

Lab 04 - x86-64: fibs

Due: October 6, 2019, 10:00 PM

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1 Introduction

Pretzel the crab loves collecting shells. Being the computer scientist they are, they also enjoy analyzing the mathematical structures embedded within the shells' shapes. They have discovered that the spirals ubiquitous in their design are consistent to a ratio determined by consecutive numbers in a curious sequence. They define the sequence using the following expression:

$$\begin{aligned}
 f(0) &= 0 \\
 f(1) &= 1 \\
 f(n) &= f(n - 1) + f(n - 2), \quad n \geq 2
 \end{aligned}$$

The resulting sequence $f(0)$, $f(1)$, $f(2)$, . . . is known as the Fibonacci Sequence.

Here are the first few terms of the sequence:

n	0	1	2	3	4	5	6	7	8	9	10
f(n)	0	1	1	2	3	5	8	13	21	34	55

In this lab, you will be writing a function to compute the nth term of the sequence.

Note: All of the labs in CS33 will be partner labs. Remember to fill out the partner form--you must work with a different partner for each lab and can either choose your partner or go random.

2 Assignment

You will be implementing the definition of the Fibonacci sequence given above as a recursive function, `fibs_recursive()`. This function takes a single unsigned integer argument, `n`, and returns the `n`th Fibonacci number. You do not need to worry about integer overflow.

Pseudocode for this function is as follows:

```
unsigned int fibs_recursive(unsigned int n):  
    if n is 0, return 0  
    if n is 1, return 1  
    otherwise, return fibs_recursive(n-1) + fibs_recursive(n-2)
```

You will have to make sure your function complies with x86 stack discipline. See the x86 guide (found on the website) or the textbook for more information.

2.1 Handout

Run the terminal command `cs0330_install lab04` to install the files for this lab to your home directory.

The lab handout contains the following files:

fibs.s: The assembly file in which you will be implementing your function. This file contains a skeleton for the function; your task is to implement the function body only.

fibs.h: A header file declaring the functions implemented in **fibs.s**.

main.c: A C file providing testing functionality.

Makefile: A makefile.

You only need to read and edit **fibs.s** to complete the lab.

3 Running Your Code

We have provided a makefile to compile the support code, link it with your code, and produce an executable. To build everything, use the command

```
make
```

This will create an executable, **fibs**, which you can then run with the command

```
./fibs n
```

where `n` is an index in Fibonacci sequence. The support code will run your function and print the result. It will also print warning messages if your code does not deal with saved registers correctly.

To remove all compilation products, use the command

```
make clean
```

3.1 Debugging with GDB

The support code “sandboxes” your function by running it in a separate process. To use GDB to debug your code, enter the command **set follow-fork-mode child** before running the test program. You can then set a breakpoint on the function of your choosing and debug as usual.

4 Getting Checked Off

Note: there is no need to run `cs0330_reformat` in this lab, as your solution is in assembly.

Once you have successfully implemented, run the handin script below. Both you and your partner must submit your work individually.

```
331lab_checkoff lab04 [--verbose]
```

Remember to read the course missive for information about course requirements and policies regarding labs and assignments. Note that this lab checkoff may take a few seconds to finish. This is normal.