CS162 – Programming Techniques

Lab 07
Recursion

Cảm ơn thầy Trần Duy Quang đã cung cấp template cho môn học

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Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

Name of your submission, for example: **18125001_W01_07.zip**

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Content

In this lab, we will review the following topics:

- How do recursive functions work?

3 Assignments

A: 3 problems / assignments.

H: 10 problems / assignments.

Implement these problems in the recursive style.

3.1 Fibonacci

f(0) = f(1) = 1
f(n) = f(n-1) + f(n-2), n>1

3.2 C(n, k)

C(n, k) = 1, if k = 0 or k = n
C(n, k) = C(n - 1, k) + C(n – 1, k – 1), if 0 < k < n.

3.3 toBinary()

You are given the following prototype:

```
string toBinary(int x)
```

Please implement this recursive function in order to print x in the binary representation.

3.4 toHex()

You are given the following prototype:

```
string toHex(int x)
```

Please implement this recursive function in order to print x in the hexa representation.

3.5 sumOfDigits()

You are given the following prototype:

```
int sumOfDigits(int x)
```

Please implement this recursive function in order to calculate the sum of all digits in the decimal representation of x.

3.6 isPrime

Given a number n, check whether it's prime number or not using recursion.

3.7 Print a pattern

Given a number n, print following a pattern without using any loop.

We basically first reduce 5 one by one until we reach a negative or 0. After we reach 0 or negative, we one add 5 until we reach n.

```
Input: n = 16
Output: 16, 11, 6, 1, -4, 1, 6, 11, 16


Input: n = 10
Output: 10, 5, 0, 5, 10
```

3.8 Recaman's sequence

Given an integer n. Print first n elements of Recaman's sequence.

3.9 Palindrome

You are given the following prototype:

```
bool isPalindrome(int l, int r, char* s)
```

Please implement this recursive function in order to check if a given string is palindrome or not.

You should not use any local variable inside the function.

A string is palindrome if and only if it reads the same when reading forwards and backwards.

Ex: "123321" is a palindrome

"apqfwfa" is not a palindrome

"quanggnauq" is a palindrome

3.10 Recursion with array

1. Output the array of integer values to screen.
2. Output the array of integer values to screen in reversed order.
3. Find the sum of positive numbers in the array.
4. Count all distinct values in the array.