CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

S0927

Project Title

Creating an Accurate Temperature Sensor Incorporating a Thermistor and Arduino Uno

Abstract

Objectives/Goals

The goal of my project was to create a reliable temperature sensor incorporating a 10K ohm thermistor and an Arduino Uno.

Methods/Materials

My project used an Arduino Uno and a thermistor to read temperature. The thermistor was incorporated in a voltage driving circuit (VDC) to make reading the resistance of the thermistor easier. A wire was connected to the VDC and runs to the Arduino. This was my input on the Arduino. My output was a liquid crystal display (LCD) attached to an Arduino Shield. I then programmed the Arduino to interpret the data from the thermistor. I used the Steinhart-Hart equation to change thermistor resistance into temperature. The Arduino displayed the temperature on the LCD after converting it into Celsius.

Results

The main problem in my results was converting voltage values (0-1023) to resistance in ohms. This caused me to have three programs, each with a different conversion method. Program 1 had some early success with 66% accuracy at a tolerance of 0 degrees. This did not continue with 0% accuracy results in trials 2 and 3. Program 2 had fluctuated results varying from 16% to 75% accuracy at 0 degrees of tolerance. Program 3 was the only program at 100% accuracy with 0 degrees of tolerance. Unfortunately this did not hold with the next trial having 0% accuracy. Program 2 had the most consistent accurate results with a tolerance of +/-0.1 degrees.

Conclusions/Discussion

In conclusion, my results do not support my hypothesis. I could not make an accurate temperature sensor with an Arduino Uno and 10K ohm thermistor. My main problem was converting voltage input into resistance of the thermistor. My best method used the analog to digital converter (ADC) which was (1023/V-1)R. This was inaccurate because the ADC on the Arduino is only 10 bit(2^10=1024). I believe that if a 14 or 16 bit ADC converter is attached to the Arduino Uno, correct values could be found with a thermistor.

Summary Statement

My objective was to create a reliable accurate temperature sensor that utilizes a thermistor and Arduino Uno.

Help Received

My family supported and encouraged me throughout the project. Jim Bock, a SJOE robotics instructor, gave advice on programming and circuity.