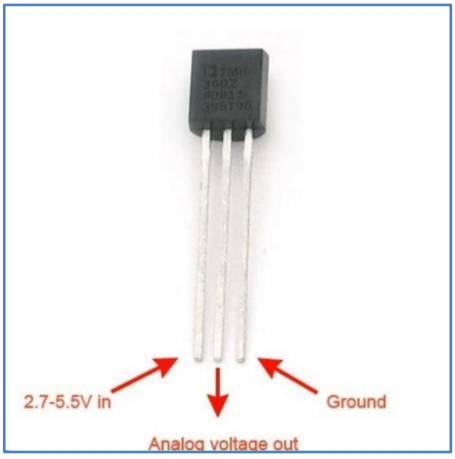
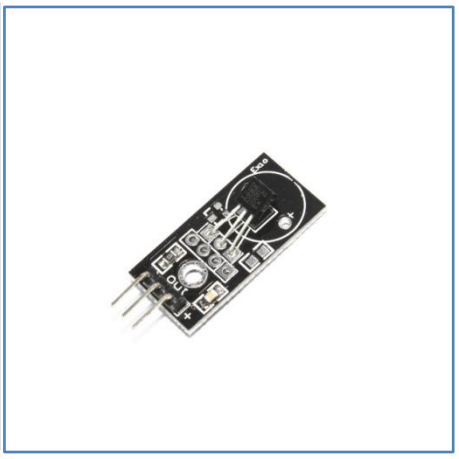
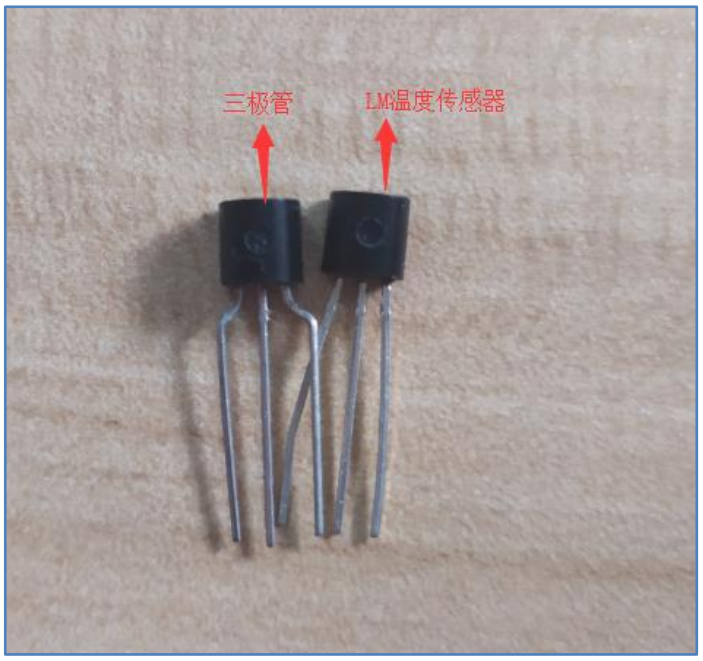
LM35 Temperature Sensor Experiment

Introduction of LM35 Temperature Sensor

Many real-life scenarios require temperature measurements. In order to measure temperature accurately, a temperature sensor is needed. Mercury thermometer is used for temperature measurement, PT100 / PT1000 is generally used for measuring the temperature of industrial instruments, LM35 and 18B20 are commonly used in daily life, this experiment will measure the temperature according to LM35.







LM35 is a temperature sensor of precision integrated circuit temperature sensor, whose output voltage is linearly proportional to the Celsius temperature. Therefore, the LM35 is far superior to the linear temperature sensor on the absolute scale. The LM35 series of sensors have been calibrated in production and the output voltage corresponds to the Celsius temperature, making it very convenient to use. The sensitivity of the LM35 series of

sensors is 10.0 mV /℃, and the accuracy ranges from 0.4℃ to 0.8℃ (temperature range from -55℃ to + 150℃), with high reproducibility and low output impedance. The linear output and internal calibration accuracy make the readout or control circuit interface easy to use. It can work with single or positive or negative power supply and has the following functions:

- It can be directly calibrated under Celsius temperature
- + 10.0 mV / ℃ linear scale
- It can ensure the precision of 0.5 ℃ (25 ℃)
- The rated temperature range is from - 55 ℃ to + 150 ℃
- It can be applied in long-distance
- Working voltage widely ranges from 4v to 30v
- Low power consumption, less than 60 uA
- In the still air, its self-heating effect stays low,less than 0.08℃
- The nonlinear data is only plus or minus 1/4 ℃
- When passing 1mA current through it, the output impedance is only 0.1Ω

Experiment Principle

Arduino collects the output value of LM35 through analogRead () function every 1 second. Firstly, we get the actual voltage by A/D analog-to-digital conversion former.

