CAB203 Assignment Report
Temperature Monitor

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Project Description

Temperature monitor is a simple Arduino project based on C language which learned in CAB202. The goal of this project is to design a home-use thermometer. It has these main functions:

- This temperature monitor can detect from -40 °c to +125 °c in Celsius and show current temperatures both in Celsius and Fahrenheit.
- The system will refresh the current temperatures every 20 seconds automatically.
- If clicks the button, the system will refresh the temperatures right now.
- When the temperatures get successfully, the LED will blink for three times and the uart will receive the message “Read Temp successfully”.

Link

Tinkercad link:

https://www.tinkercad.com/things/5cRzLfOPjLY-n10599070-zippo-he-assignment/editel?sharecode=kDPrg13uPljYChtYCn_TvvJfUtKd4SbaH_uDaNK1DXg

QUT OneDrive link:

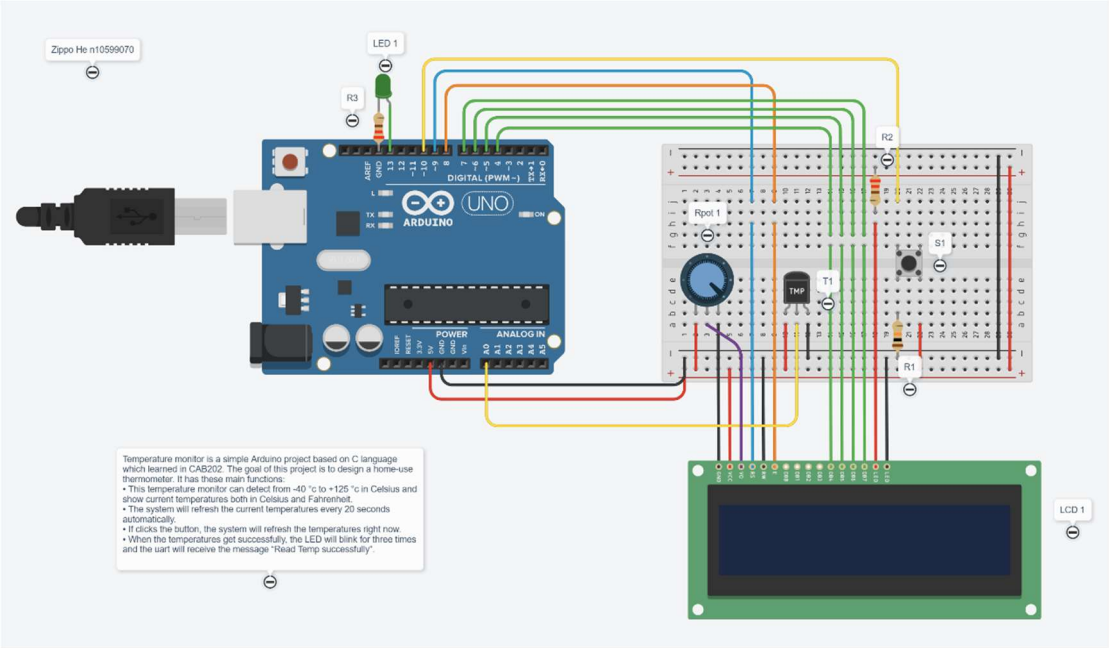
https://connectqutedu-my.sharepoint.com/:v:/g/personal/n10599070_qut_edu_au/EW23UnuF1YRDpnwclV8JDIEBHAJng93_JHXbHkyEEmcSQg?e=G0qNaA

