

ELEC 2220 Computer Systems
Homework #8
Due: Wednesday, June 10

In RAM, define three 8-word arrays, BOB, SUE and JIM, initializing each with 8 unique data values. Write and test two versions of a program that adds each element of SUE to the corresponding element of JIM, with the result written to the corresponding element of BOB. An equivalent C operations might look like:

```
for (n = 0; n < 8; n = n+1) {  
    BOB[n] = SUE[n] + JIM[n];  
}
```

Version 1

Use a separate pointer register (with no offset or index) for each array. Each pointer must be changed to the address of the next array element after each addition operation. (Note that the data are 32-bit values.)

Version 2

Use a separate “base address” register to point to the start of each array. Access data using that base address plus a common “index” or “offset” register. (The index is the same for all three arrays.) Change the index register each addition operation, so the next operation will use the next element of each array.

You must use a “loop” in your program that will be repeated N times, corresponding to arrays of N words. **Do not** simply write N sets of instructions! The program should be able to be modified to add arrays of arbitrary size by simply changing the value of N.

A loop can be produced by initializing a register to the value N, to be used as a loop counter. At the end of the set of instructions to be repeated, subtract 1 from that count and branch back to the start of the loop if the result is non-zero. Exit the loop when the count reaches 0.

To Be Submitted

1. Your two assembly language source programs, each with the corresponding uVision Debug Window, showing the final results of each program. In the Debug Windows, highlight the three data arrays in the Memory Window so we can verify that the third array is the sum of the first two arrays.
2. For the second program, discuss what you would change if the arrays comprised N bytes, rather than N words.

Suggestions:

- Use the debugger initialization file to write initial values to the three arrays (unless you prefer to do so interactively in the debug window.)
- Format the Memory Window of the debugger to display 32-bit signed numbers in decimal format (to simplify verifying the results.)