BBM 434 – Embedded Systems Lab
Lab 2 Instructions

Introduction

You have been contracted by your government to design a special gadget that will be used by secret spies. The gadget will be an embedded, innocent looking device that will have a capability of sending a distress signal in case agents find themselves in a troubling situation and in need of a backup.

Preparation

You will need a LaunchPad and access to TM4C123_LaunchPadUsersManual.pdf. In this lab, there will be no external circuitry.

Starter Project

You can use the last week's lab file as the starter project.

Purpose

The purpose of this lab is to learn about the basic input/output architecture on your Launchpad. You will also use loops for time delaying and read inputs inside a loop.

System Requirements

1) Make PF0 and PF4 inputs (switches) and PF1, PF2 and PF3 (LEDs) outputs (already done in Lab 1).

2) The system should start with the LEDs turning **red**, **blue**, **green**, **red**, **blue**, **green** and so on, staying for 0.5 second at **red**, 1 second at **blue**, and 1.5 seconds at **green** (no pauses between changing LED colors). In this lab you are expected to measure time using loops. By decrementing a counter inside a loop, you can achieve a delay of a certain amount of time.

3) **When the switch SW1 is pressed**, the LaunchPad should start flashing **SOS signal in Morse code** (three short flashes, three long flashes, three short flashes), such that S's (short flashes) are signaled with **red**, and O's (long flashes) with **white** LED light. Short red flashes should last for 0.25 seconds, while long white flashes should last for half a second. Make sure that you do not sense the pressing of a switch multiple times. The SOS signal should be flashed every time the switch is pressed; however, if the switch is pressed in the middle of the red-blue-green period, your system should wait till the end of that period (all three colors must be flashed), after which it should switch to the SOS mode. When switch is not pressed, system should go back to flashing the **red**, **blue**, **green** sequence.

Measuring Time

Since you cannot easily estimate how long a loop takes, we expect you to adjust the time by using the built-in logic analyzer. You can measure time using the logic analyzer as described in the following video.

https://www.youtube.com/watch?v=zGX-3FEN5IY

Part 1) Run the lab in the simulator

First run the lab in the simulator, as described in the last week's lab.

Part 2) Run the lab on the LaunchPad

After you have completed the lab in simulation mode, you will switch over and debug it on the real board. You will simply run the same project on the actual LaunchPad as described in the last week's lab.

Part 3) Experimenting with the code

Discuss the following:
1) In this lab, you are detecting the pressing of a button via polling. Do you think if it is a good practice? Are there any disadvantages?
2) In this lab, you introduced delay via looping. Do you think if it is a good practice? Are there any disadvantages?
3) How long does it take for a single iteration of the 1-second delay loop on the development board?

Bonus Part (Optional)

If you want to get a chance to win a **surprise award**, you should extend your project so that when the switch SW2 is pressed your LaunchPad does something that is either surprising, amazing, fun, useful, or cool.

How to Submit a Written Report

The deadline for the submission is **Friday 22 March 2019 until 13:45** (no further extensions will be allowed!). Submit your work through http://submit.cs.hacettepe.edu.tr/ (submission via e-mail will not be accepted!) in the following format (**one submission per group is sufficient**):

- **b<studentID>.zip**
  - **report.pdf**