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Object Oriented Analysis and Design (OOAD)

An Introduction

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The art of simplicity is a puzzle of complexity. –**Douglas Horton.**

Agenda

- Introduction
  - Why is large-scale software engineering so complex?
  - How to address this complexity?
- Object Oriented Analysis and Design (OOAD)
  - Hierarchy and Abstraction
  - Classes and Objects
- Unified Modeling Language (UML)

House Rule

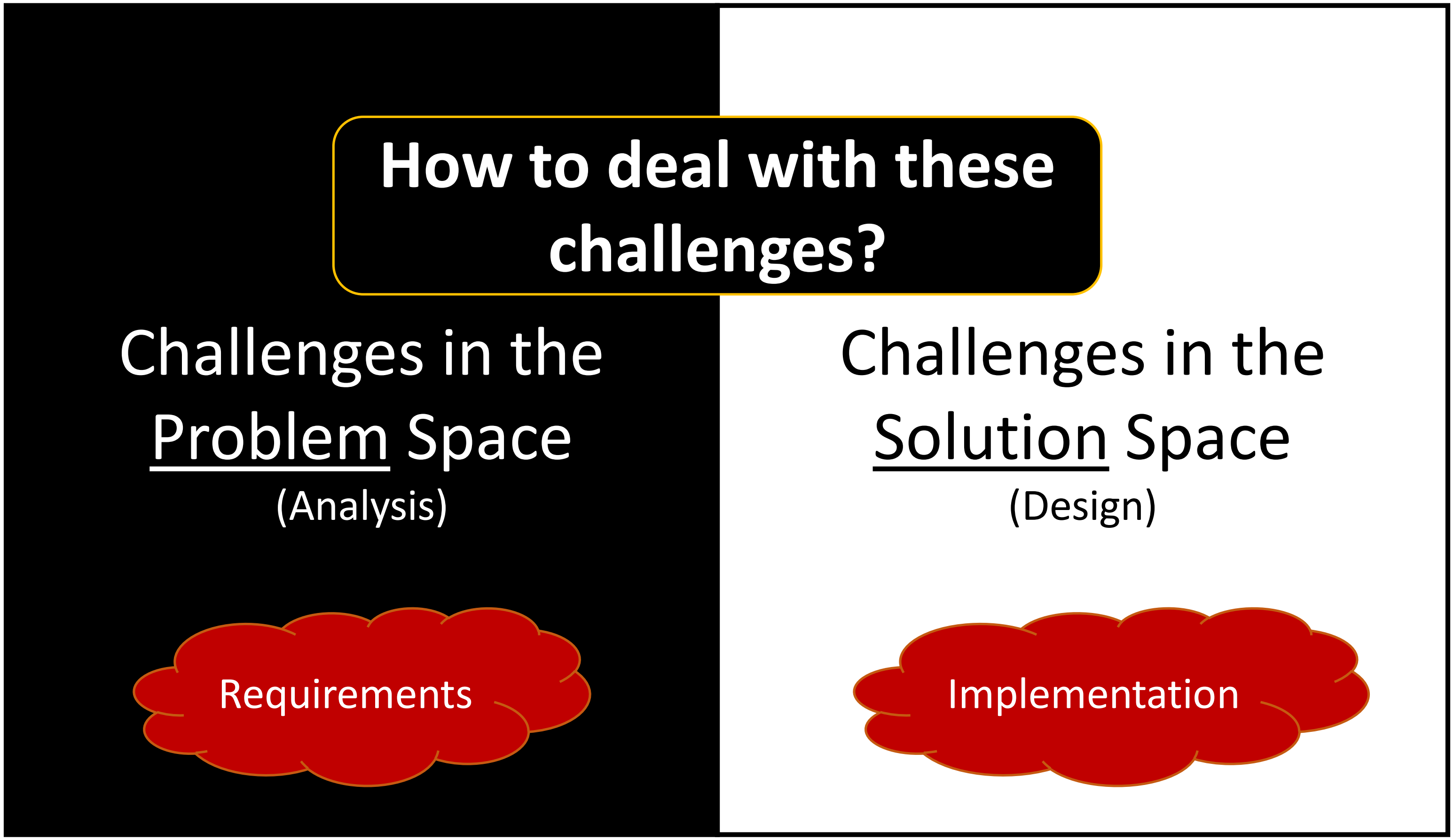
- Raise your hand if you know the answer.
- Do not shout out unless offered a chance by your instructor.

