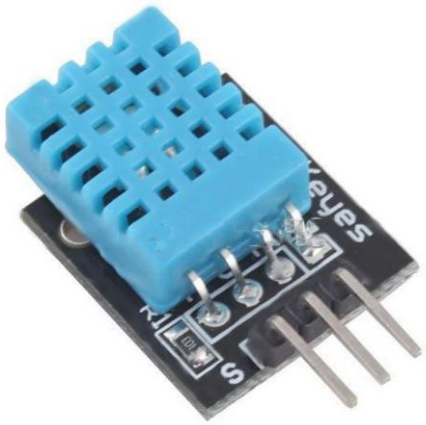
Humidity and Temperature Sensor



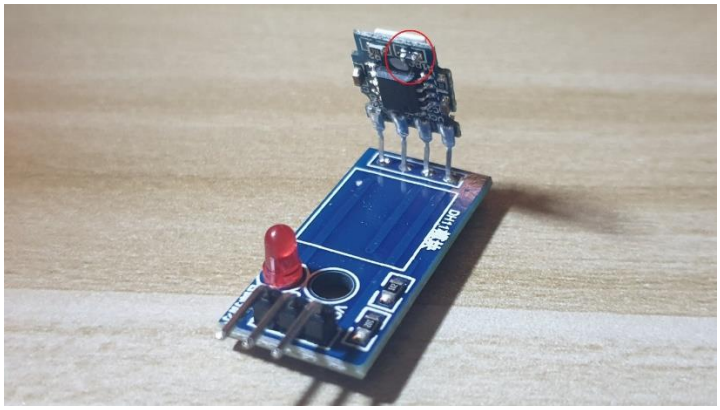
Introduction

First DHT11 measures “relative humidity”. is the amount of water vapor in air vs. the saturation point of water vapor in air. At the saturation point, water vapor starts to condense and accumulate on surfaces forming dew.

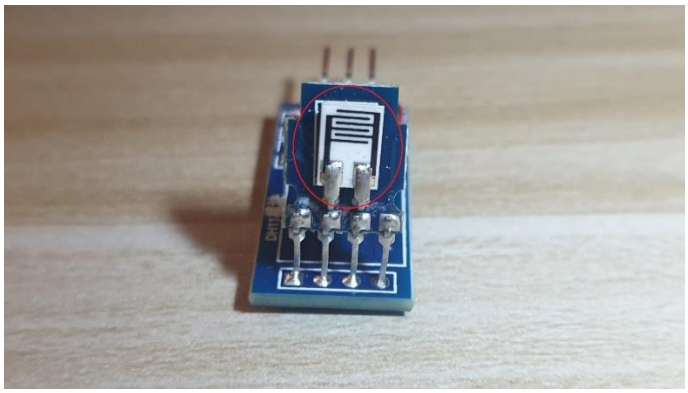
The saturation point changes with air temperature. Cold air can hold less water vapor before it becomes saturated, and hot air can hold more water vapor before it becomes saturated. The formula to calculate relative humidity is:

Relative humidity is expressed as a percentage. At 100% RH, condensation occurs, and at 0% RH, the air is completely dry.

The sensor measures temperature using a thermistor – or a resistor where its resistance varies with temperature. If we remove the cover of the sensor, it is located here (encircled)



Meanwhile, humidity is measured by these electrodes on a moisture absorbing substrate (encircled). When water vapor is absorbed, the resistances between the electrode changes. Higher moisture content gives lower resistance. Having it dry increases the resistance.

