Lesson 14 DHT11 Temperature and Humidity Sensor

Introduction

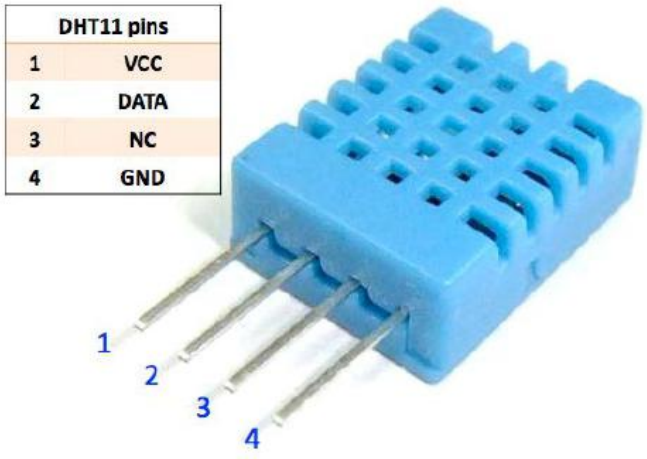
In this lesson,you will learn how to use a DHT11 Temperature and Humidity Sensor.

Hardware Required

- ✓ 1 * RexQualis UNO R3
- ✓ 1 * DHT11 Temperature and Humidity module
- ✓ 3 * F-M Jumper Wires

Principle

DHT11 Temperature and Humidity Sensor



DHT11 output calibrated digital signal. It applys exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements is connected with 8-bit single-chip computer.

Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of pro

gramme in OTP memory, when the sensor is detecting, it will cite coefficient fr om memory.

Small size & low consumption & long transmission distance(100m) enable DH T11 to be suited in all kinds ofharsh application occasions. Single-row packag ed with four pins, making the connection very convenient.

Supply voltage: DC 3.3 to 5.5V

Measuring range (T) : -20 to +60 Celsius(-4 to +140 Fahrenheit)

Measuring range (RH): 5 to 95% relative humidity

Typ. Temperature accuracy: ±2 Celsius

Typ. Humidity accuracy: ±5%RH at 25 Celsius

Long term drift(T): <1 Celsius/year

Long term drift(RH) : <1%RH/year

Resolution(T): 0.1 Celsius

Resolution(RH): 1%RH

Sensor Type: Capacitive sensor

Interface: One line digital

Housing material: ABS

Net weight: 1g

Code interpretation

```
#define DHT11_PIN 0 // pin A0

byte read_dht11_dat()

{

  byte i = 0;
```