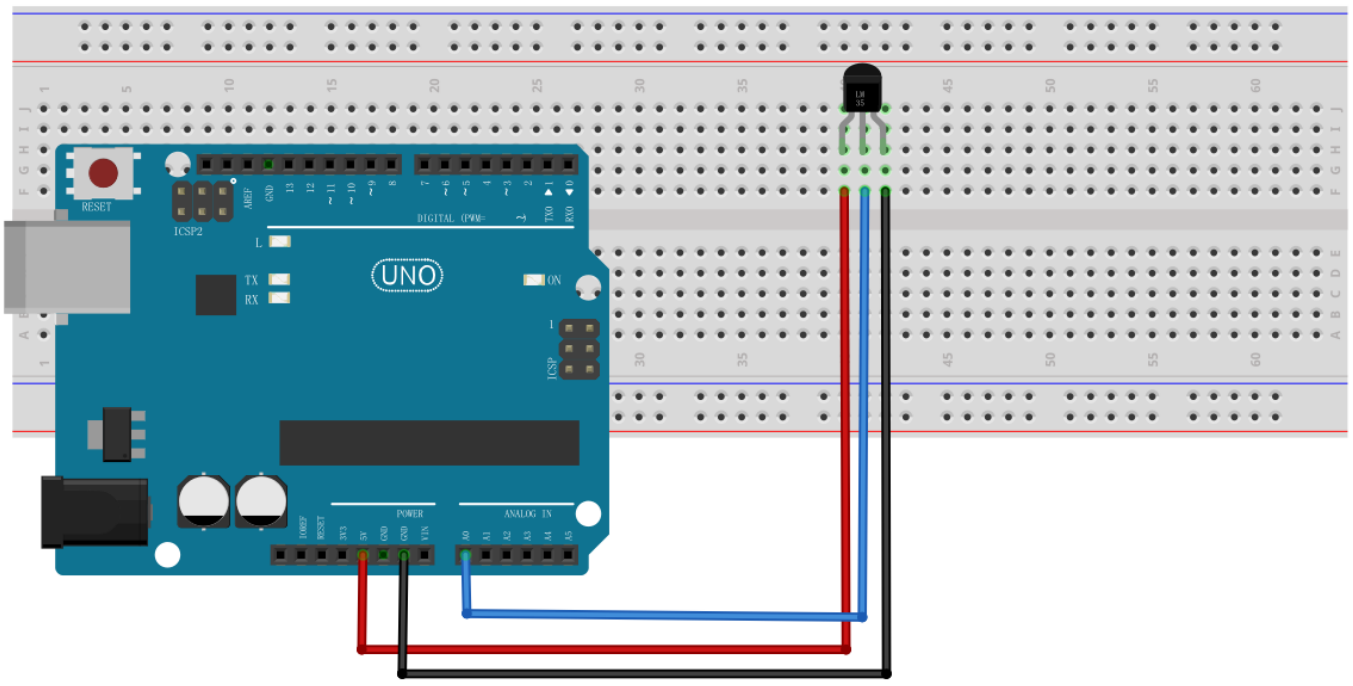
$$V_R = \frac{Value}{2^{10}-1} \times V_{DD}$$ namely, V = Vad*5 / 1023 (5V)

Secondly, According to LM35 sensor precision: Temp = Vad (V) * 100 (℃/ V), we can get the corresponding temperature value.

Component List

- Keywish Arduino Uno Mainboard
- Breadboard
- USB cable
- LM35 Temperature Sensor*1
- Several jumper wires

