ELECTRONICS DEPARTMENT   **ENSEIGNANT: M. GARAH**

level: 1st year master (ESE)   Academic year: 2023-2024

Module : systèmes à microcontrôleur

TP 3 : digital inputs

Objectives of the TP: Use a temperature/humidity sensor and display the data on an LCD screen.

required Soft and material.

> 1 DHT11 sensor 1 resistance of 220 Ω
> Software:
> Proteus
> Arduino IDE

1. DHT11 sensor

The DHT11 sensor comes with many kits for Arduino, The DHT11 only measures positive temperatures, between 0°C and 50°C with an accuracy of ± 2°C and relative humidity levels from 20 to 80% with an accuracy of ± 5%. For more specific needs where it is necessary to measure negative temperatures, it is necessary to use the DHT22, which is twice as expensive, but with a measuring range of -50°C to +125°C,
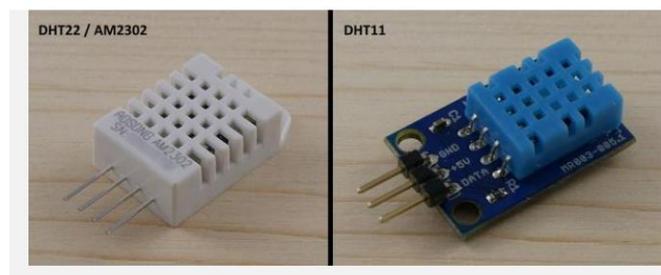
- **Using the temperature and humidity sensor:**
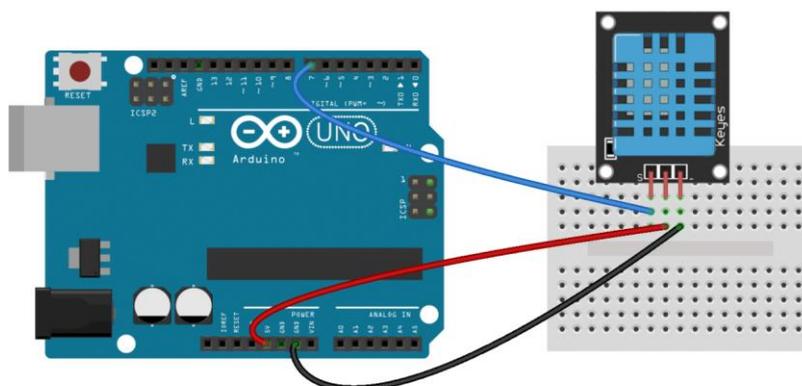
the central pin is the power supply and should be connected to the Arduino's 5V. The rightmost pin should be connected to ground (-). As for the leftmost pin, it is the data pin and will be connected to the digital input used for reading the data. We will select Pin 7 for the data connection.

- **Acquiring data from the sensor and displaying it.**

Since Arduino IDE version 1.6.0, a library manager has greatly simplified the installation and updating of libraries. The manager can be accessed through the menu **Sketch -> Include Library -> Manage Libraries**. A library management window will appear, allowing you to search for new libraries by typing their names into the search field in the top left corner or update existing Above, by typing "dht" in the search field, you will find the DHTLib library in the second position, which we will use. To install it, simply click on the button that appears on the right when you select it.
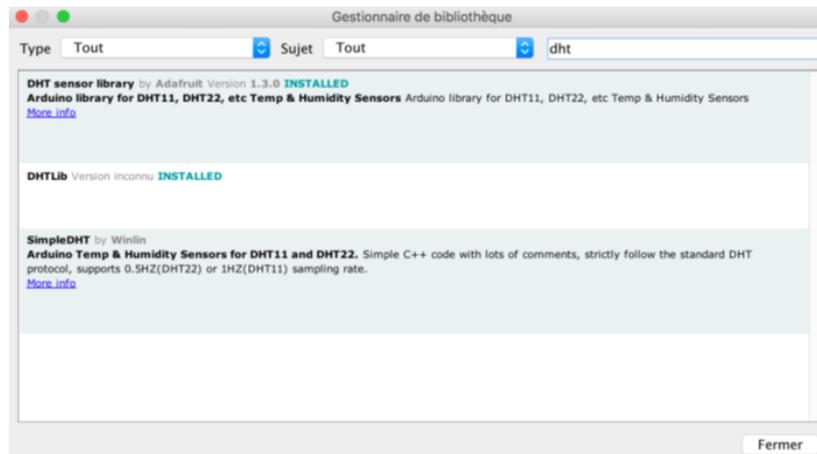
An alternative solution for installing a library is to download the .zip file of the desired library and then install it via the menu Sketch -> Include Library -> Add .ZIP Library.

You can download the DHTLib library here:

http://www.circuitbasics.com/wp-content/uploads/2015/10/DHTLib.zip

Note: *Please be aware that for the newly installed library to be usable, you will need to exit and then restart Arduino.*

Code :

Your code appears to be setting up and using a DHT11 temperature and humidity sensor to read and display temperature and humidity data. Here's a brief explanation of your code:

1- You include the DHT library using **#include <dht.h>.**

2- You create a DHT object named DHT for the DHT11 sensor **dht DHT.**

3- You define DHT11_PIN as 7, which is the pin used to receive the data from the sensor **#define DHT11_PIN 7**

4- In the setup function, you initialize the serial communication with **Serial.begin(9600).** This is necessary because you'll use the serial port to display the sensor's values.

