COE 301/ ICS 233, Term 151

Computer Architecture & Assembly Language

Programming Assignment#2
Due date: Sunday, Oct. 24, 2015

Q.1. Write a MIPS assembly language program that implements the following:

(i) A procedure, ReadA, that prints the reads a twodimensional array of integers in a two-dimensional format entered row-wise. Assume that the array receives as parameters the address of the array in register $a0, the number of rows in register $a1, and the number of columns in register $a2.

(ii) A procedure, PrintA, that prints the content of an array of integers in a two-dimensional format (row-wise) leaving a space between elements. Assume that the array receives as parameters the address of the array in register $a0, the number of rows in register $a1, and the number of columns in register $a2.

(iii) A procedure, SwapR, that swaps two selected rows in the array. Assume that the array receives as parameters the address of the array in register $a0, the number of columns in register $a1, the index of the first row to be swapped in $a2, the index of the second row to be swapped in $a3. Your procedure should ensure that the entered two row numbers are valid. The procedure SwapR should display the content of the array after performing the swap using procedure PrintA.

(iv) A procedure, SwapC, that swaps two selected columns in the array. Assume that the array receives as parameters the address of the array in register $a0, the number of rows in register $a1, the index of the first column to be swapped in $a2, the index of the second column to be swapped in $a3. Assume that the number of columns is passed as a parameter on the stack. Your procedure should ensure that the entered two column numbers are valid. The procedure SwapC should display the content of the array after performing the swap using procedure PrintA.

(v) Ask the user to enter number of rows, R, and number of columns, C, and read it.

(vi) Ask the user to enter an RxC matrix of integers and read it using procedure ReadA.

(vii) Print a menu from which the user can select one of the following options:

      1.   Print the entered array
      2.   Swap two rows
      3.   Swap two columns
      4.   Exit the program

A sample execution of the program is shown below:

Enter number of rows:2
Enter number of columns:3

Enter an array of 2x3 integers:
1
2
3
4
5
6

Select one of the following functions:
  1.   Print the entered array
  2.   Swap two rows
  3.   Swap two columns
  4.   Exit the program

If the user selects the first option, then the following should be displayed:

Array of 2x3 integers is:
1 2 3
4 5 6

If the user selects the second option, then the following should be displayed:

Enter two row numbers to be swapped: 0 1
Array after swapping row 0 and row 1 is:
4 5 6
1 2 3

If the user selects the third option, then the following should be displayed:

Enter two column numbers to be swapped: 0 1
Array after swapping column 0 and column 1 is:
2 1 3
5 4 6

If any of the entered row numbers or column numbers are out of range, your program should display an error message and asks the user to reenter the required information.

This assignment can be done by a group of two students. Every group of two students submit only one solution. The solution should be well organized and your program should be well documented. Submit a soft copy of your solution in a zip file. The name of the zip file should be your ID with the new format (i.e. 200157690). Your solution should be submitted in a word file that contains the following items:

i) *Your name and ID*

ii) *Assignment number*

iii) *Problem statement*

iv) *Your solution along with the code*

v) *Discussion of what worked and what did not work in your program. Include snapshots that demonstrate the working parts of your program. If things did not work and you attempted to solve them, mention that and write about the difficulty that you have faced.*