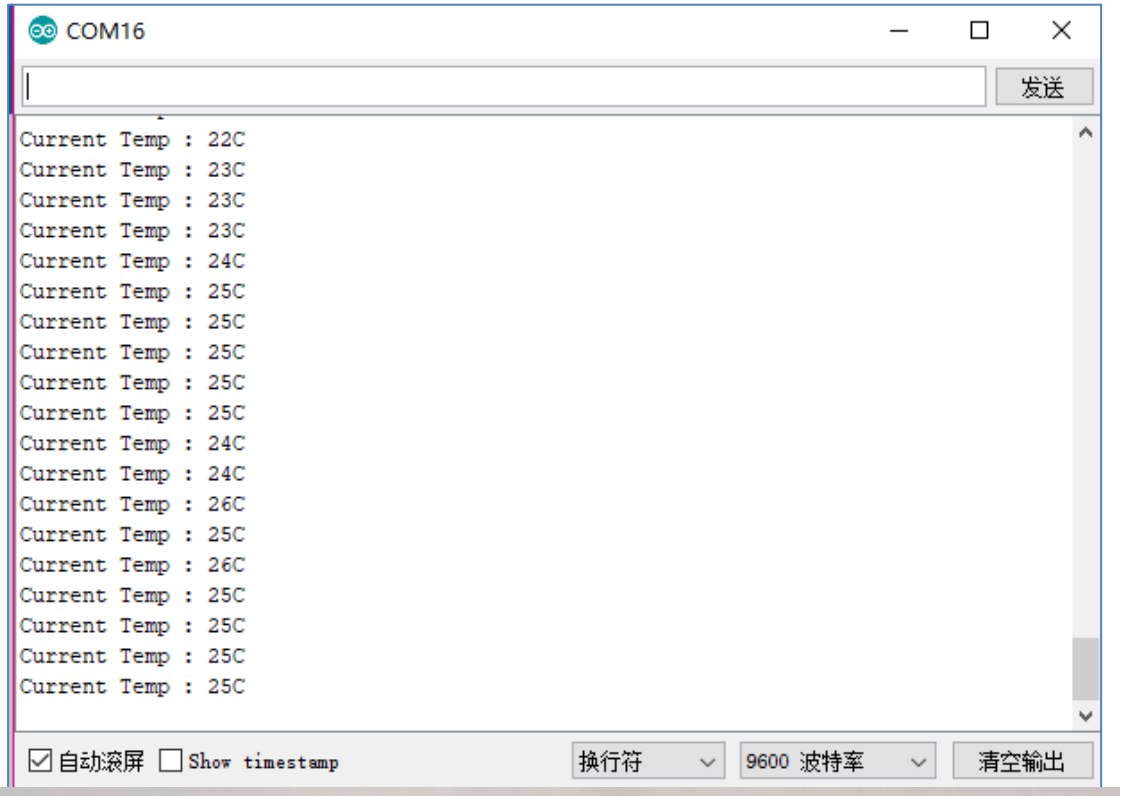
Wiring

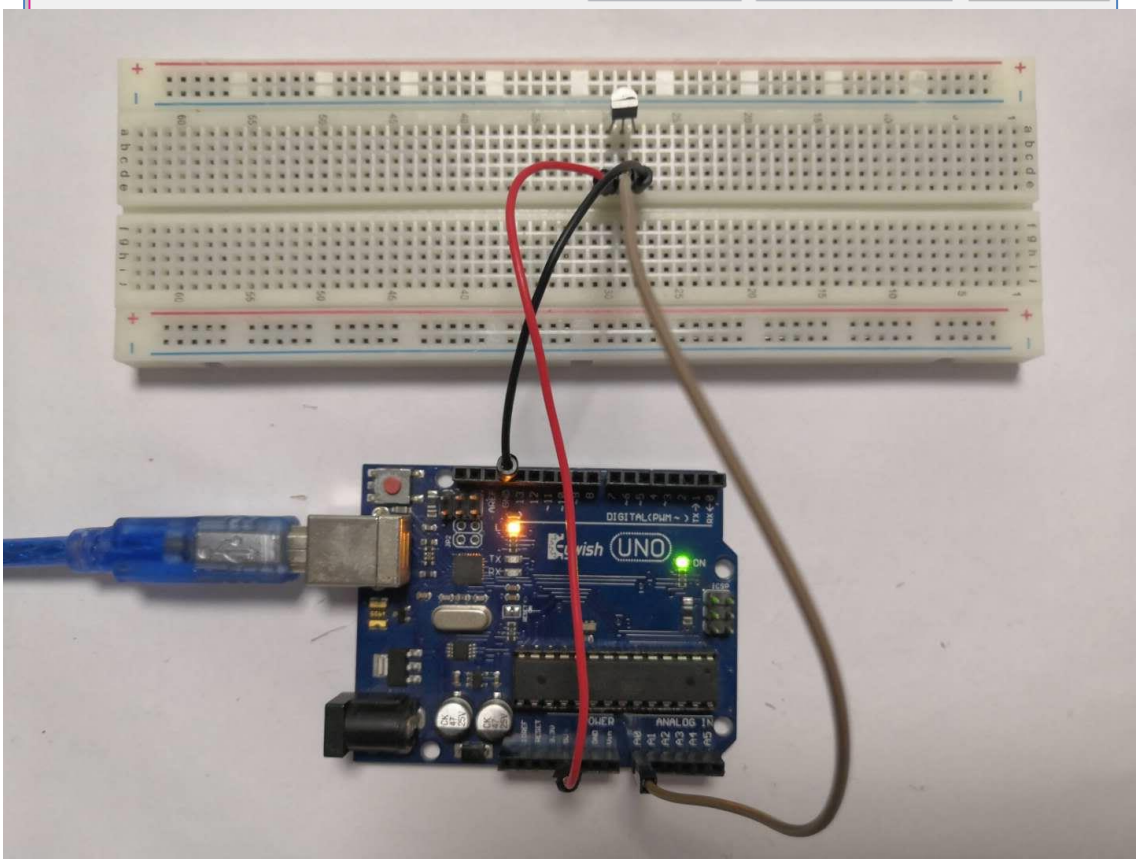


Code

```
int Temp_Pin = A0;               // analog pin line LM35 numble 2 wire
int val;
int dat;
float voltage = 0.0 ;
void setup()
{
    Serial.begin(9600);        //init serial Baud rate 115200
}
void loop()
{
    val = analogRead(Temp_Pin);        //  read analog raw data
    voltage = ( ( float )val )/1023;
    voltage = voltage * 5 ;             // convert analog value to real
voltage
    dat =  voltage * 100;                // convert voltage to temprature
