CSE 308

UML Overview
Use Case Diagrams

Reference

- Class diagrams

  en.wikipedia.org/wiki/Class_diagram

What is Modeling?

- Modeling consists of building an abstraction of reality
- Abstractions are simplifications because:
  - They ignore irrelevant details and
  - They only represent the relevant details
- What is *relevant* or *irrelevant* depends on the purpose of the model, the audience, and other factors

This is a very difficult decision

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Why Model Software?

Software is getting increasingly more complex

- Windows XP > 40M lines of code

Could you comprehend 40M LOC?

- Modifying a model of a system is much, much easier than modifying software
- We need simpler representations for complex systems
  - Modeling is a way for dealing with complexity

Remember, a course goal is to think first, code second

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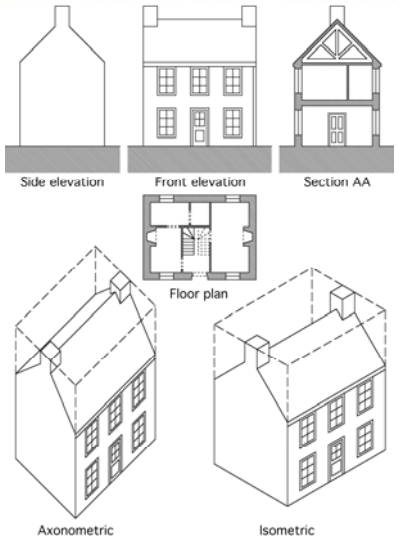
How Do We Deal With Complexity?

- Break it down into simpler parts
- Example- design specifications for a building
- Helps in
  - getting user feedback
  - Avoiding construction problems



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Systems, Models and Views

- A *model* is an abstraction describing a system or a subset of a system
- A *view* depicts selected aspects of a model
- A *notation* is a set of graphical or textual rules for depicting views
- Views and models of a single system may overlap each other

Unlike DB design, we often just generate different views, which together constitute a model

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What is UML?

- UML (Unified Modeling Language)
  - A standard for modeling object-oriented software.
  - Resulted from the convergence of notations from three leading object-oriented methods:
    - OMT (James Rumbaugh)
    - OOSE (Ivar Jacobson)
    - Booch (Grady Booch)
- Supported by several CASE tools
  - Visio
  - Workbench

You can model 80% of most problems by using about 20 of % UML (maybe 90/10)

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UML Approach for CSE308

- Use case Diagrams ← Text use cases are more practical and readable
  - Describe the functional behavior of the system as seen by the user
  - Great for decomposing a system into buildable units
- Sequence diagrams
  - Describe the dynamic behavior between actors and the system and between objects of the system
  - Helps to define the objects that are needed to implement a use-case
- Class diagrams
  - Describe the static structure of the system: Objects, Attributes, Associations
  - Can be revised based on discoveries made from sequence diagrams

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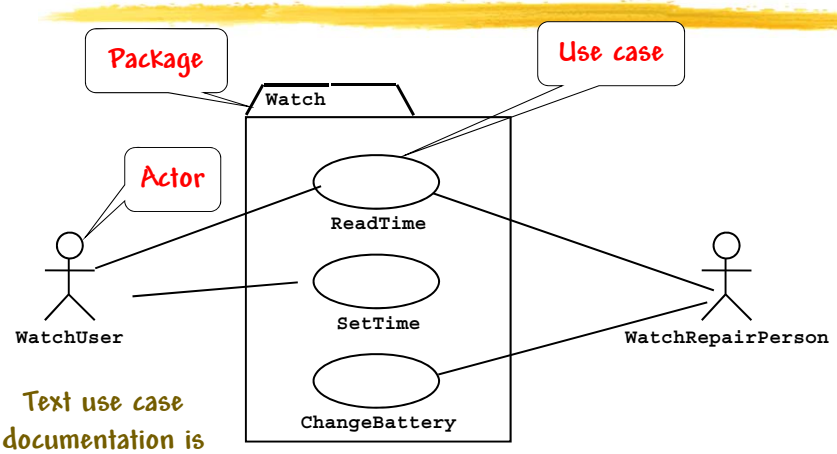
UML First Pass: Use Case Diagrams



