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CSC\_204\_LAB\_07

**First run of MIPS Fibonacci on MARS:**

**Graphical user interface, application

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**After updating assembly code to print a new line /n for the first 10 values only:   
  
Graphical user interface, application, Word

Description automatically generated**

**Source code of updated program (Note: I am very unfamiliar with Assembly and decided to just create a new subroutine / label for printing new lines and called it conditionally using `bge` and `bgtz`):**

# Compute first twelve Fibonacci numbers and put in array, then print

.data

fibs: .word 0 : 12 # "array" of 12 words to contain fib values

size: .word 12 # size of "array"

.text

la $t0, fibs # load address of array

la $t5, size # load address of size variable

lw $t5, 0($t5) # load array size

li $t2, 1 # 1 is first and second Fib. number

add.d $f0, $f2, $f4

sw $t2, 0($t0) # F[0] = 1

sw $t2, 4($t0) # F[1] = F[0] = 1

addi $t1, $t5, -2 # Counter for loop, will execute (size-2) times

loop: lw $t3, 0($t0) # Get value from array F[n]

lw $t4, 4($t0) # Get value from array F[n+1]

add $t2, $t3, $t4 # $t2 = F[n] + F[n+1]

sw $t2, 8($t0) # Store F[n+2] = F[n] + F[n+1] in array

addi $t0, $t0, 4 # increment address of Fib. number source

addi $t1, $t1, -1 # decrement loop counter

bgtz $t1, loop # repeat if not finished yet.

la $a0, fibs # first argument for print (array)

add $a1, $zero, $t5 # second argument for print (size)

jal print # call print routine.

li $v0, 10 # system call for exit

syscall # we are out of here.

######### routine to print the numbers on one line.

.data

space:.asciiz " " # space to insert between numbers

newLine:.asciiz "\n"

head: .asciiz "The Fibonacci numbers are:\n"

.text

print:add $t0, $zero, $a0 # starting address of array

add $t1, $zero, $a1 # initialize loop counter to array size

la $a0, head # load address of print heading

li $v0, 4 # specify Print String service

syscall # print heading

outNewLine: lw $a0, 0($t0) # load fibonacci number for syscall

li $v0, 1 # specify Print Integer service

syscall # print fibonacci number

la $a0, newLine # load address of spacer for syscall

li $v0, 4 # specify Print String service

syscall # output string

addi $t0, $t0, 4 # increment address

addi $t1, $t1, -1 # decrement loop counter

bgt $t1, 2, outNewLine # repeat if not finished

bgtz $t1, outSpace

outSpace: lw $a0, 0($t0) # load fibonacci number for syscall

li $v0, 1 # specify Print Integer service

syscall # print fibonacci number

la $a0, space # load address of spacer for syscall

li $v0, 4 # specify Print String service

syscall # output string

addi $t0, $t0, 4 # increment address

addi $t1, $t1, -1 # decrement loop counter

bgtz $t1, outSpace # repeat if not finished

jr $ra # return

Questions:   
**(1) ( Assembly Language Commands )**

Describe the function and purpose of each of these Assembly language commands.

li,la,lw

* **li: stands for load immediate, it loads an immediate value from one register into another**
* **la: stands for load address, it can load integer constants just like li but can also load labels**
* **lw: stands for load word, and is used to load a word from an address in memory into a register**

**(2) ( Assembly Language Statements )**

Explain what is accomplished by these assembly language statements, taken from the fibonacci.asm file.

.data

fibs: .word 0 : 12

size: .word 12

**These statements declare data variables to be used globally in the assembly program. Fibs is declared as an array of 12 words, and size is declared as a word with the int value 12.**

**(3) ( Assembly Language Statements )**

Explain what is accomplished by this assembly language statement, taken from the fibonacci.asm file.

sw $t2, 0($t0) # F[0] = 1

**This statement says “save the first value from register $t0 to register $t2.”**

**(4) ( Assembly Language Statements )**

Explain what is accomplished by this assembly language statement, taken from the fibonacci.asm file.

addi $t1, $t1, -1

**This statement executes the addition of the value at $t1 to the value at $t1 – 1. Basically, decrement the loop counter.**

**(5) ( The Fibonacci Sequence )**

Test whether your own name generates a Fibonacci Number.

Write the individual characters that comprise both your first name and last name and total the number of letters, as shown in the example.

Concatenate the two count values and place a random single digit number on the right.

Now test whether the number you generate is or is not a Fibonacci Number. Place a screen snapshot of the result in your answers document.

**My name is Hayes (5 count) Crowley (7 count). Concatenating the count of letters in both my first name and last name with a random number yields: 573.   
  
Entering 573 into Wolfram Alpha, asking “Is 573 a Fibonacci number?” yields “573 is not a Fibonacci number”:   
  
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