

EXPERIMENT NO. 2

Aim : Create a mini Temperature & Humidity project with Arduino and DHT11

Apparatus Required : Arduino Uno, DHT11 Sensor module, USB cable, Male to Female jumper wires.

Theory :

Humidity is the measure of water vapour present in the air. The level of humidity in air affects various physical, chemical and biological processes. In industrial applications, humidity can affect the business cost of the products, health and safety of the employees. So, in semiconductor industries and control system industries measurement of humidity is very important. Humidity measurement determines the amount of moisture present in the gas that can be a mixture of water vapour, nitrogen, argon or pure gas etc... Humidity sensors are of two types based on their measurement units. They are a relative humidity sensor and Absolute humidity sensor. DHT11 is a digital temperature and humidity sensor.

DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc... to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

Working Principle of DHT11 Sensor

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs

with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

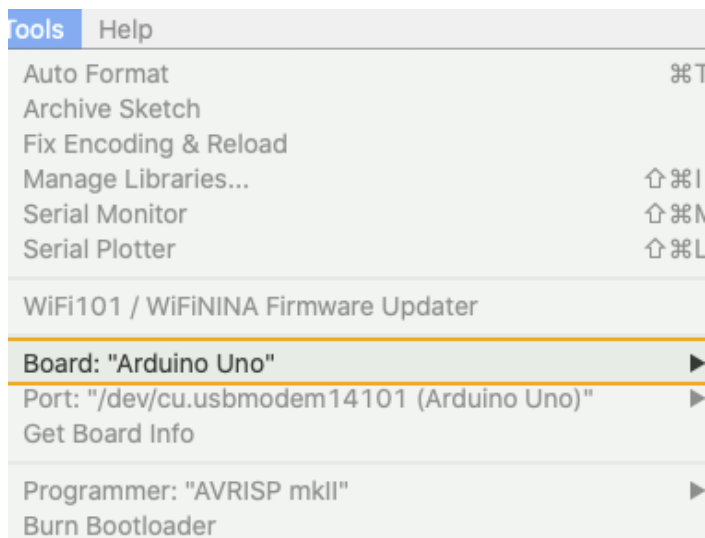
For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers.

The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA.

