Object Oriented Analysis and Design using Java

UE19CS353

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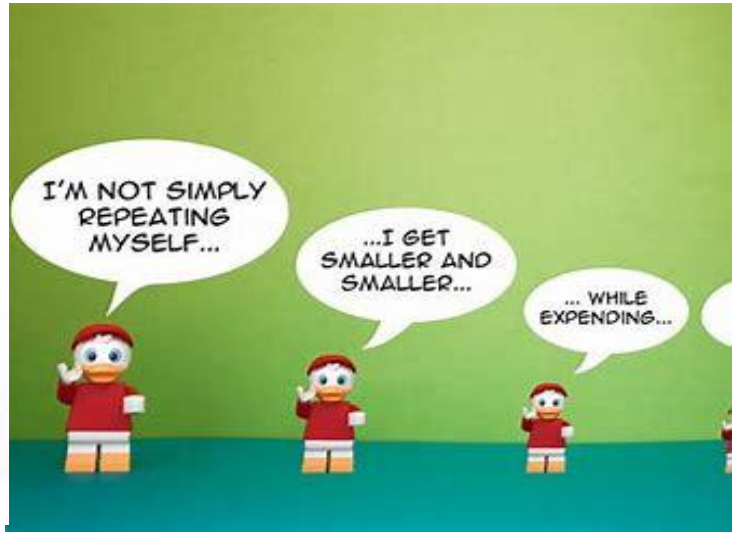
UE19CS353: Object Oriented Analysis and Design using Java

Topic??



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Agenda

- Introduction
- Memory Location
- Halting Condition
- Basic rules of recursion
- Coding examples – Demo
- Points to think!
- References

Introduction

- Process which comes into existence when a function calls a copy of itself to work on a smaller problem

- Provides a way to break complicated problems down into simple problems which are easier to solve.

- Separate memory is maintained at each recursive call.

- Occurs when a thing is defined in terms of itself or of its type

Memory Allocation

- Any method which calls itself is called recursive method, and such function calls are called recursive calls
- Each recursive call creates a new copy of that method in the memory
- Once some data is returned by the method, the copy is removed from the memory
- A separate **stack is maintained at each recursive call** to store variables and other stuff declared inside method
- Once the value is returned from the corresponding method, the stack gets destroyed
- Recursion involves complexity in resolving and tracking the values at each recursive call

Halting condition

- Recursive functions can run into the problem of infinite recursion.

- Infinite recursion is when the function never stops calling itself.

- Every recursive function should have a halting condition, which is the condition where the function stops calling itself.

Basic rules of recursion

Base cases: You must always have some base or trivial case, which can be solved without recursion.

Making progress: For the cases that are to be solved recursively, the recursive call must always be to a case that makes progress toward the base case.

Design rule: Assume that all the recursive calls work. Use proof by induction.

Compound Interest Rule: Never duplicate work by solving the same instance of a problem in separate recursive calls. If possible, use dynamic programming.

Coding Examples

- Classical example of recursion is finding the factorial of a given number
- How to find the sum of the digits of a given number using recursion?
- Print all the numbers/symbols from n to 0.
- Add all the numbers upto n from 0.
- Towers of Hanoi

Points to think!!

- Can a static method be overloaded?
- Can a class be static?
- Can I have a class inside another class?
- When you have a static method inside one class, how do you call it in main() method which is in another class ?
- Can I have an object of one class inside another class as an instance variable?

References

- Recursion in C – javatpoint
- Dynamic Programming - GeeksforGeeks

THANK YOU

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