CS2021/CS3D2

Laboratory 1—Interfacing

February 8, 2018

Summary

The purpose of this lab is to allow you to get familiar with developing a simple I/O program and to do a little troubleshooting. In the last 45 minutes of the lab, your progress will be evaluated. The lab is worth 6% of your year-end mark.

Tasks

1. The first task is to connect up (see Figure 1) the seven-segment display that comes with your board and have it display F, E, D, C, . . . 5, 4, 3, 2, 1, 0, F, E, . . . endlessly.
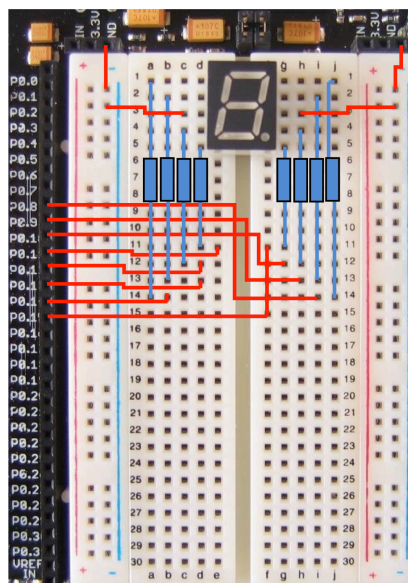

Figure 1: Wiring for the Seven Segment Display. (Diagram © Embedded Artists.)

- Write the assembly language software necessary to display each digit for about half a second before going to the next. Get it working so that it displays all 16 hexadecimal digits starting at F, then E, working down to 0 before starting at F again.

- There is a kind of a flaw in the wiring diagram, and the effect of it is to cause some of the segments to be dimmer than the others and also for the segments not to go fully off when required to. When you have your system—hardware and software—running properly, identify the flaw and fix it.

2. The second task is to the program so that it responds to the buttons P1.20 to P1.23 as follows:

   (a) if no buttons are pressed, the digit on the seven-segment display should remain unchanged.

   (b) If one or two buttons are pressed. the digit display should count down.

   (c) If three or four buttons are pressed, the digit display should count up.

3. The third task is, from your work in Assembly Language, develop a C solution.

Notes

- **Be Careful!** It is possible to damage the board by mis-wiring. Please be careful as you decide to wire up the display. Under no circumstances should you connect I/O pins to power or ground lines. The resistors are there to limit the current flow from the GPIO output pins—don't bypass them.

- *Use the Emulator* The development system contains a very useful emulator/simulator which not only simulates the processor, but also the peripheral interfaces. You should find it very useful when developing the program.

- *Documentation Sources.* Look on Blackboard for links to documentation. You may need to look at, and make sense of, the schematics (drawings) of the circuitry of the system.

- *Change Roles* As a member of a group, there might be a temptation to always do the same kind of thing each week—the programming, or the wiring, or . . . , but in cooperation with the other group member(s), you should take care to ensure you have something to do with all aspects of the practical.