EE 444/645

Assigned 3/9/2023

Lab #4: MSP430 – Putting it all together

No report required. Finish in the lab and show the working program to your TA.
*Submit only your program (**main.c** file)*

Introduction

For this lab you will use (almost) everything we learned so far. Try reusing the portions of previous lab assignments. This would be a great way to prepare for group projects, where you will be expected to integrate code written by different people into a final product.

Equipment:

CrossStudio for MSP430
TI MSP-EXP430F5438 Experimenter Board
Oscilloscope

Task:

1. Write a program that starts a slow timer that can measure time with (at least) one second resolution, calibrates the temperature sensor, sets up UART communication with the PC, and then waits (in sleep) for the user to push one of the buttons on the board. When the button is pushed, the program should:
    - Take 8 consecutive samples of the internal temperature sensor, just like we did in Lab 3, and then average them.
    - Convert that value into degrees Celsius.
    - Prepare a nicely formatted message and send it to the PC. Use the same approach we used in a class exercise this week, where we minimized the amount of time spent in the interrupt service routines. The output should look something like this:

```
001. The temperature is 23 °C. Running time is 0:23
002. The temperature is 24 °C. Running time is 0:48
003. The temperature is 24 °C. Running time is 1:35
004. The temperature is 25 °C. Running time is 5:24
```

NOTES:

- Whenever possible, try to reuse the code from previous labs/exercises.
- Set the same communication parameters as we did in Lab 4.
- Exit from all interrupt service routines as soon as possible (for example, prepare the message and then let the UART interrupt service routine take care of transmission).
- Spend the remaining time in the lowest possible low power mode.
- The originality, effectiveness, and power consumption awareness of the solution will affect your grade for this assignment. Extensive use of interrupt mechanisms and low-power modes is strongly recommended.

Be extra careful when handling the board and connecting the oscilloscope.