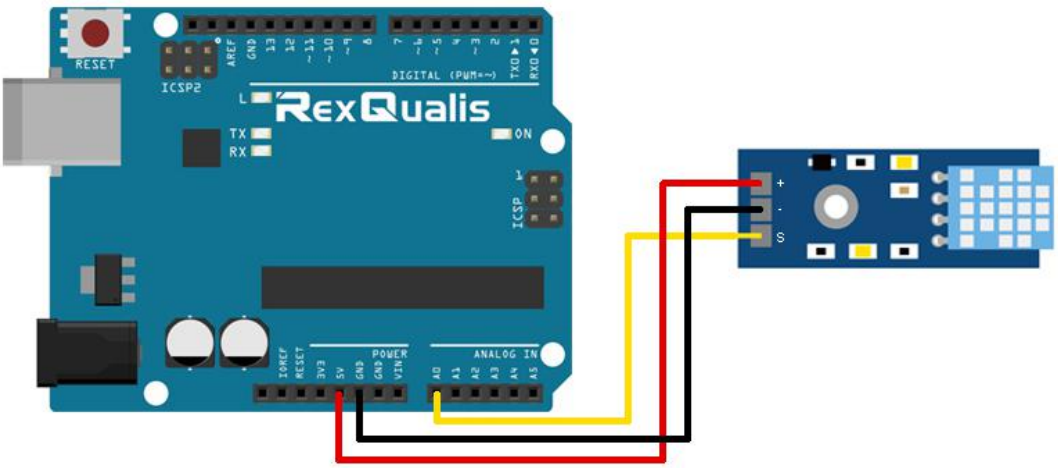
```
  byte result=0;
  for(i=0; i< 8; i++){
  while(!(PINC & _BV(DHT11_PIN))); // wait for 50us
  delayMicroseconds(30);
  if(PINC & _BV(DHT11_PIN))
  result |=(1<<(7-i));
  while((PINC & _BV(DHT11_PIN))); // wait '1' finish
  }
  return result;
}
void setup()
{
  DDRC |= _BV(DHT11_PIN);
  PORTC |= _BV(DHT11_PIN);
  Serial.begin(19200);
  Serial.println("Ready");
}
void loop()
{
  byte dht11_dat[5];
  byte dht11_in;
  byte i;
```

```
// start condition

// 1. pull-down i/o pin from 18ms

PORTC &= ~_BV(DHT11_PIN);

delay(18);

PORTC |= _BV(DHT11_PIN);

delayMicroseconds(40);

DDRC &= ~_BV(DHT11_PIN);

delayMicroseconds(40);

dht11_in= PINC & _BV(DHT11_PIN);

if(dht11_in){

Serial.println("dht11 start condition 1 not met");

return;

}

delayMicroseconds(80);

dht11_in = PINC & _BV(DHT11_PIN);

if(!dht11_in){

Serial.println("dht11 start condition 2 not met");

return;

}

delayMicroseconds(80);

// now ready for data reception

for (i=0; i<5; i++)
```

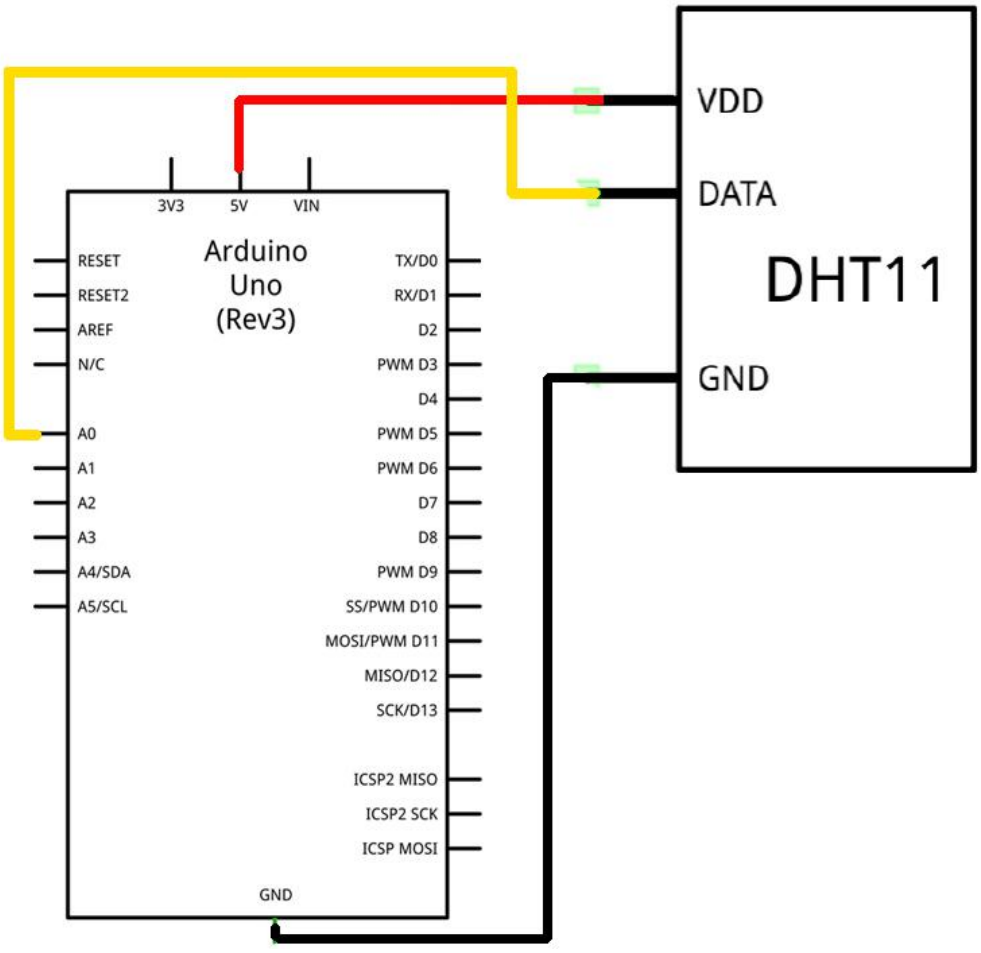
```
  dht11_dat[i] = read_dht11_dat();
  DDRC |= _BV(DHT11_PIN);
  PORTC |= _BV(DHT11_PIN);
  byte dht11_check_sum =
dht11_dat[0]+dht11_dat[1]+dht11_dat[2]+dht11_dat[3];
  // check check_sum
  if(dht11_dat[4]!= dht11_check_sum)
  {
  Serial.println("DHT11 checksum error");
  }
  Serial.print("Current humdity = ");
  Serial.print(dht11_dat[0], DEC);
  Serial.print(".");
  Serial.print(dht11_dat[1], DEC);
  Serial.print("% ");
  Serial.print("temperature = ");
  Serial.print(dht11_dat[2], DEC);
  Serial.print(".");
  Serial.print(dht11_dat[3], DEC);
  Serial.println("C ");
  delay(2000);
}
```

