Faculty of Computer Science, IBA

Data Structures (3+1)   Instructor: Ali Raza

Recursion

Objective

The objective of this lab is to understand the concept of Recursion. To understand the internal working of the recursive function trace it manually and draw function calls memory images. Finally analyze the performance in term of time and space.

Tasks

1. ## Recursive Fuction
   - Implement recursive method to find a maximum number in an array of integers. Determine total recursive calls made in your function.

2. ## Binary Recursive function
   - Solve the problem of tower of Hanoi as discussed in the class. Also determine total recursive calls made to solve when n=6.

1   2   3

Explanation:
You have three needles, need to move all disc from needle 1 to needle 3 using needle 2 as auxiliary. Constraints are as follows:
   - Move one disc at a time.
   - Always place smaller disc on larger one but not vice versa.

Algorithm will work as:
1. Base case: If (n==1) then move needle 1 to 3
2. Recursive case: If(n>1) then
   a. Move (n-1) disks from needle 1 to needle 2 using needle 3 as an auxiliary, so that largest disc could be accessed.
   b. Move this largest disc from needle 1 to 3.
   c. Now, Move (n-1) discs from needle 2 to 3 using needle 1 as an auxiliary.

3. ## Compute Power - Recursive Fuction

Compute powers using recursive implementation where base and power provided as input. Use signature,

                int power(int base, int powerRaised) { … }

4. Recursion to generate a pattern

1. Write a recursive function that takes as a parameter a nonnegative integer and generates the following pattern of stars. If the nonnegative integer is 4, the pattern generated is as follows:

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