

NIELIT, Gorakhpur

Course Name: A-level (1st Sem.)

Subject:IoT

Topic: Thermistor Interfacing with Arduino

Date: 26.03.2020

Measuring temperature using thermistor

Here, an NTC type thermistor of 10kΩ is used. NTC of 10kΩ means that this thermistor has a resistance of 10kΩ at 25°C.

Voltage across the 10kΩ resistor is given to the ADC of UNO board.

The thermistor resistance is found out using simple voltage divider network formula.

$$R_{th} + 10k = \frac{5 * 10k}{V_{out}}$$

R_{th} is the resistance of thermistor

$$V_{out} = 5 * \frac{10k}{10k + R_{th}}$$

V_{out} is the voltage measured by the ADC

$$V_{out} = \frac{5 * ADC_{val}}{1023}$$

The temperature can be found out from thermistor resistance using the Steinhart-Hart equation.

Temperature in Kelvin = $1 / (A + B[\ln(R)] + C[\ln(R)]^3)$

where A = 0.001129148, B = 0.000234125 and C = 8.76741*10⁻⁸

and R is the thermistor resistance.

Sketch For Temperature Measurement Using Thermistor

```
#include <math.h>
const int thermistor_output = A1;
void setup() {
  Serial.begin(9600);/* Define baud rate for serial communication */
}
void loop() {
  int thermistor_adc_val;
  double output_voltage, thermistor_resistance, therm_res_ln, temperature;
  thermistor_adc_val = analogRead(thermistor_output);
```

```

output_voltage = ( (thermistor_adc_val * 5.0) / 1023.0 );
thermistor_resistance = ( ( 5 * ( 10.0 / output_voltage ) ) - 10 ); /* Resistance in kilo ohms */
thermistor_resistance = thermistor_resistance * 1000 ; /* Resistance in ohms */
therm_res_ln = log(thermistor_resistance);
/* Steinhart-Hart Thermistor Equation: */
/* Temperature in Kelvin = 1 / ( A + B[ln(R)] + C[ln(R)]^3 ) */
/* where A = 0.001129148, B = 0.000234125 and C = 8.76741*10^-8 */
temperature = ( 1 / ( 0.001129148 + ( 0.000234125 * therm_res_ln ) + ( 0.0000000876741 * therm_r
es_ln * therm_res_ln * therm_res_ln ) ) ); /* Temperature in Kelvin */
temperature = temperature - 273.15; /* Temperature in degree Celsius */
Serial.print("Temperature in degree Celsius = ");
Serial.print(temperature);
Serial.print("\t\t");
Serial.print("Resistance in ohms = ");
Serial.print(thermistor_resistance);
Serial.print("\n\n");
delay(1000);
}

```

Exercise:

Write a program to display value of thermistor temperature sensor on LCD