Software Engineering (SE) is very challenging! Why?

Challenges in SE

- Over-specification and under-specification
- Relying on star performers
- Weak personnel and problem employees
- Requirements creep
- Code not even understood by the author – done by trial and error
- Designing, Coding, …
- …
- …. and >100 more!

Challenges in RE



How to deal with these challenges?

Challenges in the Problem Space

(Analysis)

Requirements

Challenges in the Solution Space

(Design)

Implementation

How to tame complexity?

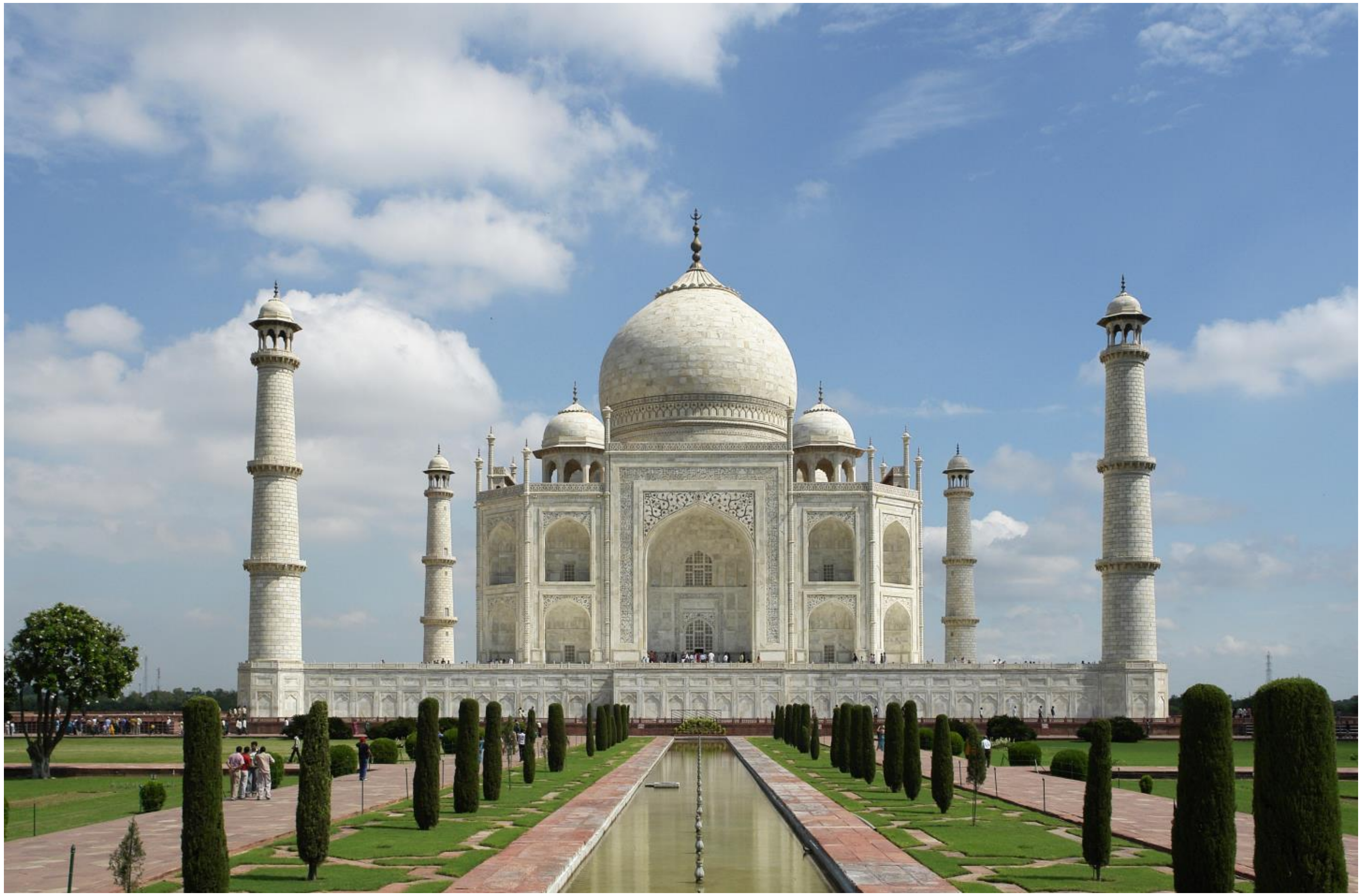
Can we learn from the world around us?

