Lab 0 – C Revision

C revision. Bit manipulation. Data structures. Pointers.

Introduction

This review exercise will allow you to revise some essential concepts that will be used frequently in embedded systems programming. The Freedom board is to implement a simple 12-hour clock that keeps track of time with a resolution of one second. When a user presses a button, a record of the button press will be stored in a statically declared (i.e. at compile-time) array which can only store 10 time-stamps using a "packed representation".

Objectives

1. To write a program in C that uses bit manipulation, arrays, and real-time event handling.

Equipment

- 1 NXP FRDM-K64F
- 1 USB cable
- NXP MCUXpresso IDE v11.1

Safety

This is a Category A laboratory experiment. Please adhere to the Category A safety guidelines (issued separately).

Cat. A lab

L0.2

Software Overview

We would like to implement a simple clock in our embedded system[1].

An application will be written around the clock so that we have the ability to time-stamp up to 10 “events”.

The time-stamped events will be efficient in their storage requirements, and will use the following packed representation of time:

A packed representation of time

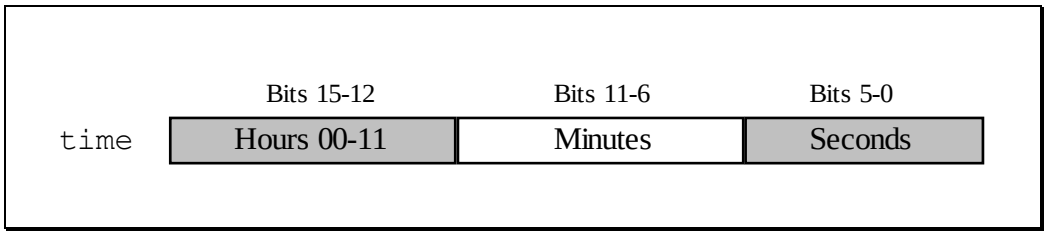

Figure L0.1

The time is only 12-hour time – i.e. AM or PM are not stored.

Your job is to expand on the given template to implement the time-stamping.

When SW2 is pressed, the current time is stored in a static array (buffer) using the packed representation above. Once the array is full, it should not overflow (no more time stamps are recorded).

Software Requirements

A git repo has been set up with the initial framework in place:

http://git.pmcl.net.au/48434_Public/Lab0

Your task is to understand the structure of the program and complete the missing elements. The project is in a runnable form, and you should test it out using the debugger. Follow the TODO: comments as a guide to completing the application.

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[1] This is NOT what you would do in a real application – this is just an exercise. As you will see later, there is hardware support for a real-time clock on our device.