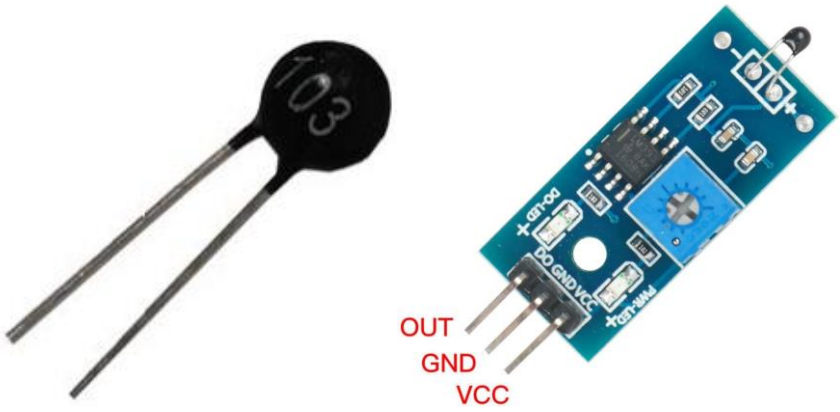
Temperature Alarm Experiment

Introduction

Thermistor is a type of the sensitive component which is divided into the positive temperature coefficient thermistor (PTC) and the negative temperature coefficient thermistor (NTC) according to the temperature coefficient. The typical characteristic of thermistor is that it is sensitive to temperature and exhibits different resistance values at different temperatures.The positive temperature coefficient thermistor (PTC) has a higher resistance value while the temperature is higher and the negative temperature coefficient thermistor (NTC) has a lower resistance value while the temperature is higher. They are both semiconductor devices.



Thermistor

Experimental Purpose

- Read the resistance value of the thermistor at different temperatures
- Use the thermistor to control the on and off of the LED.

Experimental Principle

In this experiment, the LED and thermistor are connected in series and a 10K pull-up resistor is connected to one end of the thermistor. Read the thermistor voltage that changes with temperature through the analog port and print these parameters through the serial monitor. Observe the changes of the LED brightness.

