Computer Organization and Architecture Laboratory (CS39001)

Expts. on MIPS Assembly Language Programming

1. Aim: Handling of local variables in subroutines by allocating space on stack. Handling (local) arrays in MIPS.
   Assignment statement: Finding the kth largest, $3 \leq k \leq 20$, of n integers. Write a MIPS program which:

   (a) allocates space on stack for two local integer variables n and k; give comments indicating how you would access in your program the memory locations corresponding to n, k and $a[i]$. [Hint: Use the frame pointer fp – refer to pp A-23 –A-26 in Appendix A of Hennesey and Patterson for identifying how local variables are allocated space on the stack dynamically on entry to subroutines (recall that the main routine can be viewed as a subroutine for code generation) and the allocation is undone before exit thereby maintaining the locality of the local variables, in contrast to the global variables defined through the .rdata assembler commands.]

   (b) reads the integer k with the prompt: "Enter the value of k:";

   (c) allocates space for $a[i], 0 \leq i < k$, on the stack;

   (d) reads an integer with the prompt – "Enter the count of elements to be read:"

   (e) finds the kth largest among the n elements read one by one using proper prompt(s) and

   (f) prints the same within the message – "The %d-th largest number among [a comma separated list of the n numbers read] is:" $\langle$ the k-th largest number $\rangle$.

   Marking Guidelines: Assignment marking is to be done only after the deadline expires, as submissions gets blocked after the assignment is marked. Marks are to the awarded as per the components indicated below:
   Interactive interface, as specified —— 2
   Allocation of local variables on stack —— 5
   Appropriately accessing the local variables— 5
   Correct identification of the k-th largest number - 6
   Commenting of program ———————— 2
   Total Marks 20