CMPE 200 – 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 MIPSASM 2.15 (MIPS Assembler and Simulator) and MARS (MIPS Assembler and Runtime Simulator).
2) Assemble the MIPS assembly code below (the asm file is provided) into a file called "mipstest.asm". For each MIPS instruction, compare the machine code generated by two different assemblers.
3) Single step through the instructions and verify contents of the relevant register(s). Record the execution results in the test log table on the next page (a Word version is provided) and note the memory value at address 80 (0x50) and 84 (0x54) after 19 instructions.
4) Complete a lab report that contains the source code, the test log, screen captures of the appropriate execution windows, a discussion section, a collaboration section, and a conclusion section. In the discussion section, discuss your observations in the test log and try to explain them with the help of the MIPS Reference Data Card.

```
# 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     3000    20020005
        addi $3, $0, 12         # initialize $3 = 12    3004    2003000c
        addi $7, $3, -9         # initialize $7 = 3     3008    2067fff7
        or   $4, $7, $2         # $4 <= 3 or 5 = 7      300c    00e22025
        and  $5, $3, $4         # $5 <= 12 and 7 = 4    3010    00642824
        add  $5, $5, $4         # $5 = 4 + 7 = 11       3014    00a42820
        beq  $5, $7, end        # shouldn't be taken    3018    10a7000a
        slt  $4, $3, $4         # $4 = 12 < 7 = 0       301c    0064202a
        beq  $4, $0, around     # should be taken       3020    10800001
        addi $5, $0, 0          # shouldn't execute     3024    20050000
around: slt  $4, $7, $2         # $4 = 3 < 5 = 1        3028    00e2202a
        add  $7, $4, $5         # $7 = 1 + 11 = 12      302c    00853820
        sub  $7, $7, $2         # $7 = 12 - 5 = 7       3030    00e23822
        sw   $7, 68($3)         # [80] = 7              3034    ac670044
        lw   $2, 80($0)         # $2 = [80] = 7         3038    8c020050
        j    end                # should be taken       303c    08000c11
        addi $2, $0, 1          # shouldn't execute     3040    20020001
end:    sw   $2, 84($0)         # write adr 84 = 7      3044    ac020054
       j    main               # go back to beginning  3048    08000c00
```

CMPE200 – Laboratory Assignment 2 Test Log

Configure the data segment on MARS to start at address 0 (Settings - Memory Configuration). Assemble the given MIPS instructions on both MARS and MIPSASM. Single step through the given MIPS instructions. Observe and record the following values in the test log table:

- the actual machine code for both MARS and MIPSASM
- contents of the program counter (PC) and the relevant registers for MARS
- contents of memory at location 80 (0x50) and 84 (0x54) for MARS.

Adr	Machine Code for MARS	Machine Code for MIPSASM	PC	Registers					Memory Content	
				$v0	$v1	$a0	$a1	$a3	[80]	[84]
3000										
3004										
3008										
300c										
3010										
3014										
3018										
301c										
3020										
3024										
3028										
302c										
3030										
3034										
3038										
303c										
3040										
3044										
3048										