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 $3 + 101 \times 2 = 205$