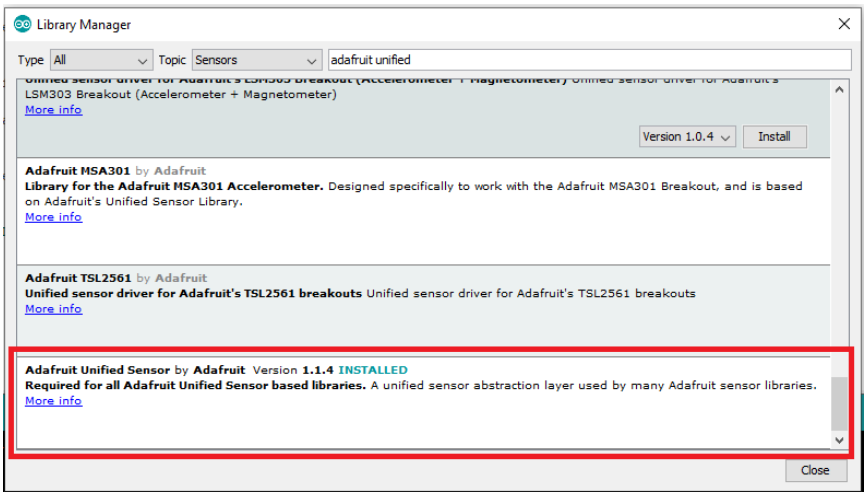


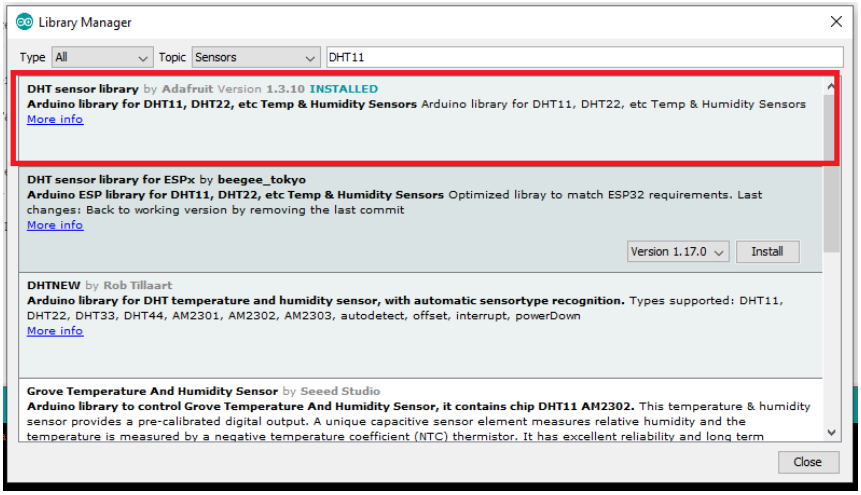
Note however, that the accuracy of the DHT11 is a bit limited for using on precision applications. Measurement of humidity is good for 20-80% RH readings with 5% accuracy. Temperature reading is good for 0-50C with +/- 2C accuracy. Note that the response time of the sensor is also around 1 second.

Interfacing with Arduino

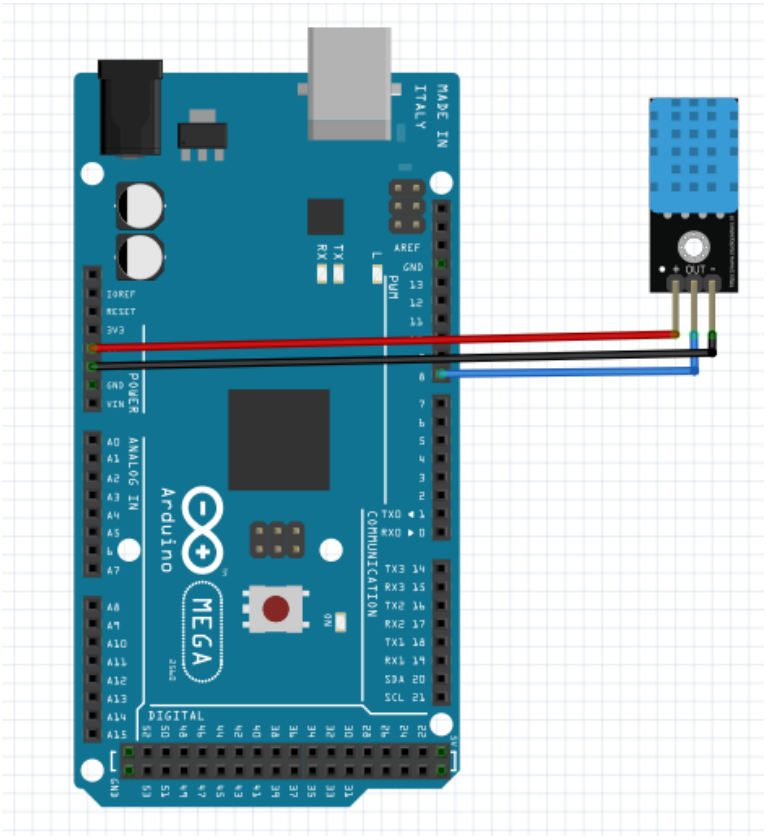
DHT11 has its own method of communicating to Arduino. The communication protocol used is a bit complex but the good thing is that Arduino already has a library for using the sensor. So before we being, please download the following libraries

- Adafruit Unified Sensor
- DHT Sensor Library





After installing the sensor, we can now wire up our Arduino. Wire up your sensor as shown below



We will use pin 8 to communicate to the sensor. You can change this if needed as well. Wiring is very straightforward.

We then load the code (DHT11 sketch)

```
#include <DHT.h>

#define DHTTYPE DHT11
#define DHTPIN 8

DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  dht.begin();
}

void loop() {

  delay(2000);

  // Reading temperature or humidity takes about 250 milliseconds!
  // Sensor readings may also be up to 2 seconds 'old' (its a very slow sensor)
  float h = dht.readHumidity();
  // Read temperature as Celsius (the default)
  float t = dht.readTemperature();
  // Read temperature as Fahrenheit (isFahrenheit = true)
  //float f = dht.readTemperature(true);

  // Check if any reads failed and exit early (to try again).
  // In this case, the reading will be a NAN / Not A Number
  if (isnan(h) || isnan(t)) {
    Serial.println("Failed to read from DHT sensor!");
    return;
  }

  Serial.print(F("\nHumidity: "));
  Serial.print(h);
  Serial.print(F("%  Temperature: "));
  Serial.print(t);
  Serial.print(F("°C "));
}
```

The first line of the code imports the library for the DHT sensor. This library contains all the code that is needed to decode the data from the sensor so we wont have to worry about it.

The next two lines defines the type of DHT sensor we will be using as there are multiple variants such as DHT22. In our case, we will only be using DHT11. We also define the pin we will use to communicate on this line.

The line “DHT dht(DHTPIN, DHTTYPE);” creates a DHT object that we can now use to query the sensor via pin 8.

To get the humidity value, use the readHumidity function. The readTemperature function on the other hand, is used to get the temperature readings.

We added the if(isnan) to detect if there is communication error with the sensor.

Useful links
https://create.arduino.cc/projecthub/arcaegecengiz/using-dht11-b0f365