Experimental Procedures

Step 1:Build the circui

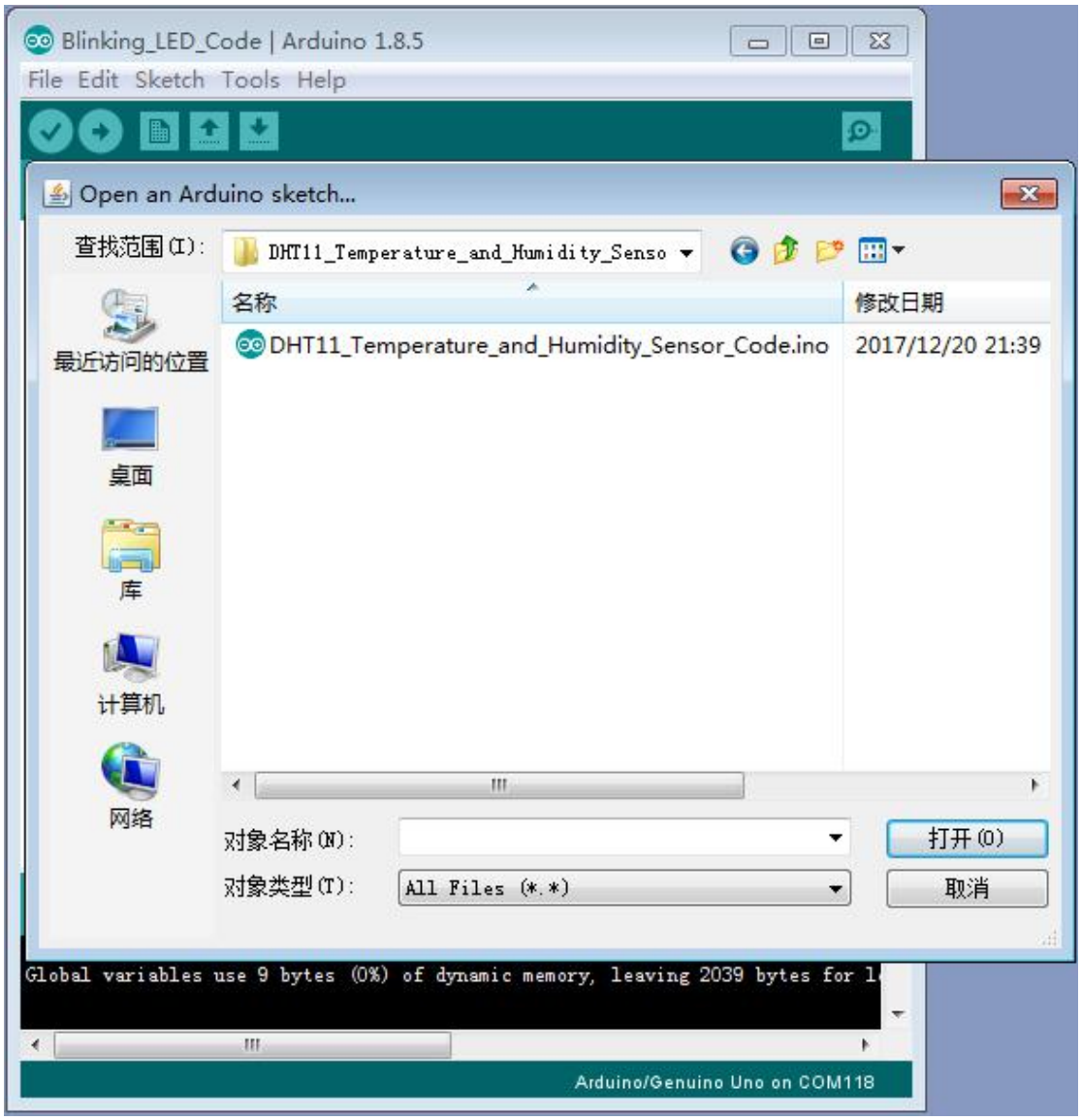


Schematic Diagram



Step 2:Open the code:

DHT11_Temperature_and_Humidity_Sensor_Code