Component List

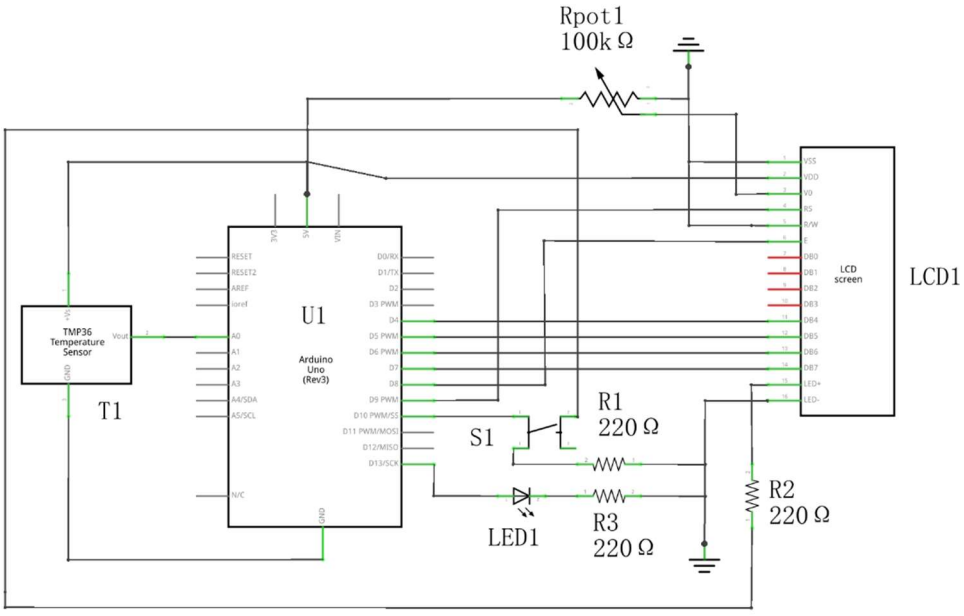
Name	Quantity	Component
U1	1	Arduino Uno R3
LCD1	1	LCD 16 x 2
T1	1	Temperature Sensor [TMP36]
R1	1	10 kΩ Resistor
R2	1	220 Ω Resistor
R3	1	220 Ω Resistor
LED1	1	Green LED
S1	1	Pushbutton
Rpot1	1	250 kΩ, Potentiometer

Schematic Diagram

Snapshot of project in Tinkercad



Schematic diagram



Wiring Instruction

Connect LED 1:

- place LED 1 above the Arduino Card
- connect pin D13 to the anode of LED 1
- connect the cathode of LED 1 to one end of a distinct 220 Ω resistor R3
- connect the other end of the resistor R1 to ground

Connect Switch S1:

- place S1 on the right side of the breadboard
- connect pin D10 to Terminal 1b
- connect Terminal 2a to Power 5V
- connect Terminal 1a to one end of a distinct 10 kΩ resistor R1
- connect the other end of the resistor R1 to ground

Connect Temperature Sensor T1:

- place T1 on the breadboard to the left of Switch 1
- connect the power pin of T1 (left pin) to Power 5V
- connect the GND pin of T1 (right pin) to ground
- connect the Vout pin of T1 (middle pin) to pin A0 on the Arduino Card

Connect LCD 1:

- place LCD 1 below the breadboard
- connect pin LED- on the LCD to ground
- connect pin LED+ on the LCD to one end of a distinct 220 Ω resistor R2
- connect the other end of the resistor R2 to the Power 5V
- connect pin DB7 on the LCD to pin D07 on the Arduino Card
- connect pin DB6 on the LCD to pin D06 on the Arduino Card
- connect pin DB5 on the LCD to pin D05 on the Arduino Card
- connect pin DB4 on the LCD to pin D04 on the Arduino Card
- connect pin E on the LCD to pin D08on the Arduino Card
- connect pin RW on the LCD to ground
- connect pin RS on the LCD to pin D09 on the Arduino Card
- connect pin VCC on the LCD to the Power 5V
- connect pin GND on the LCD to ground
- pin V0 will be connected in the Potentiometer Rpot1

Connect Potentiometer Rpot1:

- place Rpot1 on the breadboard to the left of T1
- connect pin Terminal 1 to the Power 5V
- connect pin Terminal 2 to ground
- connect pin Wiper to pin V0 on the LCD

Learning Outcomes

1. Digital I/O – switch
   Switch S1 is used to promote the Arduino Card to get the result of temperatures immediately. Once clicking the button, the device will show the up-to-date temperatures on the LCD screen without waiting the 20 seconds' refreshing time.
2. Digital I/O – interrupt-based debouncing
   In this device, the switch debounce is non-blocking switch debounce which uses Timer0 interrupt to do the debounce work.
3. Digital I/O – LED
   LED 1 is used to notify the users that the temperatures have been refreshed. Every time the temperatures refreshed to the newest one, LED 1 will blink 3 times.
4. Analog Input
   Temperature Sensor T1 is used to read the temperature of current environment. The degree range of T1 is from -40 °c to +125 °c in Celsius. T1 uses ADC to read the data from pin A0.
5. Analog Output (PWM)
   Not done this one totally. (I would like use PWM to control the backlight of LCD. The code is all right, and AMS can compile it. However, there are something wrong on Tinkercad. I have to delete PWM from code.)
6. Serial I/O
   When reads the T1 temperatures from ADC successfully, the device will send message "Read Temp successfully" to serial monitor.
7. LCD
   This device uses LCD to display the temperatures which includes both in Celsius and Fahrenheit.
8. Timers
   This device uses Timer1 to count the total running time. Every 20 seconds, the system will automatically update the temperature. (total time % 20)