EC792 HIGH PERFORMANCE COMPUTING ARCHITECTURES

Lab 1

Assembly language programming using the MIPS instruction set. This exercise is intended only to familiarise with the instruction set of MIPS processor through simple exercises.

For this exercise, you can download the SPIM assembler (or its latest version QtSim) from
http://pages.cs.wisc.edu/~larus/spim.html
Tutorial for SPIM is available at
http://courses.cs.washington.edu/courses/cse410/08sp/notes/spim/SpimTutorial.pdf
and tutorial for QtSim at
https://open.umn.edu/opentextbooks/textbooks/734

You can use any text editor to edit the code. Example codes add.s and arraysum.s are provided. Use pseudo instructions only if absolutely necessary.

a) Assume that you have an array of 10 elements with base address in $s0. Write an assembly program to find the maximum and minimum values from the array and append it after the last element in the array.

b) Assume that you have an array of 10 elements with base address in $s0. Assume that the base address of a second array is in $t0. Write an assembly program to swap the elements of the two arrays.

c) Write an assembly program to convert red-green-blue (RGB) values for a set of pixels into a single gray value per pixel. You are given an array called pixels, each element of which is a 32-bit word representing a color value. The lowest 8 bits of each color value denote an unsigned integer representing the BLUE value, the next 8 bits are the GREEN value, the next 8 bits are the RED value, and the most significant 8 bits are all zeroes. gray value = (red + green + blue) / 3 (integer divide and truncate). Use a separate procedure rgb2gray and print each RGB value and the corresponding gray value on the console.

d) Assume that you have an array of 10 distinct numbers with base address in $s0. Write an assembly program to sort the array in ascending order. Given a new number insert it in the right position in the sorted array if it is not present in the array, If it is present find the location where it is present in the array.