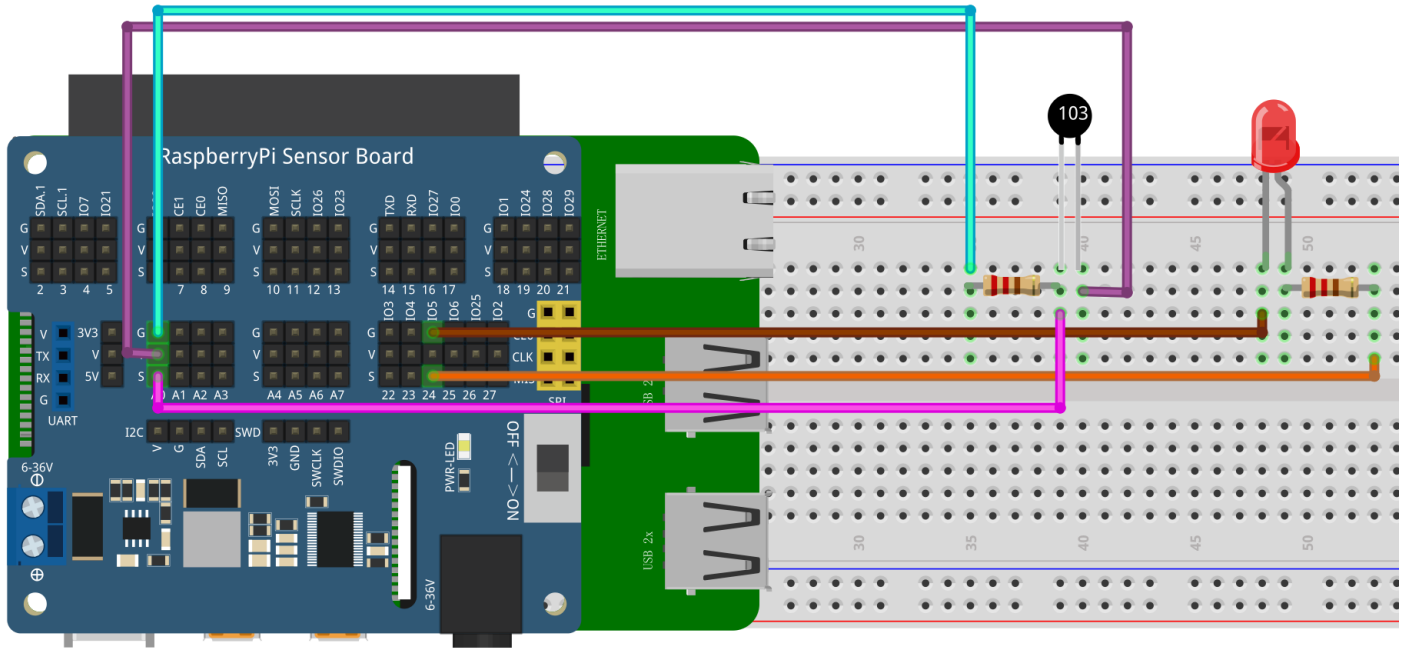
Component List

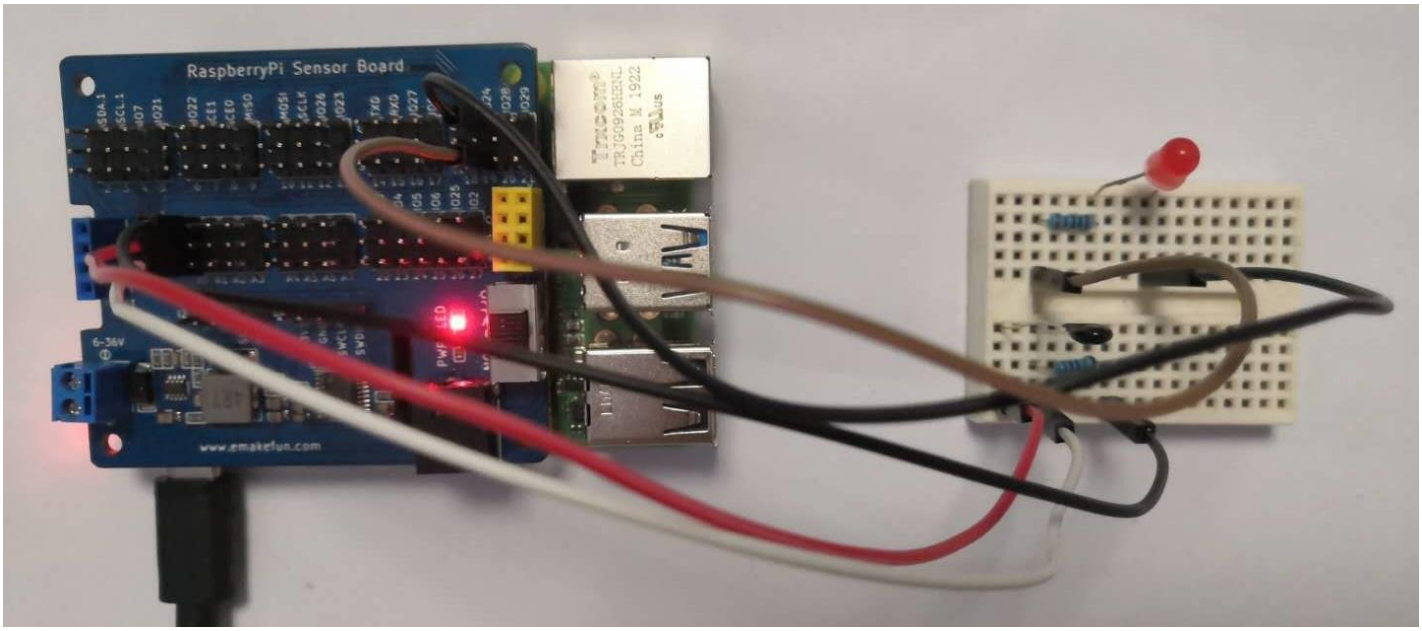
- Raspberry Pi main board
- Raspberry Pi expansion board
- Breadboard
- Cable
- Thermistor *1
- Red LED *1
- 10kΩ Resistor * 1

- 220Ω Resistor * 1
- Several jumper wires

Wiring

Raspberry Pi	Thermistor
5V	1
GND	3
A0	2
Raspberry Pi	LED Module
IO24(wiringPi)/19(BCM)	+
GND	—





C++ program

```
#include <stdio.h>//Import the basic library
#include <wiringPi.h>//Import the Raspberry Pi WiringPi encoding IO control library
#include <wiringPiI2C.h>//Import the Raspberry Pi WiringPi coding I2C control library

int  LEDPIN = 24; //LED light is connected to IO0 port
int  value = 0 ;
float voltage = 0.0 ;
int main()
{
    wiringPiSetup();
    wiringPiI2CSetup(0x04);
    pinMode(LEDPIN, OUTPUT);
    while(1)
    {
        value =  wiringPiI2CReadReg16(0x04, 0x10);
        printf("value %d\n",value); //print value
        if(value >= 800)
        {
            digitalWrite(LEDPIN, HIGH);
            delay(500);
        }else{
            digitalWrite(LEDPIN, LOW);
        }
        delay(1000); //delay 1s
    }
}
```

