CS 241 Tutorial 1

Graham Cooper

May 15th, 2015

Fibonacci Numbers $f_n = f_{n-1} + f_{n-2}$
where $f_0 = 1$ and $f_1 = 1$ and $n \geq 2$

Topics

1. MIPS Loops
2. Printing and using the stack
3. How to create and use procdedures

1)

$1 containts $n \geq 0$, find f_n and place it in $3

```
; $3 = f_n
; $4 = f_n-1
add $3, $0, $0 ; begin $3 at 0
lis $4
.word 1 ; begin $4 at 1
add $5, $0, $4 ; store 1 somewhere
loop: beq $1, $0, ___ ; brance if our counter is 1
add $4, $3, $4 ; put the next fib number in 4
sub $1, $1, $5 ; n -= 1
sub $3, $4, $3 ;
beq $0, $0, loop
jr $31 ; return
```

2)

Convert problem 1 into a procedure name fib, apart from $3, upon return, every register should have the ssame value upon return as it had when the procedure was called.

```
fib: sw $4, -4($30) ; name our procedure
sw $5, -8($30) ; store all of our used values in RAM
sw $1, -12($30)
lis $4
```

```
.word 12
sub $30, $30, $4 ; State how far we have used RAM
add $3, $0, $0 ; begin $3 at 0
lis $4
.word 1 ; begin $4 at 1
add $5, $0, $4 ; store 1 somewhere
loop: beq $1, $0, ___ ; brance if our counter is 1
add $4, $3, $4 ; put the next fib number in 4
sub $1, $1, $5 ; n -= 1
sub $3, $4, $3 ;
beq $0, $0, loop
lis $4
.word 12
add $30, $30, $4 ; Restore the last used memory location
lw $4, -4($30) ; restore all of our memory
lw $5, -8($30)
lw $1, -12($30)
jr $31 ; return
```

Printing to Stdout and using the stack

- $1 contains $n \geq 1$ - using fib, print the first n fibonacci numbers in reverse
- assume print procedure "print" uses $1 as input

```
lis $4
.word fib
lst $5
.word print
list $6
.word 4
sw $31, -4($30)
sub $30, $30, $6
add $7, $0, $0
lis $8
.word 1
loop: beq $1, $7, endloop
add $7, $7, $8
jalr $4, ; call fib
```

```
sw $3, -4($30) ; store the result of fib in memory
sub $30, $30, $6 ; add 4 to register 30
beq $0, $0, loop
endloop:
loop2: beq $1, $0, endloop2
add $30, $30, $6
lw $1 , -4($30)
jalr $5
sub $7, $7, $8
beq $0, $0, loop2
endloop2:
add $30, $30, $6
lw $31, -4($30)
jr $31
```