Software Engineering

Lesson 05
Object Oriented Analysis
v1.0a

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Fall 2007/ 2008

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OOA
Introduction

- Why OOA?
  - Integrated consideration of data and functions reduces complexity: Things belonging together are considered together.
  - OOA as an object oriented method is “more natural” and that's why closer to the way of looking at a problem and makes communication with the customer easier
  - Integrated Models
    - OOA uses the same language conventions as the Object Oriented Design and programming, so there is methodical integration and consistence of terms

OOA
Introduction

- Goal
  - The goal of the OOA is an easy understandable model with objects and relationships

OOA Introduction

- Differentiation of requirements
  - Required Functionality
    - What provides the system?
  - Required Constraints (Non-functional requirements)
    - Quality requirements like performance, testability
    - Constraints like operating system, legal stipulations
    - Operation requirements

OOA
Introduction

- Precondition for OOA:
  - Business Idea or System Idea
    - Which business should be established?
    - Why should a system be developed?
  - Limits of the system:
    - Where are the limits of the system to the outside?
    - Which function blocks does the system have, which not?

OOA
Introduction

- OOA is the precondition for Object Oriented Design (OOD) and the object oriented implementation
- Don't mistake OOA and OOD only because of the integrated model representation

OOA
Business Classes

- Identification of Business Classes
  - Reason
    - Visualization of complex context, so it's easier to understand
    - With representation in a model in a structured way it's easier to detect contradictions and redundancies
  - Illustration
    - Class Diagrams are a good choice to describe Business Classes

OOA
Business Classes

- Identification of Business Classes
  - Basic
    - User Requirement Specification
    - Functional Specification / Target Specification
    - Use Case Descriptions
    - Glossary
    - Miscellaneous textual descriptions

OOA
Business Classes

- Identification of Business Classes
  - Contents; representation out of the "real business life" of
    - Concepts
    - People
    - Objects
  - Level of detail depends:
    Domain experts should understand

OOA
Proceeding

- Identification of objects or entities
  - Candidates are nouns in textual descriptions
- Identification of properties of objects
  - e. g. in automotive: color, gear, power
- Identification of relationships between objects, e. g.
  - **A** “consists of” or “consists of many” or “has a” **B** (Aggregation or composition)
  - **A** „is a“ **B** (Classification)
  - **A** „uses“ **B**, **A** „has a“ **B** (Use)

OOA Proceeding

- Identification of behavior
  - Verbs in textual descriptions
  - Behavior as change or modification of relationships
  - Behavior as change of properties
  - Behavior as arising or disappearing of objects

OOA Proceeding

- Restriction of properties and relationships, e. g.
  - Color could be realized as
    - an attribute like String
    - a specific object “Color” and corresponding relationships
- Identification of contradictions and ambiguity
  - Example:
    Wheel as a part of a car or as a spare wheel
  - Resolving with establishing of more detailed terms

OOA
Proceeding

- Identification of multiple classification (multiple inheritance)
  - Example: „A car is a land vehicle” and “A car is a auto driven vehicle“
  - Multiple classifications are normal, not wrong
  - During the OOA a treatment is not necessary
- Identification of changes of classifications
  - Example:
    At first you talk about a work piece, later it is a car

OOA Proceeding

- Identification of additional properties of classes
  - Are there similar objects or similar relationship in other existing systems or databases?
  - Events in the system, which could be important for the class
  - Life cycle of instances of a class
  - Invariance – stable objects or values that do not change
  - Quantity structure

OOA
Consolidation of terms

- In practice you typically find – especially in projects and big companies – already introduced terms and definitions
- But these terms could be ambivalent and unclear
  - Terms are used different in different context from the same person
  - Even different people at the customer side don't notice that they use the same term in the same context with different meanings
- Once introduced definitions and terms are difficult to change in practice

OOA
Consolidation of terms

- General guideline*
  - Use active instead of passive phrases
  - Don't use
    - synonyms (different words with identical meanings)
    - homonyms (same spelled words but different meanings)
    - tautology (unnecessary repetition)
  - Use terms only in plural if reasonable
  - Use clear language
  - Don't mismatch information with information carrier
  - Mind wrong terms as this could cause wrong communication!