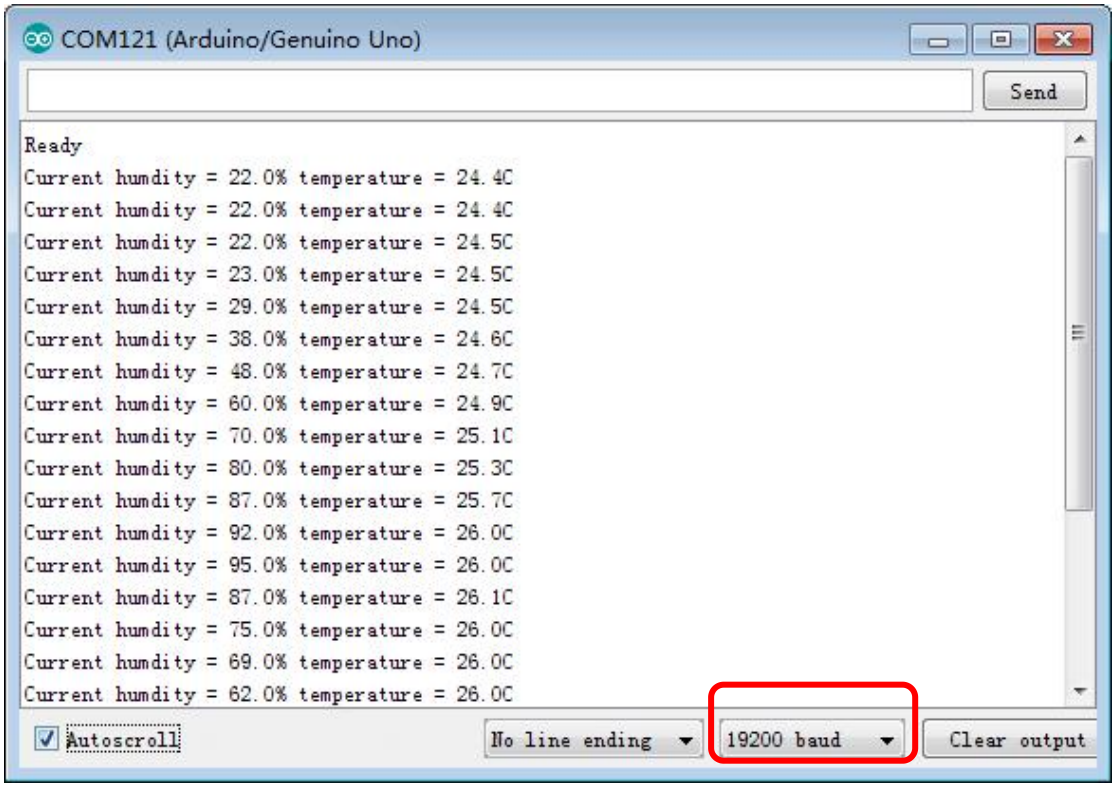
Step 3:Attach Arduino UNO R3 board to your computer via USB cable and check that the 'Board Type' and 'Serial Port' are set correctly.

