Computer Architecture (Lab). Week 9

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Topic of the Lab

- Floating point operations
- Exercises

Floating Point Operations

- Floating point operations are managed with a help of Coprocessor 1
- There is a special set of instructions (some with dots)
- Utilize **$f0-$f31** registers

Arithmetics

- mul.s, mul.d - multiplication
- div.s, div.d - division
- add.s, add.d - addition
- sub.s, sub.d - subtraction

Example 1: Circumference (pi*D)

```
.data
        pi: .float 3.1415
.text
        li $v0, 6
        syscall # Read diameter - result will be stored in $f0

        l.s $f1, pi
        mul.s $f2, $f0, $f1

        li $v0, 2
        mov.s $f12, $f2
        syscall #requires arg to be stored in $f12
```

Branching and Condition Bit

- **c.eq.s, c.lt.s, c.le.s** set comparison bit
- **bc1t, bc1f** instructions branch if condition bit is true/false

Example 2: Compare and branch

```
.data
        pi: .float 3.1415
        alert: .asciiz "Greater than zero"
.text
        mtc1 $zero, $f0 # move zero value to $f0
        l.s $f1, pi     # load pi into $f1
        c.lt.s $f0, $f1 # compare
        bc1t pi_greater_that_zero # branch if 0 < pi
        j end
pi_greater_that_zero:
        li $v0, 4   # print message
        la $a0, alert
        syscall
end:
```

Exercise 1

Write a program that computes value of the following arithmetic expression for values of x and y entered by the user:

$$5.4xy - 12.3y + 18.23x - 8.23$$

Exercise 2

Write a program that calculates the sum of the following series with a some provided precision:

$$\sum_{i=1}^{n} 2^i$$

Hints:

- Implement 2^i as a separate function
- Terminate once $i <= n$

Exercise 3 *Optional

Write a MIPS program to find the MIN of eight floating point numbers. The user should be asked to input 8 FP numbers and the program should print the MIN value

Useful Links

- https://chortle.ccsu.edu/AssemblyTutorial/Chapter-31/ass31_1.html
- https://chortle.ccsu.edu/AssemblyTutorial/Chapter-32/ass32_1.html