    Serial.print("Current Temp : ");
    Serial.print(dat);
    Serial.println("C");
    delay(500);                          // Delay 0.5 s
}
```

Experiment result





Mblock programming program

MBlock writes LM35 program as shown in the figure below:

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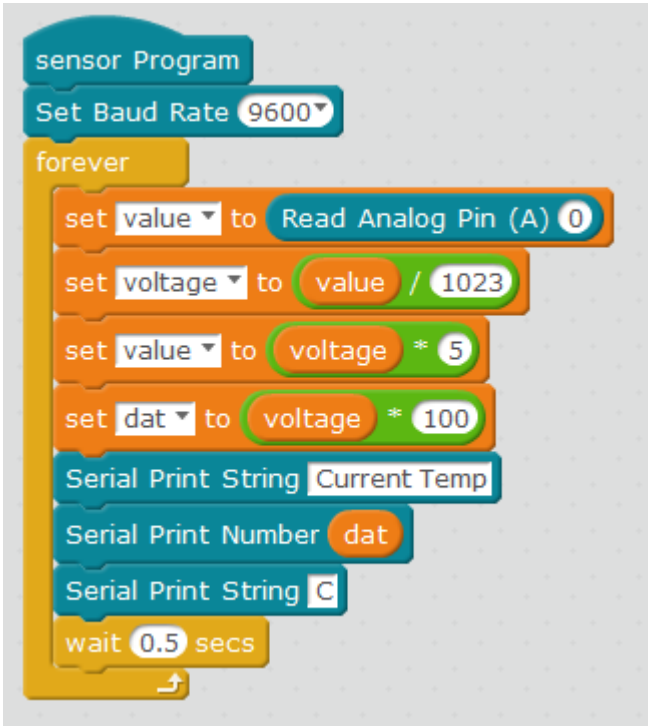
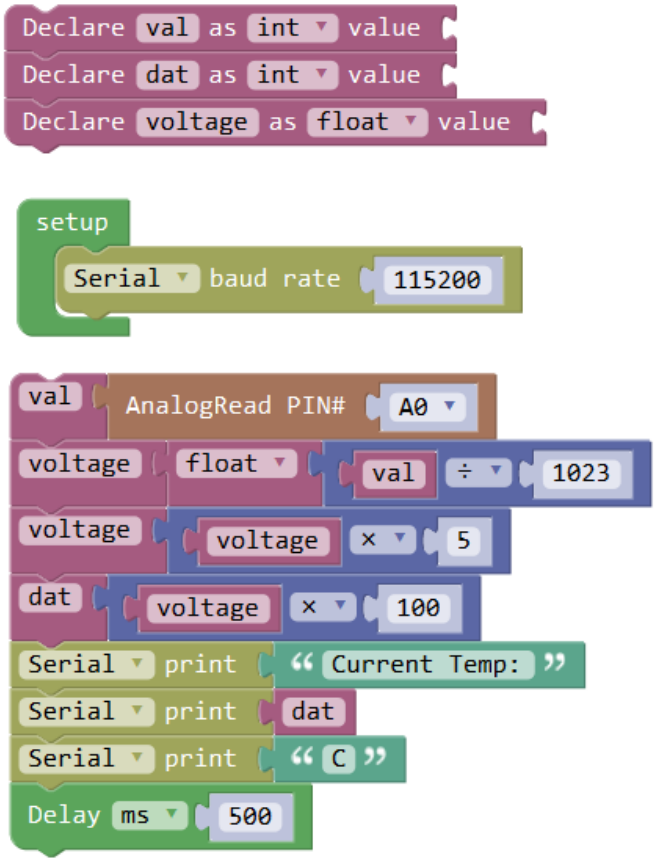
-- The serial port prints a string;
- 

-- The serial port prints variable values;
- 

-- Read the analog value of pin A0;



Mixly programming program



Magicblock programming program