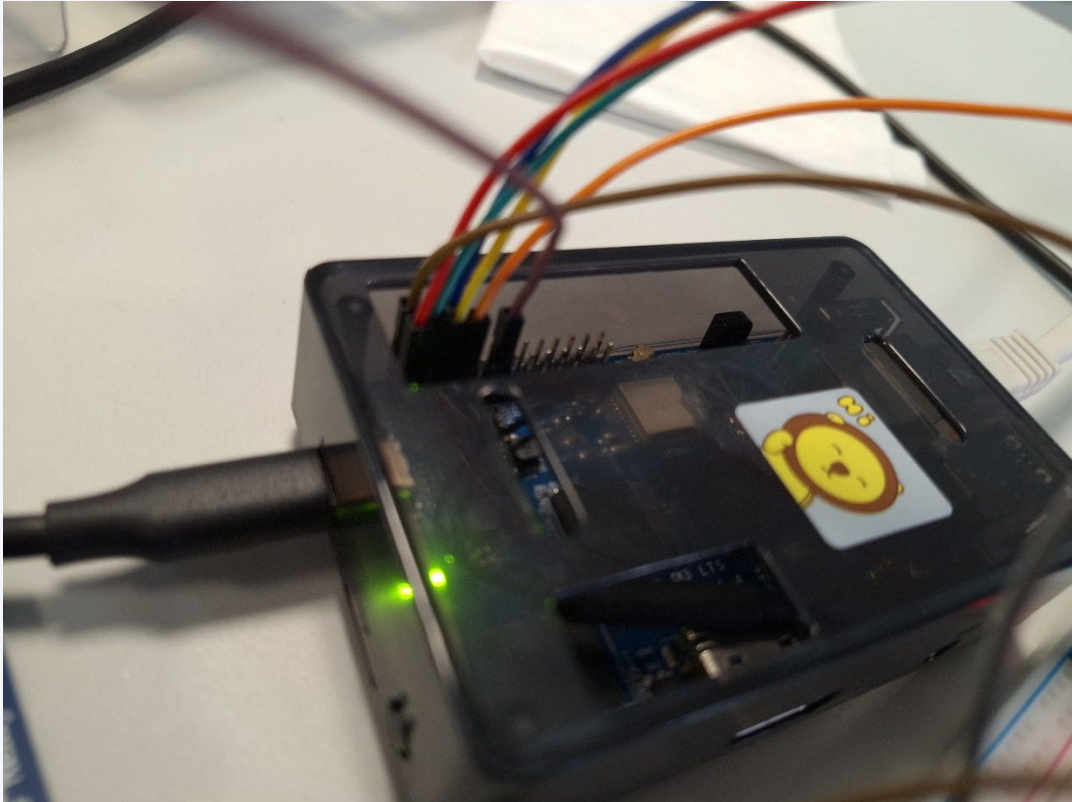
2. Pictures & Screenshots











3. Description

3.1. Code

3.1.1. OrangePI

```
import time
from bmp280 import BMP280
from smbus2 import SMBus, i2c_msg
import paho.mqtt.client as mqtt
import wiringpi

# Function
def getLux(bus, address):
    write = i2c_msg.write(address, [0x10])
    read = i2c_msg.read(address, 2)
    bus.i2c_rdwr(write, read)
    bytesRead = list(read)
    return (((bytesRead[0] & 3) << 8) + bytesRead[1]) / 1.2

# Constants
interval = 20
pinLedLight = 2
pinRelay = 5
# Vragen goal Light & Temp
goalLight = int(input("What is the goal for the light? (In Lux) "))
goalTemp = int(input("What is the goal for the temperature? (In Celsius) "))

# Declaration variables
lux = 0
temperature = 0

# Setting up WiringPI & LED's
wiringpi.wiringPiSetup()
wiringpi.softPwmCreate(pinLedLight, 0, 100)
wiringpi.pinMode(pinRelay, wiringpi.OUTPUT)

# Setup BH1750
bus = SMBus(0)
bh1750Address = 0x23

# Setup BMP280
bmp280Bus = SMBus(0)
bmp280Address = 0x77
bmp280 = BMP280(i2c_addr=bmp280Address, i2c_dev=bmp280Bus)
```

```

# MQTT Configuration
MQTT_HOST = "mqtt3.thingspeak.com"
MQTT_PORT = 1883
MQTT_KEEPALIVE_INTERVAL = 60
MQTT_TOPIC = "channels/2459550/publish"
MQTT_CLIENT_ID = "KQwEOggKARI7NjAWGikSOy0"
MQTT_USER = "KQwEOggKARI7NjAWGikSOy0"
MQTT_PWD = "RWoBuMTHgQNTm8BMQBTchjiC"

# MQTT Callbacks
def onConnect(client, userdata, flags, rc):
    if rc == 0:
        print("Connected OK with result code " + str(rc))
    else:
        print("Bad connection with result code " + str(rc))

def onDisconnect(client, userdata, flags, rc=0):
    print("Disconnected result code " + str(rc))

def onMessage(client, userdata, msg):
    print("Received a message on topic: " + msg.topic + "; message: " +
msg.payload)

# Set up MQTT Client
client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1, MQTT_CLIENT_ID)
client.username_pw_set(MQTT_USER, MQTT_PWD)

# Connect callback handlers to client
client.on_connect = onConnect
client.on_disconnect = onDisconnect
client.on_message = onMessage

print("Attempting to connect to %s" % MQTT_HOST)
client.connect(MQTT_HOST, MQTT_PORT)
client.loop_start()

# Main Loop
try:
    while True:
        print()
        # Measure Lux
        lux = round(getLux(bus, bh1750Address), 2)
        print("Lux:", lux)

        # Adjust LED brightness based on light difference from goal
        goalLightDifference = round(lux - goalLight, 2)

