COE 301/ICS 233: Computer Organization

MIPS Programming Assignment 2, Term 212

Write a MIPS assembly language program that implements the following:

1. **A procedure, PrintA, that prints the content of an array 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, the number of columns in register $a2, the size of each element in the array in register $a3.**
2. **A procedure, ExchangeR, that exchanges the content of two rows in the array and prints the array after the exchange. Assume that the array receives as parameters the address of the array in register $a0, the number of rows in register $a1, the number of columns in register $a2, the size of each element in the array in register $a3. Assume that the two row numbers to be exchanged are passed as arguments in the stack.**
3. **A procedure, ExchangeC, that exchanges the content of two columns in the array and prints the array after the exchange. Assume that the array receives as parameters the address of the array in register $a0, the number of rows in register $a1, the number of columns in register $a2, the size of each element in the array in register $a3. Assume that the two column numbers to be exchanged are passed as arguments in the stack.**
4. **Ask the user to enter number of rows, R, and read it.**
5. **Ask the user to enter number of columns, C, and read it.**
6. **Ask the user to enter the type of elements to be read and read it. Assume that i indicates integers (words) and anything else indicates characters.**
7. **Ask the user to enter an RxC matrix of the required type and read it.**
8. **Print a menu from which the user can select one of the following options:**
    a. **Print the entered array**
    b. **Exchange two rows**
    c. **Exchange two columns**
    d. **Exit the program**

Note that row numbers and column numbers are assumed to start from 0. Furthermore, note that to multiply two registers $s2 and $s3 and store the result in register $s1, you can use the instruction mul $s1, $s2, $s3.

Submission Guidelines:

This assignment can be solved individually or in groups of two students only. No group should have more than two students. **At the beginning of your program, write the names of the students who worked on the program.** If this program was solved individually then write your name only. Your code should be well written and well document.

All submissions should be done through Blackboard. Submit the source code of the program. **If the assignment was solved by two students, then it is sufficient for one student to submit the assignment. The other student can write a note on Blackboard indicating his partner.**

All submissions should be done on time. Late submissions are accepted with a late penalty. The late penalty is **-1 point** for two days late. Blackboard will not accept any submission which is later than two days.

A sample execution of the program is shown below:

Enter number of rows:2
Enter number of columns:3
Enter type of element: i
Enter an array of 2x3 integers:
1
2
3
4
5
6

Select one of the following functions:
1. Print the entered array
2. Exchange two rows
3. Exchange 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 the first row number: 0
Enter the second row number: 1
The array after exchanging rows 0 and 1
4 5 6
1 2 3

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

Enter the first column number: 0
Enter the second column number: 1
The array after exchanging columns 0 and 1
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.