

COMP9032 Lab 2

Sept. 2024

1. Objectives

In this lab, you will learn AVR programming on

- function
- parallel I/O

2. Preparation

For **Task 3** of this lab, you will use the lab board. It is required that during this week (Week 3):

- read [Introduction to AVR Microprocessor Development Board](#) on how to use the board, and
- 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: (5 marks, due **your lab session in Week 4**)

Work together as a group to test the lab boards distributed to your group. It is required that

- before the test, every group member read all documents about the [lab board](#), which are available on the Labs page of the course website
- all group members work together in the lab to test the board by following test procedure provided in the **Lab Board Information.zip** file
 - There may already be some wire connections on the board. But you still need to identify the ports and check each connection as specified in the test sheet.
 - After the test, pull off all wires and make the board ready for the following lab exercises.

3.2 Task 2 (20 marks, **due your lab session in Week 5**)

For the task, you need to work individually, and your work will be assessed **individually**.

Write an assembly function that reads a sentence from the program memory and saves the length of the sentence in the data memory. The sentence length is measured in terms of the number of words in the sentence and its value is one byte in size.

It is assumed that the end of sentence is marked by '.', a word is less than 10 characters, and words are separated by space.

3.3 Task 3: (20 marks, due **your lab session in Week 5**)

Implement a LED display control system that can display three different patterns in the following way:

- 1) When the user presses a button for the first time, the first pattern is displayed.
- 2) When the user presses the button again, the second pattern is displayed.
- 3) When the user presses the button the third time, the third pattern is displayed.
- 4) When the user presses the button the fourth time, the display loops around the three patterns automatically. 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.
- 5) To stop the pattern display, press the second button, which will reset the display to the initial setting when the execution started.

Here we assume the three patterns are stored in registers r12, r13, r14. Their values should be set manually before the code execution and only the middle 6 LEDs in the LED bar are used.

Assemble your program using Microchip Studio and run your code on the lab board. Demonstrate your work to your lab tutor.

Note:

- Tasks 1 and 3 will be assessed in groups by your tutor, which will test your team skills. All group members are supposed to work together to make sure the task is completed on time and with a good quality.
- For Task 1, each member who fully participated in the board test will earn 5 marks.
- The assessment for Task 3 consists of two components:
 - 10 marks for overall group work
 - All participants have the same marks.
 - 10 marks for individual member's performance
 - based on your understanding about the group work.
- We have a limited stock of lab kits. Please treat them with caution to avoid damage and unnecessary replacement.