Recursive Fibonacci Numbers

Programming Assignment # 4

By

407261128

康智絜

X86 Assembly Language

Fall 2019

Date Submitted: December 07, 2019

**Test Plan :**

The goal of this assignment is to learning X86 assembly language. By the

end of this assignment, you should be able to:

1. read a string from standard input

2. write an algorithm in pseudocode

3. translate that pseudocode into assembly

4. implement recursion by calling procedure with passing parameters

Fibonacci Numbers by, Andy

What is your name?:

June

Hi, June

How many Fibonacci numbers should I display?

Enter an integer in the range [1..25]:

50

That number was out of range, try again.

How many Fibonacci numbers should I display?

Enter an integer in the range [1..25]:

3

F(3) = F(2) + F(1) =

F(2) = F(1) + F(0) =

F(1) = 1

F(0) = 0

F(2) = 1

F(1) = 1

F(3) = 2

Goodbye, June

**Feedback: (required)**

我覺得這次的作業對我來說非常困難，尤其是印出格式的部分，花了非常多的時間，最後沒有照老師提供的Example的格式印出來，且要搞懂stack frame也花了不少時間

**Appendix A: Test Log (required)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Case Number | Input Values | Date&Time | Actual Output | Result |
| 1 | Kang 0 | 2019/12/7 5:35pm | Fibonacci Numbers by, Jago  Hi! What's your name?  Kang  Hi,Kang  How many Fibonacci numbers should I display?  Enter an integer in the range [1..25]: 50  That number was out of range, try again. | Pass |
| 2 | Kang  5 | 2019/12/4 11:00pm | Fibonacci Numbers by, Jago  Hi! What's your name?  Kang  Hi,Kang  How many Fibonacci numbers should I display?  Enter an integer in the range [1..25]: 5  F(5) = 5  Goodbye,Kang | Pass |
| 3 | Kang  10 | 2019/12/4 11:01pm | Fibonacci Numbers by, Jago  Hi! What's your name?  Kang  Hi,Kang  How many Fibonacci numbers should I display?  Enter an integer in the range [1..25]: 10  F(10) = 55  Goodbye,Kang | Pass |
| 4 | Kang  50 | 2019/12/4 11:02pm | Fibonacci Numbers by, Jago  Hi! What's your name?  Kang  Hi,Kang  How many Fibonacci numbers should I display?  Enter an integer in the range [1..25]: 50  That number was out of range, try again. | Pass |

**Appendix B: Source Code (required)**

INCLUDE Irvine32.inc

.data

IntroductionString BYTE "Fibonacci Numbers by, Jago", 0Dh, 0Ah, 0Ah, 0

WhatNameString BYTE "Hi! What's your name?", 0Dh, 0Ah, 0

Hi BYTE "Hi,", 0

NameString BYTE 50 DUP(0)

HowManyString BYTE "How many Fibonacci numbers should I display?", 0Dh, 0Ah,

"Enter an integer in the range [1..25]: ", 0

F\_leftWord BYTE "F(", 0

F\_rightWord BYTE ")", 0

Add\_word BYTE " + ", 0

Equal\_word BYTE " = ", 0

WrongMsg BYTE "That number was out of range, try again.", 0Dh, 0Ah, 0

ByeMsg BYTE "Goodbye,", 0

n DWORD ?

.code

main PROC

mov edx, OFFSET IntroductionString ; display "Fibonacci Numbers by, Jago"

call WriteString

mov edx, OFFSET WhatNameString ; display "Hi! What's your name?"

call WriteString

mov edx, OFFSET NameString ; read user names

mov ecx, SIZEOF NameString

call ReadString

mov edx, OFFSET Hi ; display "Hi!" + name

call WriteString

mov edx, OFFSET NameString

call WriteString

call crlf

call crlf

input\_n:

mov edx, OFFSET HowManyString ; display "How many Fibonacci numbers should I display?"

call WriteString ; "Enter an integer in the range [1..25]: "

call ReadInt ; get n

mov n, eax

cmp eax, 1 ; if n<1

jb Wrong ; jump Wrong

cmp eax, 25 ; if n>25

ja Wrong ; jump Wrong

jmp continue ; else continue

Wrong:

call crlf

mov eax , red + ( black \*16 ) ; set the text color

call SetTextColor

mov edx, OFFSET WrongMsg ; display "That number was out of range, try again."

call WriteString

mov eax , white + ( black \*16 ) ; set the text color

call SetTextColor

jmp ReadString

continue:

mov edx, OFFSET F\_leftWord

call WriteString

mov eax, n

call WriteDec

mov edx, OFFSET F\_rightWord

call WriteString

mov edx, OFFSET Equal\_word

call WriteString

push n

call Fibonacci ; calculate Fibonacci( n )

call WriteDec ; display it

call crlf

call crlf

mov edx, OFFSET ByeMsg ; display "Goodbye" + name

call WriteString

mov edx, OFFSET NameString

call WriteString

call crlf

exit

main ENDP

Fibonacci proc

cmp eax, 1 ; n<=1?

jbe exit\_Fibonacci

dec eax ; eax = n-1

push eax ; save n-1

call Fibonacci ; computing Fibonacci(n-1) to EAX

xchg eax,0[esp] ; swap Fibonacci(n-1) for saved n-1

dec eax ; eax = n-2

call Fibonacci ; computing Fibonacci(n-2) to EAX

pop ecx ; = Fibonacci(n-1)

ADD EAX,ECX ; = Fibonacci(n-1) + Fibonacci(n-2)

exit\_Fibonacci:

ret

Fibonacci endp

END main

Pseudocode：

print "Fibonacci Numbers by, Jago"

print "Hi! What's your name?"

get name

print "name"

print "How many Fibonacci numbers should I display?"

print "Enter an integer in the range [1..25]: "

get n

if n<1 then

print "That number was out of range, try again."

if n>25 then

print "That number was out of range, try again."

else

print"F(n) = "

call Fibonacci(n)

print"Fibonacci(n)"

func Fibonacci(n): n is int

if(n<=1)

return n

else

return Fibonacci(n-1) + Fibonacci(n-2)