The Hong Kong Polytechnic University

Department of Electronic and Information Engineering

EIE3105 Integrated Project (Part I)

Laboratory Exercise 7: ARM Programming

(Deadline: Check the course information)

Objective:

To develop C programs with timers/counters, interrupts and serial port communication under the ARM platform.

Equipment:

Keil uVision5 with ARM support (software)
STM32F103RBT6 (hardware)

Procedure:

Section A: Write a C Program to simulate the traffic lights

Write a C program to simulate the traffic lights by using different pins. You can use any pins to simulate the traffic lights. You must use interrupt to implement the application.

A set of traffic lights for cars (Light 3, 3 LEDs)
A set of traffic lights for cars (Light 2, 3 LEDs)
A set of traffic lights for people (Light 1, 2 LEDs)

Repeat the following:
Light 1 (RED), Light 2 (GREEN), Light 3 (RED), period (around 5s)
Light 1 (RED), Light 2 (YELLOW), Light 3 (RED), period (around 1s)
Light 1 (RED), Light 2 (RED), Light 3 (RED), period (around 1s)
Light 1 (RED), Light 2 (RED), Light 3 (RED+YELLOW), period (around 1s)
Light 1 (GREEN), Light 2 (RED), Light 3 (GREEN), period (around 5s)
Light 1 (GREEN Blinking), Light 2 (RED), Light 3 (YELLOW), period (around 1s)
Light 1 (RED), Light 2 (RED), Light 3 (RED), period (around 1s)
Light 1 (RED), Light 2 RED+YELLOW), Light 3 (RED), period (around 1s)

Section B: Write a C program to count a switch

Connect a switch to a pin and a LED to another pin. There are two states in the switch: State 0 and 1. When it is in State 0, the LED is off. When it is in State 1, the LED is on. At the beginning, the switch is in State 0. When the switch is pressed three times and it is in State 0, it goes to State 1. When the switch is pressed three times and it is in State 1, it goes to State 0. You must use interrupt to implement the application.

Section C: Use an external hardware interrupt to enable the simulation of the traffic lights.

Connect a switch to an external hardware interrupt pin. Write a C program so that the simulation of the traffic lights in Section A can be started by pressing the switch once. If the switch is pressed again, the simulation of the traffic lights will be stopped (i.e., all LEDs are OFF).

Section D: Write a C program to keep sending and receiving characters

Write a C program to complete the following tasks by using interrupts:

1. Before you press any keys, character 'a' is printed continuously.

2. When you press a key (say 'b'), 10 characters of this key (i.e., 'b') are printed out and then stop.

3. After that when you press a key other than the first key (i.e., 'b'), nothing happens.

4. When you press the key again (i.e., 'b'), character 'a' is printed continuously (i.e., resume).

Set the baud rate of the PC terminal (i.e., Tera Term) to 9600.

If your program runs successfully and the setting of Tera Term is correct, you should see the following output:

```
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaabbbbbbbbbbaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaacccccccccc
```

<u>Demonstrate Section A, B, C and D to our tutors or technicians.</u>

Instructions:

1. You are required to demonstrate your programs to our tutor or technicians.
2. Zip all programs (including the whole projects) in Section A, B, C and D into a single file, and submit it to Blackboard.
3. Deadline: **<u>Check the course information</u>**.

Ivan Lau
Lawrence Cheung
October 2017