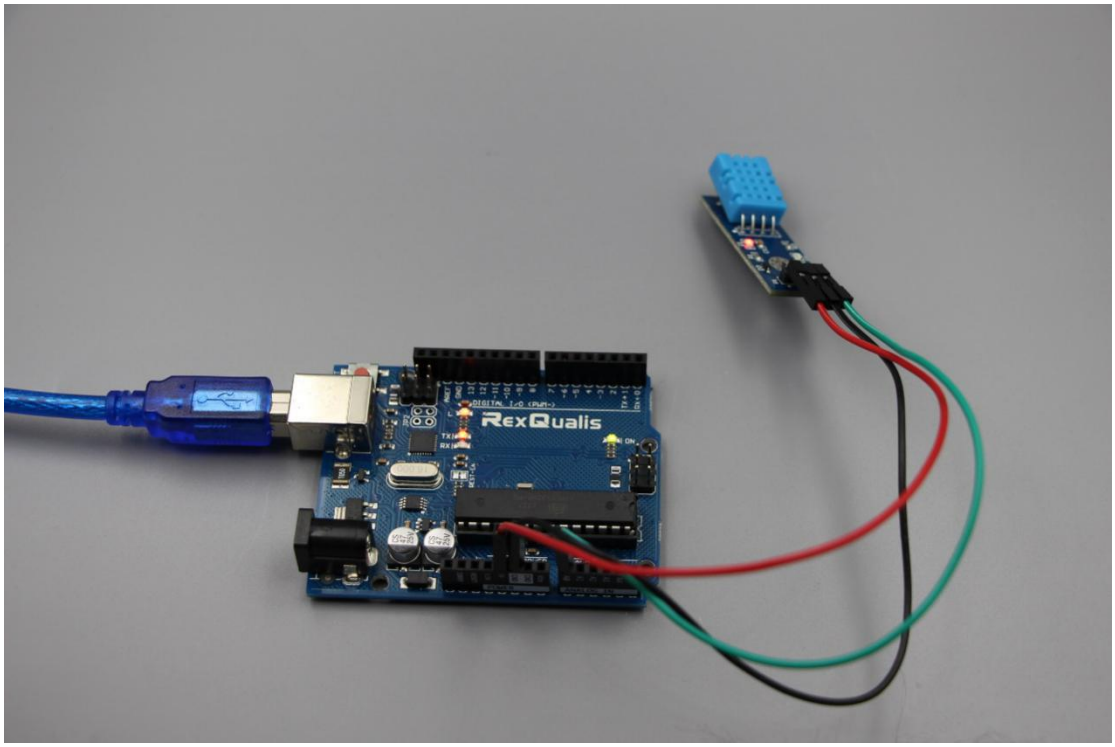
Step 4:Upload the code to the RexQualis UNO R3 board.

Step 5:Open the Serial Monitor,alter the baud rate to 19200,then you can see the data as blow:

(How to use the Serial Monitor is introduced in details in

Lesson 0 Preface)





You can see the video of the experiment results on YouTube:

https://youtu.be/dILc2gf0e60

If it isn’t working, make sure you have assembled the circuit correctly, verified and uploaded the code to your board.For how to upload the code and install the library, check Lesson 0 Preface.