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Launchpad

Lecture - 10

Order Complexity

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CODING BLOCKS

Order Complexity Analysis

Amount of time/space taken by the algorithm to run as a function of the input size.

Experimental Analysis

We can calculate time complexity of solution by calculating time taken by a program on various input sizes and then plotting the graph to find the function.

Selection Sort vs Merge Sort.

Why not experimental analysis

I. Exact run time of an algorithm is also dependent on the environment on which it is being run on.
II. A lot of algorithm can take different run times based on type of data for the same n. For example arrangement of input elements can highly effect sorting algorithm.
III. Its slow. To figure out best solution among a set we need to code all of them.

Theoretical Analysis

I. The time complexity of an algorithm is commonly expressed using big O notation, which excludes coefficients and lower order terms
II. When expressed this way, the time complexity is said to be described asymptotically, i.e., as the input size goes to infinity
III. Big O notation characterizes functions according to their growth rates: different functions with the same growth rate may be represented using the same O notation
IV. The letter O is used because the growth rate of a function is also referred to as order of the function.

Lets do some theoretical Analysis

I. Selection Sort
II. Binary Search
III. Merge Sort
IV. Factorial of Number
V. Count digits of Number
VI. Intersection of two arrays
VII. Diamond Pattern
VIII. Fibonacci Series

Time to try?

I. Assignment 4 and 5 Solutions
II. Sudoku Solver

Time to try?

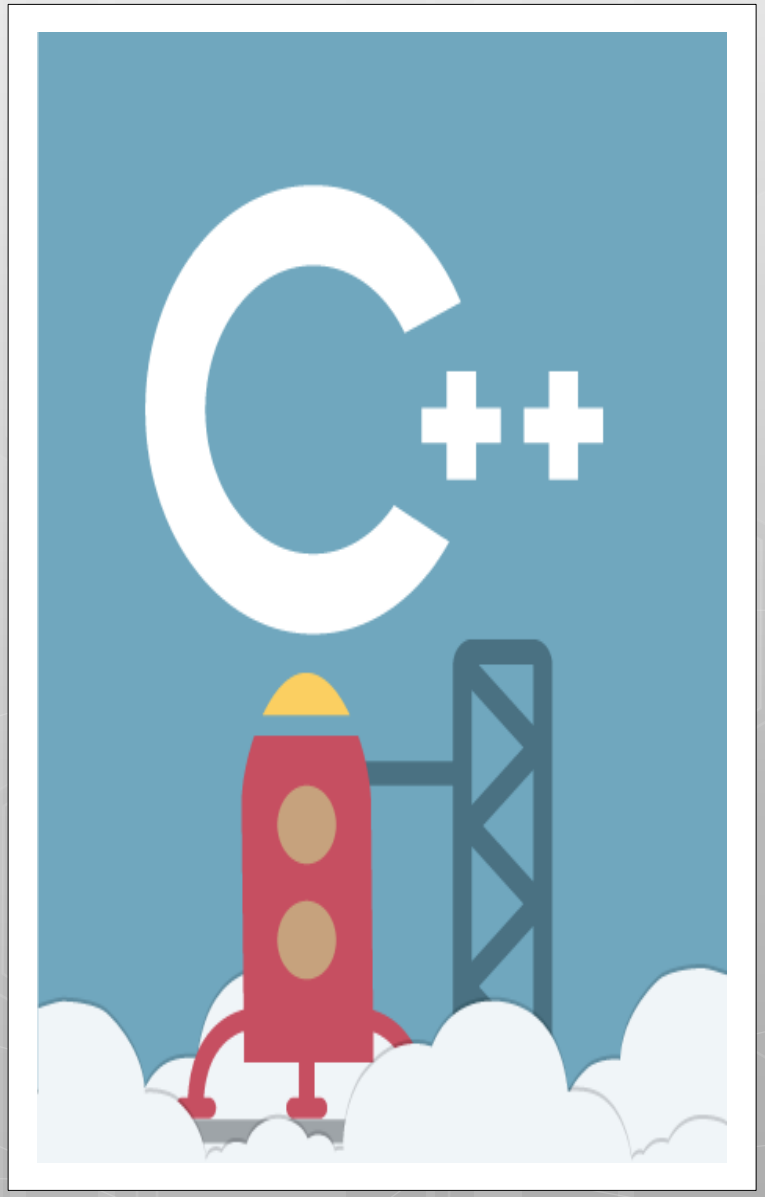
```
while(n) {
        j=n;
        while(j>1) {
                j-=n/j;
        }
        n/=2;
}
```

What is space complexity?

I. Space complexity is a measure of the amount of working storage an algorithm needs.
II. That means how much memory, in the worst case, is needed at any point in the algorithm.
III. As with time complexity, we're mostly concerned with how the space needs grow, in big-Oh terms, as the size N of the input problem grows.

Space Complexity in recursion

We need to take space allocated in the function/call stack.



Thank You!

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