

CS 431 Lab #1
LCD Module and Digital I/O
Spring 2015

Demonstrations will occur at the beginning of next lab (in your own section). Code submissions are due by Tuesday of next week, at 11:59pm.

1 Overview

In this lab you will be introduced to programming the AVR board. You must write a program that does all of the following:

1. Display the name of each group member on the LCD (10 points).
2. Toggle LED4 at the start of your main program loop (10 points).
3. LED1 should be on when joystick A's button #1 (trigger) is pressed and off when the button is not pressed (10 points).
4. LED2 should be on when joystick A's button #2 (thumb) is pressed and off when the button is not pressed (10 points).
5. LED3 is off whenever buttons #1 and #2 both have the same state (both held down or both not held down). LED3 is on whenever buttons #1 and #2 have different states (10 points).
6. Keep an accurate (debounced) 8-bit unsigned count of the number of times that joystick A's button #1 has been pressed. Display the counter's current value on the LCD in a fixed location as both a hexadecimal value and a decimal value (50 points).

2 Procedure

1. Before getting started, read sections 2, 3.1, 3.2, 4.1 - 4.7, 5 in the CS 431 Laboratory Manual (available on the course website).
2. Setup for Lab 01.
 - (a) Create a folder named Lab01 and copy all the files from the HellowWorld to it.
 - (b) A demonstration version of the Lab 01 program that you now need to write is provided in compiled form. You have learnt in Lab0 how to program it on your device.
 - (c) Update main.c such that it fulfills the requirements specified in the Overview section

- i. Printing text to the LCD can be a relatively slow process. Therefore, static text should be printed only once outside of the main program loop. In the provided demo of Lab 01, the first few lines of text are all static.
- ii. Debouncing the joystick trigger should be done using the algorithm proposed in section 4.6.3 of the Lab Manual.
- iii. Be careful when performing port operations and be sure to insert Nop statements where appropriate.

At the start of Lab 2, each lab group will be asked to demonstrate and explain their Lab 1 code to the TA.

3 Questions to Ponder

The following questions are provided for your lab group to think about. No written response is required.

1. When debouncing the trigger button, how many consecutive 0s do you read before considering the button pressed?
2. Suppose the microcontroller's CPU clock was slowed from 16 MHz to 8 MHz. How many consecutive 0s would you need to read to debounce the trigger?