How to get All India Rank 1 in JEE?

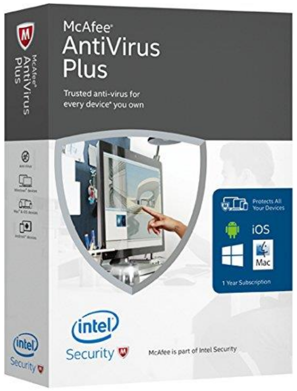
FUN TIMES 01/04/2017
Learning never Stops for this AIR
What the Best College Students Do
KEN BAIN

*Am not AIR 1 in JEE. Just for fun.

How did we humans build this?



We could build these too!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How to tame complexity?

Can we learn from the world around us?

Taming Complexity

Key Principles

1. Hierarchy
2. Abstraction
3. Keeping Related Things Together
4. Polymorphism

Do you recognize this?

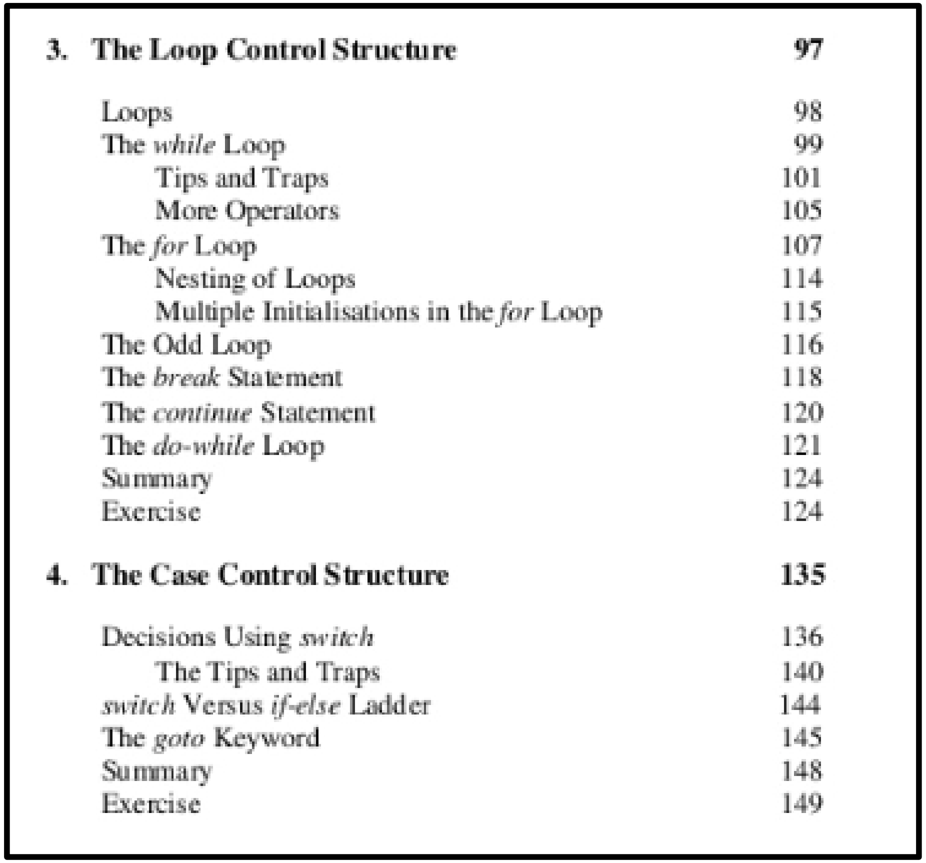


Table of Contents of C Programming Book

Taking These Ideas to Software Engineering!

Object Oriented Analysis and Design

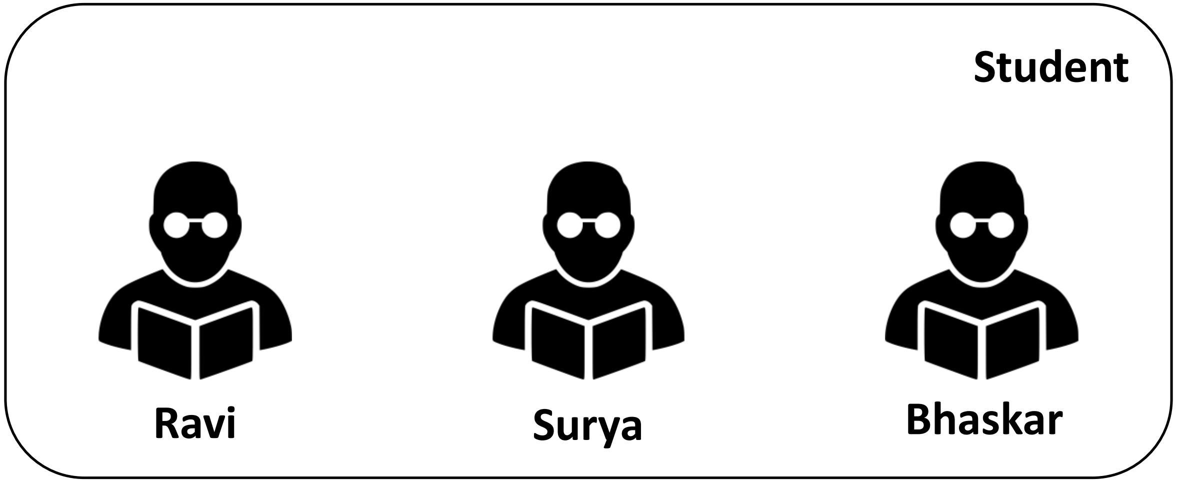
Objects are Everywhere!

- We are inherently Object Oriented!
- An Example Object:
  - Identity (Venkatesh)
  - Data (Height = 5’ 6’’, Weight = 80 KG*, …)
  - Behavior (Lecture, Put Students to Sleep, …)

Objects have Identity, Data and Behavior associated with them.

*May be slightly more. ☺

Abstraction



"*Student*" is a class.
The objects namely "*Ravi*", "*Surya*" and "*Bhaskar*"
belong to the "Student" class.

Abstraction

- Classroom
    - Classroom 101
- Student
    - Student1
    - Student2
    - …
- Faculty
    - Faculty1
- Electrical Fitting
    - Light
        - Power Saver Light
            - PSL 1
            - PSL 2 … and so on.

A class called "Student".

Objects are instances of a class.

Class Vs. Object

- Object has:
  - Identity (Jimmy).
  - Data (four legged).
  - Behavior (barks).
- Class has:
  - Data (Dogs are four legged [quadruped]).
  - Behavior (Dogs bark).

