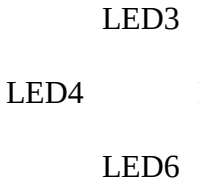
ELEC 5260/6260 Problems Set #5
Due Friday, 2/22/2013

To practice with parallel I/O ports, write a program that creates and displays one of two patterns on the 4 LEDs on the Discovery board. Under the control of the user push button (the blue button).



LED3 (orange) = I/O port pin PD13
LED4 (green) = I/O port pin PD12
LED5 (red) = I/O port pin PD14
LED6 (blue) = I/O port pin PD15
User button (blue) = I/O port pin PA0

The program is to operate as follows.

1. Initially, all LEDs are off.
2. On the first press of the user button, the LEDs should be turned on with the following pattern:
   LED3 – LED4 – LED6 – LED5 – ALL OFF (each LED remains ON until ALL OFF)
   This pattern is to be repeated until the next button press. Note that you should see LEDs turn on in a counter-clockwise circle.
   Each step of the pattern is to be held for exactly one-half second.
3. On the next press of the user button, the LED pattern is to change to the following:
   LED3 – LED5 – LED6 – LED4 – ALL OFF (each LED remains ON until ALL OFF)
   This pattern is to be repeated until the next button press. Note that you should see LEDs turn on in a clockwise circle.
   Each step of the pattern is to be held for exactly one-half second.
4. On the next button press, return to step 1 (all LEDs off). Then repeat steps 1-4 continuously.

The program is to contain the following modules:

1. An ***output handler***, written in ARM assembly language, which writes patterns to the LEDs.
2. An ***input handler***, written in ARM assembly language, which tests the user button, and sets a global variable.
3. A ***system tick timer interrupt handler***, written in C, which is activated every one-half second. This routine should call the output handler, if the LEDs are to be changed.
4. A main program, written in C, which executes in a continuous loop, calling the input handle every time through the loop.
5. The "startup code" for the STM32F4-Discovery board, as found in the Keil installation directory: C:/Keil/ARM/Boards/ST/STM32F4-Discovery/Blinky
6. The STM32F4xx microcontrollers "include file", found in the Keil installation directory: C:/Keil/ARM/INC/ST/STM32F4xx/stm32f4xx.h

(see program testing and submission on the next page)

Testing and submitting the program:

The program can be tested in RAM on the board or in flash memory. The final version should be programmed into the flash memory of the board, so that the program can be demonstrated without being connected to the Keil debugger.

Print and submit the source program, ***and also email it to me***.

Rather than printing multiple debug windows, bring your programmed board to my office and demonstrate the program to me.