SNUVM Assembly Programming

Finding a Maximum

- N 32-bit integers are consecutively stored at addresses starting at the address labeled “intArray”
  - N > 0 and N is stored at the address labeled “N”
- We want to find the maximum among those N integers
- The result will be stored at the address labeled “max”
- Algorithm
  - Initialize Rx with the first integer
  - Compare the content of Rx with each integer Y and update Rx with Y if Y is bigger than the content of Rx
  - Store the content of Rx at the location labeled “max”

Finding a Maximum (contd.)

```
@ Finding_a_Maximum

            mov r3, #0              @ Initially, r3 contains 0
                                    @ (r3 will contain the maximum)
            ldr r0,=intArray        @ r0 contains intArray
            mov r1, #0              @ r1 contains 0
                                    @ r1 is the number of checked integer
            ldr r2, N               @ r2 contains the value stored at N
Loop:
            ldr r4, [r0]            @ r4 contains the integer to compare
            cmp r3, r4              @ Compare current maximum(r3) with the integer(r4)
            blt Change              @ If r3 is less than r4, change the maximum
            b Skip                  @ Else, Skip
Change:
            mov r3, r4              @ Change the maximum
Skip:
            add r0, r0, #4          @ Increment the index(r0)
            add r1, r1, #1          @ Also, increment the number of checked integer(r1)
            cmp r1, r2              @ If I checked all the integers(number of checked integer = N)
            beq Done                @ Go to Done
            b Loop
Done:
            ldr r5, =max            @ r0 contains max
            str r3, [r5]
            b halt

N: .word 10
intArray: .word 4, -5, 2, 8, 9, 10, 32, 99, 3, 100
max: .word 0
```

Linear Search

- Finding a particular number X in a sequence of numbers
  - Checking every element, one at a time sequentially, until the desired one is found
- N 32-bit integers are consecutively stored at addresses starting at the address labeled “intArray”
  - N > 0 and N is stored at the address labeled “N”
- X is stored at the address labeled “X”
- If X is found, store the position of X (starting from 0) in the number sequence at the address labeled “found”
- Otherwise store -1 to “found”

Linear Search (contd.)

```
            LDR R0, X
            LDR r1, N
            LDR r2, =intArray     @ load the value of intArray
            MOV r3, #0            @ position i
L:          LDR r4, [r2]
            CMP r0, r4
            BEQ X_found
            ADD r2, r2, #4
            ADD r3, r3, 1         @ i = i + 1
            CMP r3, r0
            BLT L
Not_found:   MOV r5, #-1           @ X is not found
            STR r5, found
            B halt
X_found:    STR r3, found          @ X is found
            B halt

found:     .word
X:          .word 14
N:          .word 9
intarray:  .word -24, 34, 92, 234, 659, -145, -789, 12, 19
```

Linear Search (contd.)

- Fix the code
  - There are some bugs in the linear search code
  - Fix the code to work correctly