* following [Oes06]

OOA
Example

- Design an object oriented Analysis Model based on following requirements
  - Requirement #1

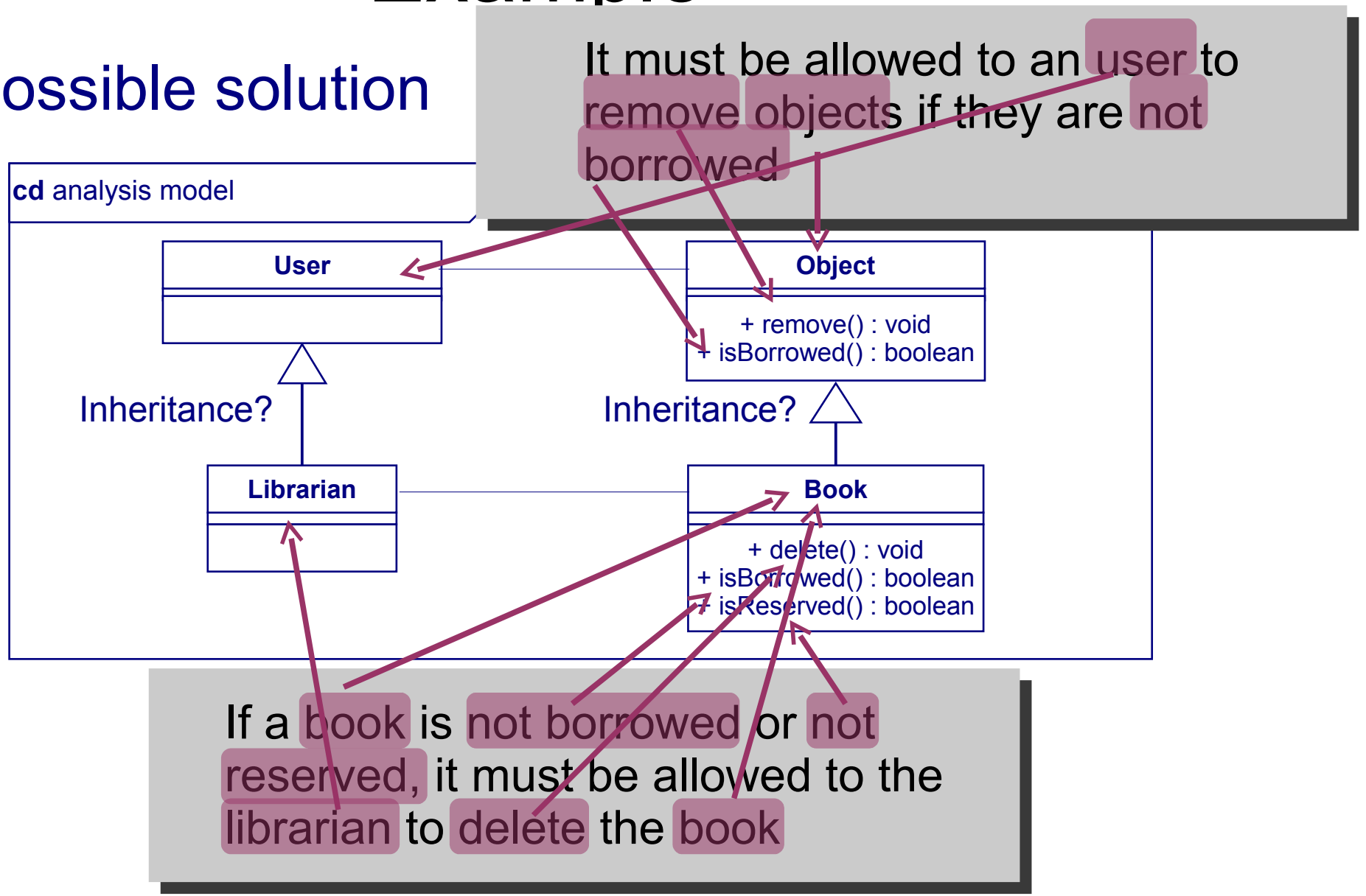
> It must be allowed to an user to remove objects if they are not borrowed

  - Requirement #2

> If a book is not borrowed or not reserved, it must be allowed to the librarian to delete the book

OOA Example

- Possible solution



OOA
Example

- Questions
  - Is User a generalization of Librarian or a synonym?
  - Is Object a generalization of Book or a synonym?
  - What means remove?
  - What means borrowed?
  - What means reserved?
  - Is there a difference between remove and delete?
  - Is there a difference in borrowing an object and borrowing a book?