The University of Iowa

22C:22 (CS:2820)

Object-Oriented Software Development

Fall 2013

Object Oriented Analysis and Design

Educational Goals

- Apply principles and patterns to create better object-oriented software designs
- Iteratively follow a set of common activities in analysis and design
- Use an agile approach to the Unified Process as an example
- Create frequently used diagrams in the UML notation

What is Analysis

- An investigation of the problem and requirements (not of solutions)
    - requirements analysis
    - object-oriented analysis
- Goal: *do the right thing*

What is Design

- development of a conceptual solution (in software and hardware) that fulfills the requirements
  - object-oriented design
  - database design
- Goal: *do the thing right*

OO Analysis and Design

Object-oriented analysis:

emphasis on finding and describing the objects, or concepts, in the problem domain

Object-oriented design:

emphasis on defining software objects and how they collaborate to fulfill the requirements

Unified Modeling Language

- a visual language for
  - specifying,
  - constructing, and
  - documenting

  the artifacts of a system
- *de facto* standard for object-oriented software development

Uses of UML

- As a sketch
- As a blueprint
- As a programming language

UML as a Sketch

Informal and incomplete diagrams created to explore difficult parts of the problem or solution space

UML as a Blueprint

Relatively detailed design diagrams used either for

1. reverse engineering, to visualize and better understand existing code, or
2. forward engineering, to drive code generation

UML as a Programming Language

Complete executable specification of a software system in UML.

- Executable code automatically generated
- Code not normally seen or modified by developers
- technology not quite mature yet

UML Perspectives

1. Conceptual perspective
2. (Software) Specification perspective
3. (Software) Implementation perspective

Conceptual Perspective

- UML diagrams describe entities in the real world or domain of interest

Specification Perspective

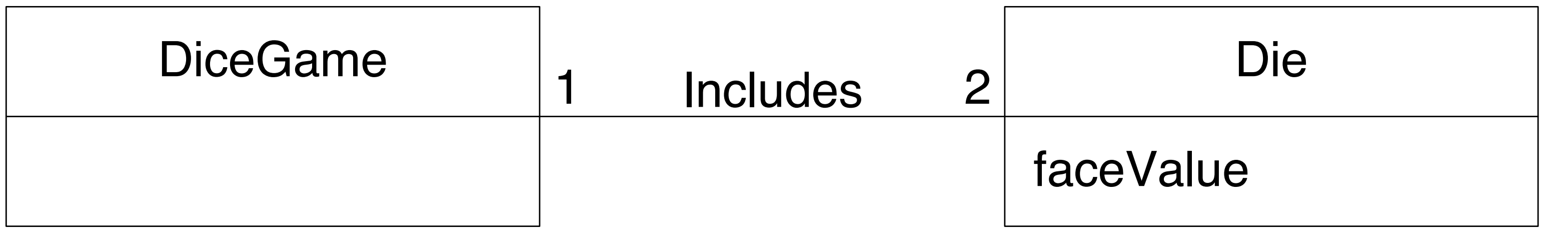
- UML diagrams describe software abstractions or components with specifications and interfaces
- There is no commitment to a particular implementation

E.g., not specifically a class in Scala or Java

Implementation Perspective

- UML diagrams describe software implementations in a particular technology

  e.g., Java



DiceGame

1

Includes

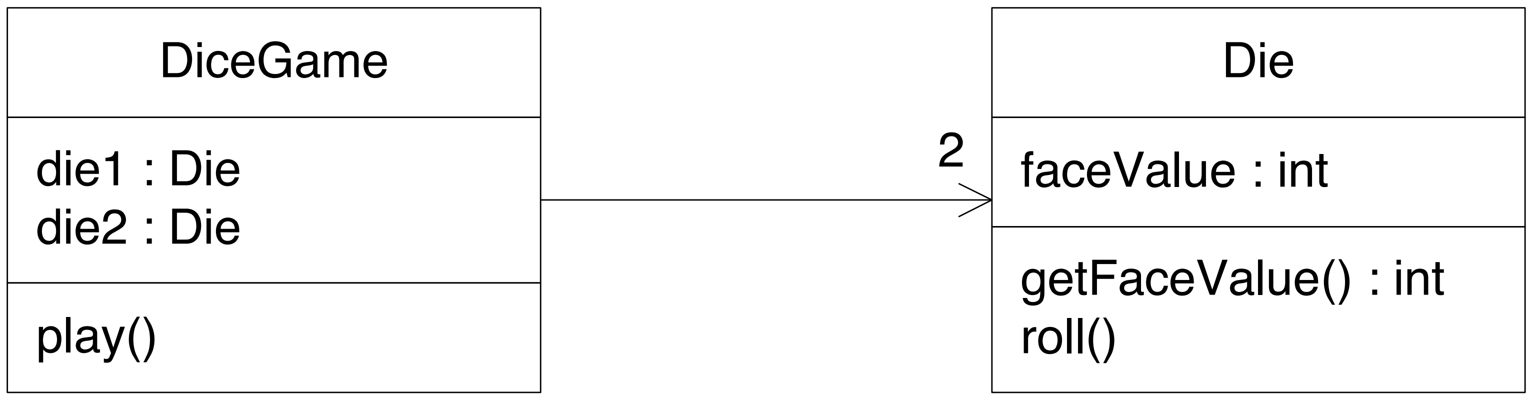
2

Die

faceValue

Conceptual Perspective
(domain model)

Raw UML class diagram notation used to visualize real-world concepts.



DiceGame

die1 : Die
die2 : Die

play()

2

Die

faceValue : int

getFaceValue() : int
roll()

Specification or
Implementation
Perspective
(design class diagram)

Raw UML class diagram notation used to visualize software elements.

Credits

Notes and figures adapted from

Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development by C. Larman. 3rd edition. Prentice Hall/Pearson, 2005.