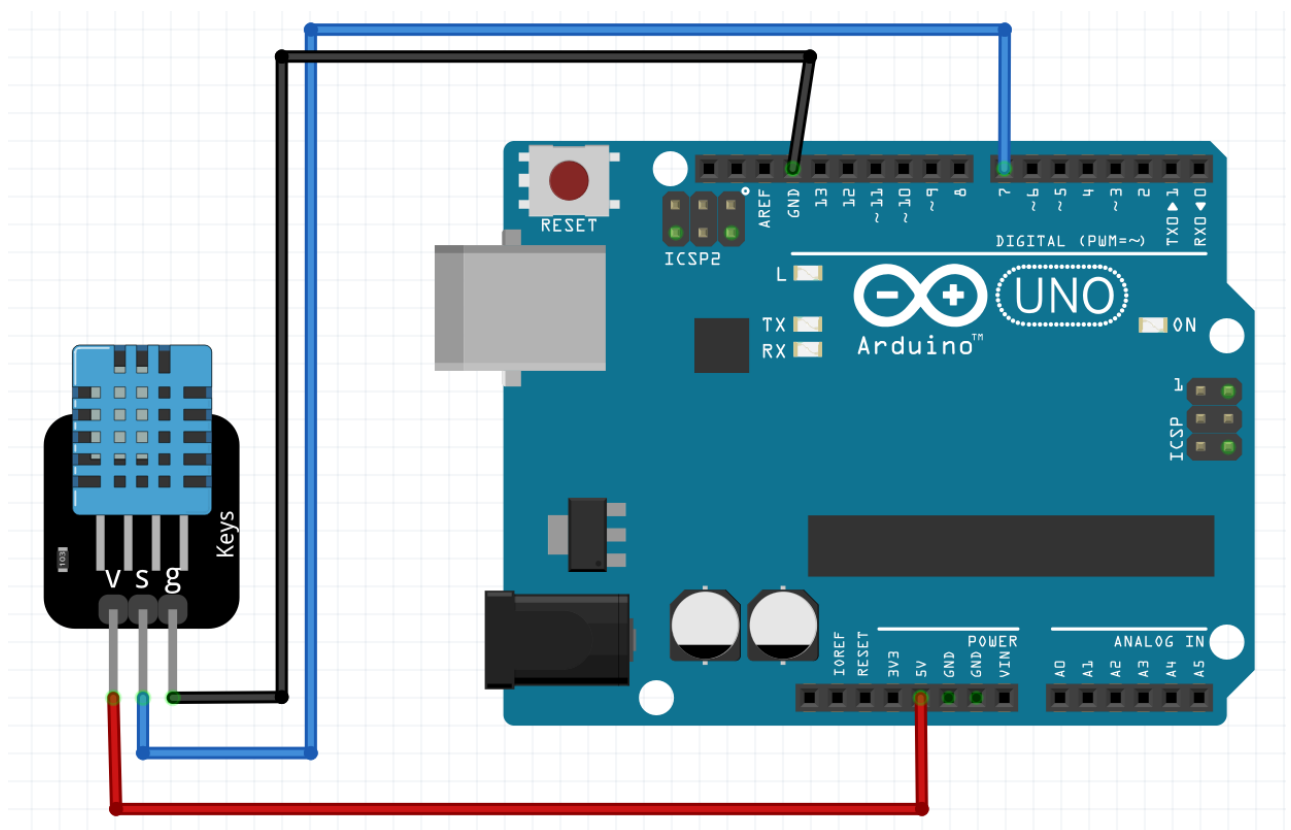
Uploading Code to Arduino :

1. Install Arduino IDE on your PC. You can download the latest version of Arduino software.
2. Connect the Arduino board to your PC using a USB cable and wait for Windows to begin the USB driver installation process.
3. If the Windows installer does not start automatically, open the Windows Device Manager from Start→ Control Panel option and find the Arduino under the Ports (COM&LPT) list.
4. If Arduino is not found, go to Other Devices and select the Unknown Device option. Then update the driver.
5. Select the Browse my computer for driver software option and go to the Arduino software download location and select Arduino.inf/Arduino uno.inf (depending on your software version) to install the driver.
6. After successful installation of the driver, from the Arduino IDE select the Tools/Board option. From here select your Arduino board among those listed, such as Arduino Uno, Arduino Mega 2560, Arduino Leonardo, etc.
7. Choose the correct serial COM port for your board. The COM port number will be visible under the Device Manager.
8. Open the source code/sketch, compile it and upload the code to the Arduino board by clicking the Upload button. If you do not have the

sketch ready, the easiest way to start with the Arduino programming is to use the 'Blink' sketch from the Examples in Arduino. You can access Blink source code from the File→Examples→Basics option.



Circuit Diagram :



Code :

```
#include <DHT.h>
#include <DHT_U.h>

#define dpin 7
#define DHTTYPE DHT11
DHT dht(dpin,DHTTYPE);
void setup() {
    // put your setup code here, to run once:
    Serial.begin(9600);
    dht.begin();
    Serial.println("Welcome To DHT11\n");
}

void loop() {
    // put your main code here, to run repeatedly:
    float t = dht.readTemperature(); // Gets the values of the temperature
    float h = dht.readHumidity(); // Gets the values of the humidity

    // Printing the results on the serial monitor
    Serial.print("Temperature = ");
    Serial.print(t);
    Serial.print(" *C ");
    Serial.print("    Humidity = ");
    Serial.print(h);
    Serial.println(" % ");

    delay(1000);
}
```

Result : Hence, we successfully created a mini Temperature & Humidity project with Arduino and DHT11.

[illegible]