5- In the loop function, you read the data from the DHT11 sensor using **int chk =DHT.read11(DHT11_PIN)** and store the result in the variable chk.

6- You then print the temperature and humidity values to the serial monitor using **Serial.print** and **Serial.println**. These values are obtained from **DHT.temperature** and **DHT.humidity**.

Serial.print("Temperature = ");
Serial.println(DHT.temperature);
Serial.print("Humidite = ");
Serial.println(DHT.humidity);

7- The **delay (1000)** function is used to pause for 1 second before reading the sensor again, which is done in a continuous loop in the loop function.

Your code will repeatedly read and display temperature and humidity data from the DHT11 sensor every second.

- **Preparing to assemble and program the Arduino card:**

-Start with the assembly procedure shown on the board.

-Then test the program.

2- Display the measured values on the LCD screen

- required soft and material.

1   2x16 LED screen

1   potentiometer (variable resistor)

1   resistor of 220 Ω

1   DHT11 sensor (already wired from previous circuit)

Software:

Proteus
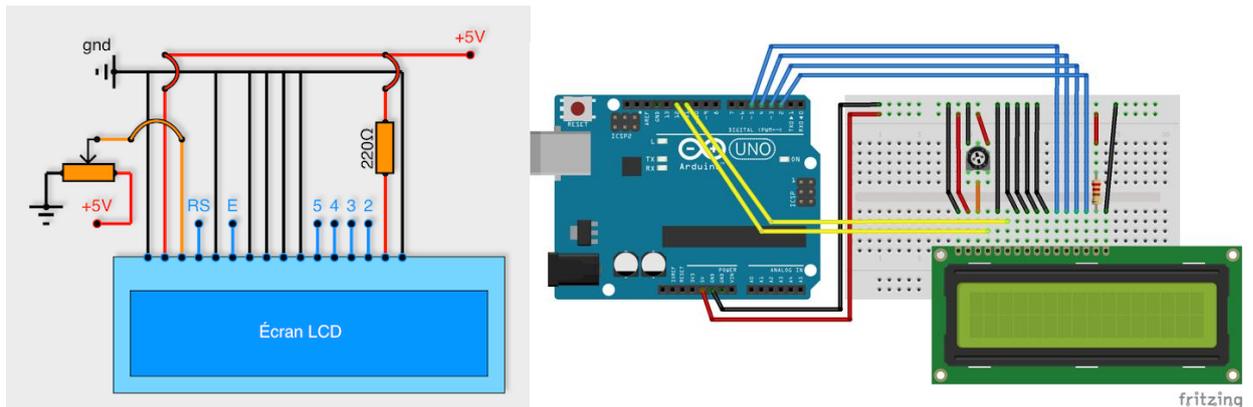
Arduino IDE

Is "LiquidCrystal" included with the Arduino IDE software, but you still need to install it before you can use it. Menu: Sketch -> Include a library -> Manage libraries

In the search tab, type: "LiquidCrystal". If the library is already installed, you will see noted "INSTALLED", otherwise click on Installed.

Your code is set up to read temperature and humidity data from a DHT11 sensor and display it on a 16x2 LCD screen. Here's a brief explanation of your code:

1- You include the necessary libraries for the DHT11 sensor and the LCD screen.

#include <dht.h>

#include <LiquidCrystal.h>

2- You define the LiquidCrystal object and specify the pins used for connecting the LCD.

LiquidCrystal lcd(12, 11, 5, 4, 3, 2)

3- Create a dht object for the DHT11 sensor and define the pin (DHT11_PIN) where the sensor's data is connected.

#define DHT11_PIN 7

In the setup function, you initialize the LCD screen with the dimensions 16x2.

lcd.begin(16, 2);

4- In the loop function, you read data from the DHT11 sensor using DHT.read11(DHT11_PIN).

int chk = DHT.read11(DHT11_PIN)

5- You set the cursor position on the LCD and print the temperature value, including the degree Celsius symbol, on the first line.

lcd.setCursor(0,0);

lcd.print("Temp: ");

lcd.print(DHT.temperature,1);

lcd.print((char)223);

lcd.print("C");

6- You move the cursor to the second line and print the humidity value with a percentage symbol. 5

lcd.setCursor(0,1);

lcd.print("Humidity: ");

lcd.print(DHT.humidity,1);

lcd.print("%");

7- You introduce a delay of 1 second before taking the next reading.

delay(1000);

This code continuously updates and displays the temperature and humidity data on the LCD screen, refreshing the values every second. Make sure to connect your DHT11 sensor and the LCD to the appropriate pins on your Arduino board as specified in your code.

- Preparing to assemble and program the Arduino card:

- Start with the assembly procedure shown on the board.

- Then test the program.