COMP9032 Lab 2

Sept. 2020

1. Objectives

In this lab, you will learn AVR programming on
- function
- parallel I/O

2. Preparation

For **Task 2** of this lab, you will use the lab board. It is recommended that you this week (Week 3):
- read *Introduction to Lab Board* to know how to use the board.
- download and install the following Arduino software that is available on the course website.
    - arduino-1.0.6-windows.exe

3. Tasks

3.1 Task 1: (10 marks, due **your lab session in Week 4**)

GCD can be calculated in many ways. Figure 1 shows a different approach (as compared to the one used in Lab 1) to obtain GCD of two unsigned integers (written in C, where, a%b is the remainder of a divided by b).

Write an **assembly recursive function** to implement the C program. Here we assume the integer size is two bytes. For readability, use a macro for a%b in your assembly code.

```c
unsigned int gcd(int a, int b)
{
    if (b != 0)
        return gcd(b, a%b);
    else
        return a;
}
```

Figure 1

Assemble and run your program in Atmel Studio and show your working program to your tutor.

3.2 Task 2: (3 marks, **due Tuesday 12noon in Week 4**)

Work together as a group to test the lab board distributed to your group in the f2f class. It is required before the test,

- every group member read all documents about the lab board information available on the course website;

- each group hold a Teams meeting to test the board together by following test procedure provided in the Lab Board Information zip file;

- upload the test report to your group channel in MS Teams before the due time. For a faulty board, send a chat message to your tutor from your group channel and make an appointment for replacement.

3.3 Task 3: (7 marks, due **your lab session in Week 5**)

Implement a LED control system to repeatedly display a sequence of three patterns. Assume the three patterns are stored in registers r10, r11, r12; Their values can be set manually before the code execution.

The display will be halted when the user presses a button. When halted, the display should stay the pattern currently displayed. The display will resume from where it was when the button is pressed again.

To ensure visibility, insert some delay (for example, 0.5 second) between two adjacent patterns. The clock frequency used on the lab board is 16MHz.

Assemble your program using Atmel Studio, and run your code on the lab board. Demonstrate your work to the lab assessor.

Note, Tasks 2 and 3 will be assessed in group, which will test your team skills. All group members are supposed to work together to make sure the task completed on time and with a good quality.

It is suggested that online-only member/s focus on designing the solution and developing code, and the member who holds the lab board mainly acts as a tester to download the code developed by other group members and test it on the lab board and help to debug the code if there are any problems.