

CS 2321 Solutions to Laboratory Problem Set 3

March 8, 2006

- Problem 2.47

To test for loop termination, the constant 401 is needed. Assume that it is placed in memory when the program is loaded:

```
lw    $t8, AddressConstant401($zero) # $t8 = 401
lw    $t7, 4($a0)                    # $t7 = length of a[]
lw    $t6, 4($a1)                    # $t6 = length of b[]
add   $t0, $zero, $zero              # initialize i = 0
Loop: slt $t4, $t0, $zero             # $t4 = 1 if i < 0
      bne $t4, $zero, IndexOutOfBounds # if i < 0, goto Error
      slt $t4, $t0, $t6               # $t4 = 0 if i >= length b
      beq $t4, $zero, IndexOutOfBounds # if i >= length, goto Error
      slt $t4, $t0, $t7               # $t4 = 0 if i >= length a
      beq $t4, $zero, IndexOutOfBounds # if i >= length, goto Error
      add $t1, $a1, $t0               # $t1 = address of b[i]
      lw  $t2, 8($t1)                # $t2 = b[i]
      add $t2, $t2, $s0               # $t2 = b[i] + c
      add $t3, $a0, $t0               # $t3 = address of a[i]
      sw  $t2, 8($t3)                # a[i] = b[i] + c
      addi $t0, $t0, 4                # i = i + 4
      slt $t4, $t0, $t8               # $t8 = 1 if $t0 < 401, i.e., i <= 100
      bne $t4, $zero, Loop           # goto Loop if i <= 100
```

The number of instructions executed is $4 + 101 \times 14 = 1418$. The number of data references made is $3 + 101 \times 2 = 205$