CMPE 140 – Lab Assignment 2

Dr. Donald Hung
Computer Engineering Department, San Jose State University

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.smd". 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.smd
# 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) Vincent Van **2)** Harmander Sihra

Date: 9/11/17

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	20020005	04	5	0	0	0	0	0	0
04	2003000c	2003000C	08	5	C	0	0	0	0	0
08	2067fff7	2067FFF7	0C	5	C	0	0	3	0	0
0c	00e22025	00E22025	10	5	C	7	0	3	0	0
10	00642824	00642824	14	5	C	7	4	3	0	0
14	00a42820	00A42820	18	5	C	7	B	3	0	0
18	10a7000a	10E5000A	1C	5	C	7	B	3	0	0
1c	0064202a	0064202A	20	5	C	0	B	3	0	0
20	10800001	10040001		----------SKIPPED----------						
24	20050000	20050000	28	5	C	0	B	3	0	0
28	00e2202a	00E2202A	2C	5	C	1	B	3	0	0
2c	00853820	00853820	30	5	C	1	B	C	0	0
30	00e23822	00E23822	34	5	C	1	B	7	0	0
34	ac670044	AC670044	38	5	C	1	B	7	7	0
38	8c020050	8C020050	3C	7	C	1	B	7	7	0
3c	08000011	08000011		----------SKIPPED----------						
40	20020001	20020001	44	7	C	1	B	7	7	0
44	ac020054	AC020054	48	7	C	1	B	7	7	7
48	08000000	08000000	00	7	C	1	B	7	7	7