```

```

    if goalLightDifference >= 100:
        lightBrightness = 0
    elif goalLightDifference >= 45:
        lightBrightness = 30
    elif -10 <= goalLightDifference <= 10:
        lightBrightness = 50
    elif goalLightDifference <= -45:
        lightBrightness = 70
    elif goalLightDifference <= -100:
        lightBrightness = 100
    wiringpi.softPwmWrite(pinLedLight, lightBrightness)

    # Measure Temperature
    temperature = round(bmp280.get_temperature(), 2)
    print("Temperature:", temperature)

    # Turn on heating based of temperature
    if temperature > goalTemp:
        wiringpi.digitalWrite(pinRelay, 1)
    else:
        wiringpi.digitalWrite(pinRelay, 0)

    # Publish MQTT Data
    try:
        print("Start pushes")
        MQTT_data = "field1=" + str(lux) + "&field2=" + str(temperature) +
"&field3=" + str(goalLight) + "&field4=" + str(goalTemp)+
"&status=MQTTPUBLISH"
        client.publish(topic=MQTT_TOPIC, payload=MQTT_data, qos=0,
retain=False, properties=None)
        time.sleep(interval)
        print("Pushed item")
    except OSError as e:
        print("Error publishing MQTT data:", e)
        client.reconnect()
except KeyboardInterrupt:
    print("\nExiting program")

```

3.1.2. Graph Light

```

%% Intialise constants %%
readChannelID = 2459550;
fieldID1 = 1;
fieldID2 = 3;
readAPIKey = 'W15QW8CKOQQHHI1D';

```

```

%% Read data from fields %%
[data, time] = thingSpeakRead(readChannelID, 'Field', fieldID1, 'NumPoints',
15, 'ReadKey', readAPIKey);
[target_data, time2] = thingSpeakRead(readChannelID, 'Field', fieldID2,
'NumPoints', 15, 'ReadKey', readAPIKey);

%% Visualize Data Light %%
plot(time, data, time2, target_data);
legend({'Current', 'Target'});
xlabel('Time');
ylabel('Light (Lux)');
title('Light graph');
ylim([-50 100]);

```

3.1.3. Graph Temperature

```

%% Intialise constants %%
readChannelID = 2459550;
fieldID1 = 2;
fieldID2 = 4;
readAPIKey = 'W15QW8CKOQQHHI1D';

%% Read data from fields %%
[data, time] = thingSpeakRead(readChannelID, 'Field', fieldID1, 'NumPoints',
15, 'ReadKey', readAPIKey);
[target_data, time2] = thingSpeakRead(readChannelID, 'Field', fieldID2,
'NumPoints', 15, 'ReadKey', readAPIKey);

%% Visualize Data Temperature %%
plot(time, data, time2, target_data);
legend({'Current', 'Target'});
xlabel('Time');
ylabel('Temperature (Celcius)');
title('Temperature graph');
ylim([-5 25]);

```

3.2. Self evaluation

Item	Max	My score	Motivation
Data on terminal	2	2	Per lezing van de data print ik ook al de waardes in de terminal venster. Er wordt ook gevraagd naar de gewenste lux waarde en temperatuur.
Data on dashboard	4	4	In de infinite loop ga ik de data versturen per onderdeel en komt op een grafiek op Thingspeak te staan.
Set goals	2	2	Op Thingspeak heb ik de goals gepushed en in een grafiek gestoken voor ze dan in een gezamenlijke grafiek te plaatsen. Er wordt ook gevraagd naar de gewenste lux waarde en temperatuur.
Control light	4	4	Wanneer er te veel licht is zal het led uitgaan en als er te weinig, gaat het aan. Het zal dus rond de gewenste lux regelen.
Control temperature	4	4	De temperatuur wordt aangestuurd door de stroom die er door de weerstanden gaan.
Close the loop	4	4	De code zal bij het begin van de loop de waarden lezen en dan al proberen corrigeren voor de volgende lezing.
Total	20	20	De reden voor mijn cijfer dat ik denk dat ik zou moeten krijgen is dat ik de temperatuur en het licht inval kan regelen. Er zijn ook geen problemen met de waardes naar Thingspeak te sturen en ze samen op 1 grafiek te plaatsen.

3.3. Video

<https://www.youtube.com/watch?v=MUXtueDuo9M>



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