IoT exercises – Week 3

This week, we will connect a sensor with NodeMCU/ESP8266 and read the sensory data from it. Particularly, the temperature and humidity sensor DHT11 will be used together with built-in modules provided by the platform. Furthermore, we will look at the button based ON/OFF control and implement it. If you have not finished the previous exercises, please go on with them. Should you need further support, please just let me know it during the practical or by mail (preferred as we could not have hand by hand support during face-to-face suspension).

The official documentation is provided here again for your reference. Please remember, when you are building your own IoT project in the future, always refer to the bespoke built-in modules and read their documentation first, which will be helpful!!!

https://nodemcu.readthedocs.io/en/master/

In the lecture we have talked about the types of sensors. And the DHT11 and SR501 are introduced as examples for you to understand how to read sensory data from a sensor and how to refer to the datasheet to know the principles and specifications of the sensor. This week we will mainly practice on the DHT11 sensor using dht module, which has been included in your firmware bin file. And we will combine our previous exercises with the new sensor.

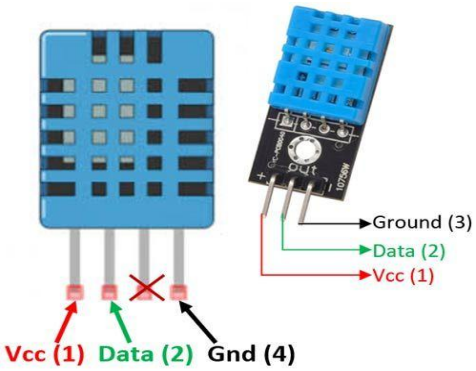
The details of dht module can be found in

https://nodemcu.readthedocs.io/en/master/modules/dht/

The infrared Motion Detection sensor SR501 will be optional for you to play with. Please refer to the datasheet before you use it, with a particular focus on its working conditions.

Exercise 1:

In this exercise, you will need to connect the DHT11 sensor to the NodeMCU/ESP8266 using a breadboard and Dupont wires or using only wires. Please note that the DHT11 sensor has 3 pins, which can only function and communicate with your platform when they are correctly connected and powered.



- For the 3 pins in a DHT11.
  - Ground (GND) pin should connect to the GND.
  - VCC pin should connect to the 3.3V output pin. (Please refer to the datasheet (available on Moodle) for working Power Supply).
  - The Data pin (Out) should be connected to a GPIO pin of the NodeMCU to send data to the platform.
- Once you connected all the pins correctly, read and display the temperature and humidity info using the dht module.

==========

dhtPin = 2

```
status, temp, humi, temp_dec, humi_dec = dht.read11(dhtPin)
if status == dht.OK then
--3 different status
--dht.OK, dht.ERROR_CHECKSUM, dht.ERROR_TIMEOUT
    print("DHT Temperature:"..temp..";".."Humidity:"..humi)
-- 2 dots are used for concatenation
elseif status == dht.ERROR_CHECKSUM then
    print( "DHT Checksum error." )
elseif status == dht.ERROR_TIMEOUT then
    print( "DHT timed out." )
end
```

==========

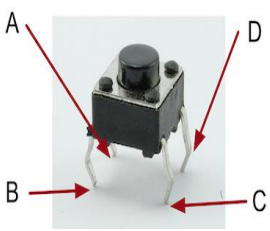
Exercise 2:

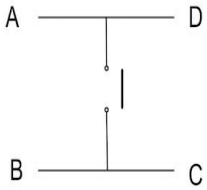
In this exercise, you will need to combine the Timer and DHT11 sensor using the tmr and dht to provide real-time temperature and humidity info.

- Try different interval for the tmr, and check when there will be the error message
  - **DHT timed out from the status "dht.ERROR_TIMEOUT".**
- Determine the best interval for the sensor to operate and think about why it happens.
- Hold your sensor to see the change of the measured temperature and humidity.

Exercise 3:

Now you are asked to include the 4pin button in the loop to control the ON/OFF of sensor reading.





- When the button is pushed, the AD and BC are connected, the LED is lighted and the DHT11 starts working and you get the temperature and humidity for once.
- Button click can be detected by gpio as follow

==========

```
buttonPin = 7

gpio.mode(buttonPin, gpio.INPUT)

gpio.write(buttonPin, gpio.LOW)

pushed = 0

mytimer = tmr.create()

mytimer:register(100, 1, function()

if gpio.read(buttonPin)==1 then

    pushed = 1

    print("Button detected")

end

end)

mytimer:start()
```

==========

- You may find a problem that "Button Pushed" keeps being detected. If you have experience in related issues, you should be able to solve it yourself and please go on with the rest exercises.
- If you don't know how to solve it, recall the optional exercise in Week1, you would need to reset the Timer.

(Optional) Exercise 4:

- Now go on with the button based ON/OFF control. This time the button is used to switch working modes of the DHT11.
- When the button is being pushed without bouncing back for more than 2 seconds, the DHT11 changes its working status and keeps providing temperature and humidity for every 5 seconds.

- With another pushed without bouncing back for more than 2 seconds, the DHT11 changes its working status and stops the cycle.
- If you don't know how to detect the long push, use the single push detection from Exercise 3 instead, next week we will solve the problem together.

Now you have your own local temperature and humidity meter, better with a LED/LCD screen when using it at home.

(Optional) Exercise 5:

In this exercise, you can explore how you can read the SR501 sensor detection (Datasheet available on Moodle) results and used it as a controller in your application. Let me know it should you need any other resources. If you can't play with SR501, let me know why.