CptS 121 - Program Design and Development

Lab 11: Recursion

Assigned: Week of April 7, 2014
Due: At the end of the lab session

I. Learner Objectives:

At the conclusion of this programming assignment, participants should be able to:
- Utilize recursion to solve problems
- Distinguish between base cases and recursive steps

II. Prerequisites:

Before starting this programming assignment, participants should be able to:
- Utilize output parameters and pointers in a C program
- Apply the dereference or indirection C operator
- Declare strings in C
- Apply library functions found in <string.h>
- Distinguish between character arrays and strings in C
- Implement array notation or pointer arithmetic to manipulate strings
- Declare arrays in C
- Apply arrays in C to various problems
- Pass arrays into functions
- Initialize arrays using an initializer list
- Construct loops to traverse through arrays
- Compose iterative statements ("while", "for", and/or "do-while" statements)
- Compose decision statements ("if" conditional statements)
- Apply top-down design

III. Overview & Requirements:

This lab, along with your TA, will help you navigate through applying recursion to solving problems. Recall that recursion involves the use of a function the call indirectly through a sequence of calls. Problems that are best suited for recursive solutions have the following properties or characteristics:
- One or more simple cases that have nonrecursive solutions
- The other cases may be defined in terms that are closer to the simple cases
- Through successive calls to the recursive function, all problems are reduced to the simple cases

Labs are held in a "closed" environment such that you may ask your TA questions. Please use your TAs knowledge to your advantage. You are required to move students in need when you are finished with a task. You may work in pairs if you wish. However, I encourage you to compose your own solution to each problem education in CptS 121 so work diligently.

Tasks:

1. Complete Project 2 in Chapter 10 on page 562. A palindrome consists of a word or deblanked, unpunctuated phrase that is spelled exactly the same when th returns a value of 1 if its string argument is a palindrome. Notice that in palindromes such as level, deed, sees, and Madam I'm Adam (madamimadam), the firs to-last, and so on.

2. Complete Project 5 in Chapter 10 on page 563. Write a function that accepts an 8 by 8 array of characters that represents a maze. Each position can contai any path through the maze to get to location (7, 7). Only horizontal and vertical moves are allowed. If no path exists, write a message indicating there is no pa

Moves can be made only to locations the contain a blank. If an X is encountered, that path is blocked and another must be chosen. Use recursion.

3. Complete Project 7 in Chapter 10 on page 563. Write a recursive function that displays all the binary (base 2) numbers represented by a string of xs, 0s, and example, the string 1x0x represents the numbers 1000, 1001, 1100, 1101. The string xx1 represents 001, 011, 101, 111. Hint: Write a helper function replace_f argument. In one, first x is replaced by a 0, and in the other by a 1. The set function is_element() may be useful too.

IV. Submitting Labs:

- You are not required to submit your lab solutions. However, you should keep them in a folder that you may continue to access throughout the semester. on the Sloan 353 machines. These files are erased on a daily basis.

V. Grading Guidelines:

- This lab is worth 10 points. Your lab grade is assigned based on completeness and effort. To receive full credit for the lab you must show up on time and dismissed you.