CMPE 140 – Lab Assignment 2

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(This lab is created by Prof. Donald Hung)

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     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
```

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]
3000	20020005									
3004	2003000c									
3008	2067fff7									
300c	00e22025									
3010	00642824									
3014	00a42820									
3018	10a7000a									
301c	0064202a									
3020	10800001									
3024	20050000									
3028	00e2202a									
302c	00853820									
3030	00e23822									
3034	ac670044									
3038	8c020050									
303c	08000c11									
3040	20020001									
3044	ac020054									
3048	08000c00									