Text use case documentation is more useful

Use case diagrams represent the functionality of the system from a user's point of view

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Other UML Notations

- UML provide other notations that are used less often
- Implementation diagrams
  - Component diagrams
  - Deployment diagrams
  - State-chart diagrams (essentially a finite state automaton)
  - Activity diagrams (essentially a flow chart)

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UML Core Conventions

- Rectangles are classes or instances
- Ovals are functions or use cases
- Instances are denoted with colon notation

```
myWatch:SimpleWatch
:SimpleWatch
joe:Firefighter
```

- Diagrams are graphs
  - Nodes are entities
  - Arcs are relationships between entities

A consistent code and design style is essential for group communication

Note the camel case notation

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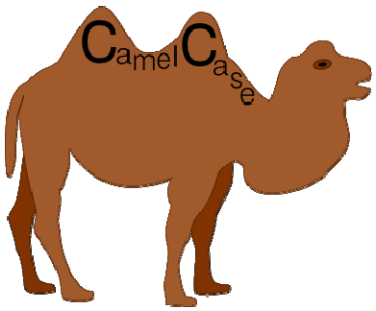
CamelCase

- A compound word begins each element with a capital letter
  - Upper camel case (UCC)
  - Lower camel case (LCC) - first letter not capitalized
- Examples
  - UCC - "CamelCase"
  - LCC - "camelCase"



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Naming Conventions

- Camel case for classes (upper cc) and attributes (lower cc)
- Classes- singular
- attributes- singular (plural for collections)
- Avoid acronyms and abbreviations except where well known (e.g., PI for Principal Investigator)

Conventions apply very early in the process

Names should describe the application domain, not the implementation approach

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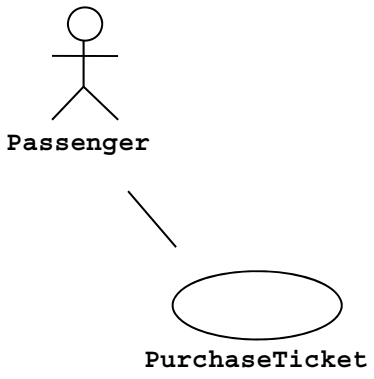
Use Case



- Used during requirements elicitation to represent external behavior
- *Actors* represent roles, that is, a type of user of the system
- *Use cases* represent a sequence of interaction for a type of functionality
- The use case model is the set of all use cases. It is a complete description of the functionality of the system and its environment

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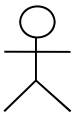
Actors



- An actor models an external entity which communicates with the system
- It can be a:
  - User,
  - External system, or
  - Physical environment
- An actor has a unique name
- Examples:
  - Passenger: A person in the train
  - GPS satellite: Provides the system with GPS coordinates

Similar to a role

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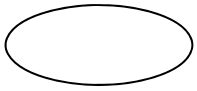
Use Case



A use case represents a class of functionality provided by the system as an event flow

A use case consists of:

- Unique name
- Participating actors
- Entry conditions
- Trigger
- Flow of events (scenario)
- Exceptions
- Build location (when available)
- Exit conditions
- Issues

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Example

- Example of a textual use case
- Design issues:
  - No overlap in use cases (instead think of preconditions)
  - Look for use cases that cover multiple roles (with exceptions that differentiate the roles)
  - Proper size (not too many steps or too few steps)

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Class Exercise

- Start to list some use cases in the project based on a look at the GUI
- Detail one use case

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Use Case: Summary

- Use case documentation
  - represents external behavior
  - are useful as an index into the use cases
  - Includes text and diagrams
  - Should be complete (all use cases need to be described)

We use use-case text for all processes

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UML Summary

- UML provides a wide variety of notations for representing many aspects of software development
  - Powerful, but complex language
  - Can be misused to generate unreadable models
  - Can be misunderstood when using too many exotic features

UML should be used to the extent that it improves communications concerning the system to be built

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