ECE 2534
Spring 2018
Homework 3

This homework develops the hardware abstraction layer (HAL) you need for Lab 2. Code that you write for this homework may be reused in your Lab 2 solution. The homework is a collection of 4 examples that each rely on the HAL functions for Lab 2. The example code is fixed; you only need to write the function body for the HAL functions.

To start the Homework, navigate to https://classroom.github.com/a/lflc9nrV and accept the assignment. You will obtain a repository (https://github.com/vt-ece2534-s18/homework-3-username) which contains 4 CCS projects. The 4 projects are the following.

- homework3-example1: foreground and background color setting for LCD
- homework3-example2: UART Baudrate setting
- homework3-example3: One-shot timer functions
- homework3-example4: Debouncing FSM for switch S2

Homework3-example1 –
In this problem, you need to develop code for the color-setting functionality of the LCD. You have to write two functions:

- void LCDSetFgColor(color_t c);
- void LCDSetBgColor(color_t c);

If your implementation is correct, the main program will clear the LCD, set the foreground color to yellow, the background color to red, and write 'YELLOW ON RED' on the LCD.

You have to consult the MSP Graphics Library User Guide to learn how to set LCD colors. The manual is available on Canvas (Technical Documentation)

Homework3-example2 –
In this problem, you need to develop code to set the baud rate for the UART. You have to write one function:

- void UARTSetBaud(UARTBaudRate_t t);

The main program prints four messages, each at a different baud rate. The messages are self explanatory: 'Baud is 9600', 'Baud is 19200', 'Baud is 38400' and 'Baud is 57600'.

To test your implementation, connect MobaXterm to your COM3 UART and run the MSP432P4 program. You should be able to read the message corresponding to the baudrate setting you chose for MobaXterm. The other messages will read as garbage characters. For example, if you connect with MobaXterm at 19200 baud, you should be able to see 'Baud is 19200' when the MSP432P4 program runs.

You have to consult the MSP432P4 User Guide to learn about baud rate settings, and in particular section 24.3.10. The manual is available on Canvas (Technical Documentation).

Homework3-example3 –
In this problem, you need to develop code for two one-shot timers. The first one has a period of 100ms and will be used for switch debouncing. The second one has a period of 200ms and will be used for LED flashing. In total you have to write five functions.

- void InitTimer();
- void Timer200msStartOneShot();
- int Timer200msExpiredOneShot();
- void TimerDebounceStartOneShot();
- int TimerDebounceExpiredOneShot();

If the implementation is correct you will see the red LED toggling with a half-period of 100ms, and you will see the color LED cycling through 8 colors, at 200ms per color. The driverlib manual is available on Canvas (Technical Documentation)

Homework3-example4 –
In this problem, you need to develop debouncing code for switch S2. You can use the timer functions of the previous example to implement the debouncing delay. You have to develop one FSM.

- bool BounceFSM(bool b);

where the input is the S2 button status and the output is the debounced S2 button status.

If the implementation is correct you will be able to toggle the red LED while pressing S2. The toggles should be stable and no toggles should be skipped.

You have to consult Lecture 9 for a discussion on the design of a Debouncing FSM.

What to turn in –
By the deadline, develop the function bodies for the examples above and push your results back to GitHub. The code that you develop for this homework may be used to solve Lab 2. It's in your advantage to start early with the homework in order to get a lead on Lab 2. Good luck!