Quiz

- Which of the following is not a “**class**”?
  - Employee
  - Train
  - Vehicle
  - India

Quiz

- Which of the following is not a “**class**”?
  - Employee
  - Train
  - Vehicle
  - **India**

Quiz

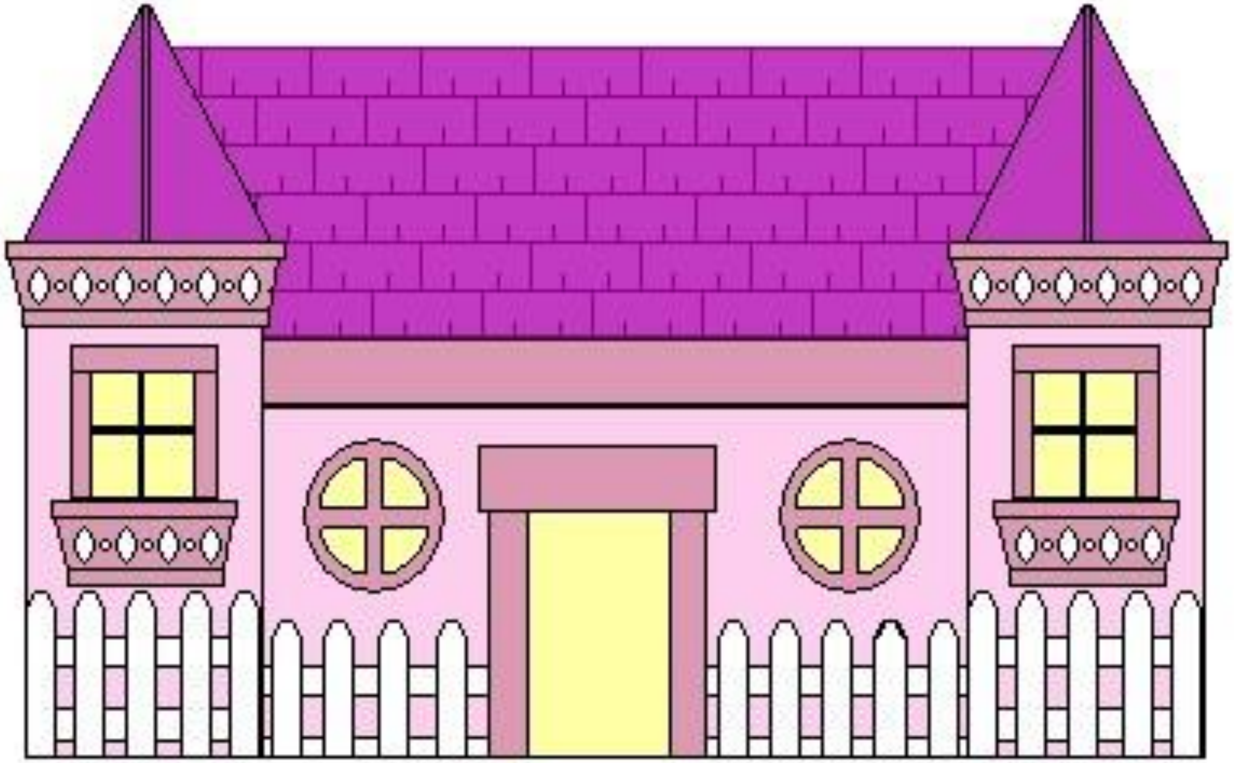
- Which of the following is not an “Object”?
    - LG Q6 Mobile Phone
    - Venkatesh V
    - Pinakini Express
    - Employee with ID 231

Quiz

- Which of the following is not an “Object”?
    - **LG Q6 Mobile Phone**
    - Venkatesh V
    - Pinakini Express
    - Employee with ID 231

Two Volunteers Please…

Describe this!



Part of the problem in industry today is related to

1. Specification
2. Visualization
3. Construction

Unified Modeling Language

A way to address these problems!

What is UML?

Unified Modeling language (UML)

is a

standardized *modeling language*

enabling developers to

specify, visualize, construct and document

artifacts of a software system.