

Assignment 3

- The hardware implementation

Components: Arduino board, breadboard, temperature sensor, DC motor, two 7 segment displays, resistors, wires.

Connections:

- I connected the breadboard to GND and 5V of Arduino.
- I connected the temperature sensor's pins this way: Power to 5V, Vout to A0, Gnd to Gnd.
- I connected the DC motor's pins: Terminal 1 to Gnd, Terminal 2 to D13.
- I connected the multiplexed 7 segment displays: both 'a' segments to D7, 'b' segments to D8, 'c' segments to D2, 'd' segments to D3, 'e' segments to D4, 'f' segments to D6, 'g' segments to D5 and the common cathodes to D10 (for the tens digit display), respectively to D9 (for the ones digit display), using appropriate resistors to limit the current (200 Ohms).

- The software implementation

I declared variables for the pins of the temperature sensor, DC motor, and displays' segments. I also created an array for the pattern of every digit.

After that, in the setup function, I set the pins' mode: tempPin as input and the rest (DC motor, segments) as outputs.

In the loop function I read the value from the temperature sensor and I compute and map the value in celsius degrees using the formula $\text{map}(((\text{analogRead}(\text{tempPin}) - 20) * 3.04), 0, 1023, -40, 125)$; this way I can obtain the temperature in the range -40, 125 C.

If the temperature is greater than 23 degrees C, I turn on the fan (simulated with the help of a DC motor).

To display the temperature on two 7 segment displays, I extract the tens digit and the ones digit from the temp_celsius variable and I call the function displayDigit for each extracted digit.

The displayDigit(byte digit, byte display) has two parameters - digit, display. You pass the extracted digit from the temp_celsius variable using the digit parameter; through the display variable you can pass the common cathode of the display you want (for the tens or ones digit).

In this function, the corresponding display is activated, the values of the segments change accordingly, using the digitPatterns table in the beginning, then the display is deactivated.

The software implementation is found at the following link:

<https://www.tinkercad.com/things/8yMeyDnuYWq-assignment-3-rtcs-ionescu-natalia-cen4ha/editel?sharecode=VjFYA0FzDaMDXCuJgVUFNcGeOPziO4ITtWLCsebbT5U>

- Personal information

The fan was simulated using a DC motor. Additionally, when I extracted the digits to display the temperature of the two 7 segment displays, for the negative values I used the abs() function, so for example if the temperature is - 10 celsius degrees, the two displays will show '1' '0'.