Python program

```
import time
import smbus as smbus
import RPi.GPIO as GPIO
import time

LEDPIN = 19
cyc =0.5
ADC=smbus.SMBus(1)#Declare to use I2C 1
GPIO.setmode(GPIO.BCM)
```

```
GPIO.setup(LEDPIN, GPIO.OUT)

while True:
    ADC.write_byte(0x04, 0x10)#Write a byte to the slave
    val = ADC.read_word_data(0x04, 0x10)
    print(val)#Raspberry Pi reads the data returned by the expansion board and prints it
out
    if val>=800:
        GPIO.output(LEDPIN, True)
        time.sleep(0.5)
    else:
        GPIO.output(LEDPIN, False)
    time.sleep(1)#Delay 1 second
```

Java program

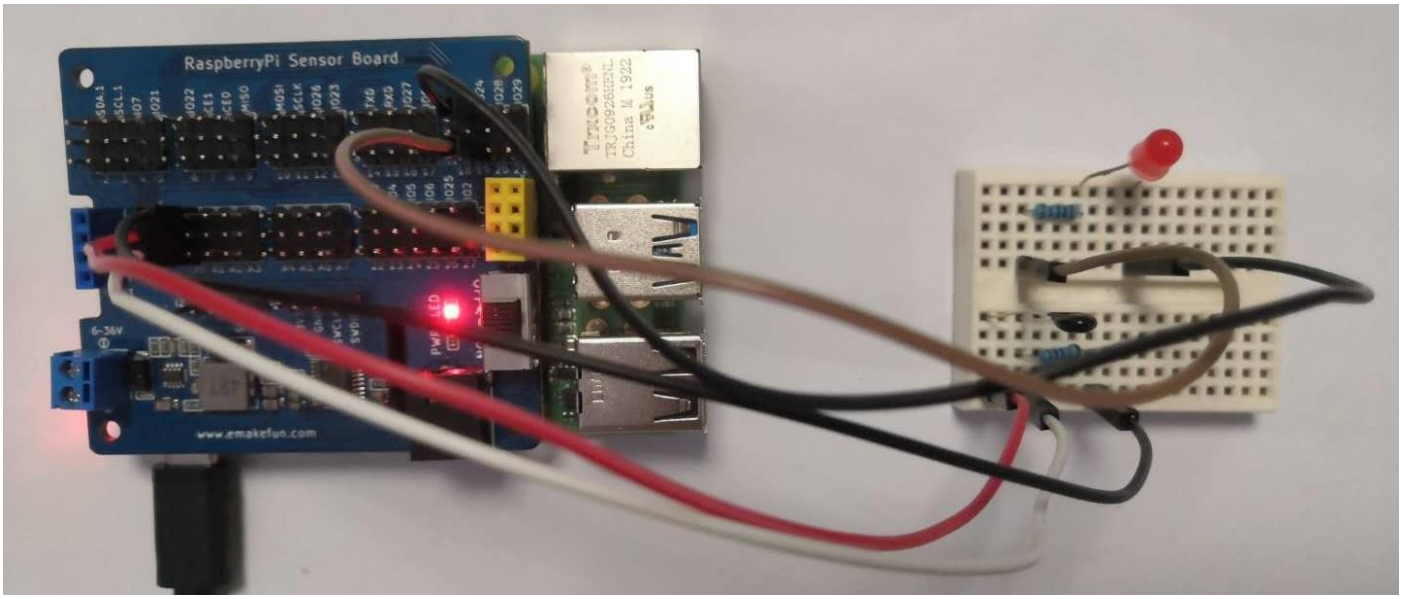
```
import com.pi4j.wiringpi.I2C;
import com.pi4j.wiringpi.Gpio;

public class Thermistor {
    static int Buzzer = 4, led_pin = 5, value = 0, fd;

    static {
        Gpio.wiringPiSetup();
        fd = I2C.wiringPiI2CSetup(0x04);
        Gpio.pinMode(led_pin, Gpio.OUTPUT);
    }

    public static void main(String[] args){
        for ( ; ;){
            value =  I2C.wiringPiI2CReadReg16(fd, 0x10);
            if(value > 200) {
                Gpio.digitalWrite(led_pin, Gpio.HIGH);
                Gpio.digitalWrite(Buzzer, Gpio.HIGH);
                Gpio.delay(1000);
            } else {
                Gpio.digitalWrite(led_pin, Gpio.LOW);
                Gpio.digitalWrite(Buzzer, Gpio.LOW);
            }
        }
    }
}
```

Experimental Effect



After the program runs, we observe the voltage value printed on the serial port, then use a flame or a higher temperature medium to approach the thermistor and finally observe the voltage change and the brightness of the LED.