CMPE 140 – Lab Assignment 2

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MIPS Instruction Set Architecture & Programming (1)

Purpose

Gain familiarity with the MIPS instruction set by assembling, simulating, and analyzing a sample MIPS program.

Tasks

1) Install the MIPS Assembler/Simulator software
2) Assemble the MIPS assembly code provided below (you only need to enter the instructions listed under the "Assembly" column) into a file called "mipstest.asm". For each MIPS instruction, compare the machine code generated by the assembler with the machine code given in the comments below
3) Single step through the execution of the instructions and verify contents of the relevant register(s). Record the execution results in the test log table on the next page and note the memory value at address 80 (0x50) and 84 (0x54) when the program execution has completed
4) Complete a lab report that contains the source code, the recorded test result (typed test log), screen captures of the appropriate execution windows generated by the assembler/simulator, and a conclusion/discussion section.

```
# mipstest.asm
# Test the following MIPS instructions.
# add, sub, and, or, slt, addi, lw, sw, beq, j

#        Assembly                Description              Address Machine
main:   addi $2, $0, 5          # initialize $2 = 5      0       20020005
        addi $3, $0, 12         # initialize $3 = 12     4       2003000c
        addi $7, $3, -9         # initialize $7 = 3      8       2067fff7
        or   $4, $7, $2         # $4 <= 3 or 5 = 7       c       00e22025
        and  $5, $3, $4         # $5 <= 12 and 7 = 4     10      00642824
        add  $5, $5, $4         # $5 = 4 + 7 = 11        14      00a42820
        beq  $5, $7, end        # shouldn't be taken     18      10a7000a
        slt  $4, $3, $4         # $4 = 12 < 7 = 0        1c      0064202a
        beq  $4, $0, around     # should be taken        20      10800001
        addi $5, $0, 0          # shouldn't execute      24      20050000
around: slt  $4, $7, $2         # $4 = 3 < 5 = 1         28      00e2202a
        add  $7, $4, $5         # $7 = 1 + 11 = 12       2c      00853820
        sub  $7, $7, $2         # $7 = 12 - 5 = 7        30      00e23822
        sw   $7, 68($3)         # [80] = 7               34      ac670044
        lw   $2, 80($0)         # $2 = [80] = 7          38      8c020050
        j    end                # should be taken        3c      08000011
        addi $2, $0, 1          # shouldn't execute      40      20020001
end:    sw   $2, 84($0)         # write adr 84 = 7       44      ac020054
        j    main               # go back to beginning   48      08000000
```

CMPE140 – Laboratory Assignment 2 Test Log

Student Names: 1) _____ **2)** _____

Date: _____

Single step through the execution of the given MIPS instructions, observe and record the following values in the test log table below:
- the actual machine code of each instruction executed
- contents of the program counter (PC) and the relevant registers
- contents of memory at location 80 and 84.

Adr	Expected Machine Code	Actual Machine Code	PC	Registers					Memory Content	
				$v0	$v1	$a0	$a1	$a3	[80]	[84]
00	20020005									
04	2003000c									
08	2067fff7									
0c	00e22025									
10	00642824									
14	00a42820									
18	10a7000a									
1c	0064202a									
20	10800001									
24	20050000									
28	00e2202a									
2c	00853820									
30	00e23822									
34	ac670044									
38	8c020050									
3c	08000011									
40	20020001									
44	ac020054									
48	08000000									