CSE 142

Objects, Values and Types

Outline for Today

- Role-Playing Demonstration
- Discussion of Demonstration

- Major concepts
  - More about objects (properties and responsibilities)
  - Types
  - Values
  - State
  - Queries and commands (messages)

Performer Role-Playing

- We have Performer objects that are responsible for knowing how to:
  - Clap
  - Twirl
  - TellCount
- We have different types of Performer objects:
  - Acrobat
  - Choreographer
  - AcrobatWithBuddy
  - Actor
  - Curmudgeon

What did we see? (1)

- Performers as objects
  - What are their properties?
  - What are their responsibilities?
- Values: pieces of information manipulated by a program
  - Examples: numbers, characters, point on a plane
  - What values did we see?
- State
  - The collection of property values in an object is called its *state*
  - Values (state) of objects can change over time
  - How did values change?

What did we see? (2)

- Commands and Queries
  - Examples from demonstration?
  - *Commands* can change the state of an object
  - *Queries* determine values associated with an object
- Commands and queries are *messages*
  - May include *Parameters* to pass information
  - May include *Return values*
    - Queries always return a value
  - Chained messages
- Errors
  - Did we see any errors?

Values

- Information manipulated by a program
  - Examples: numbers, characters, point on a plane
  - Simple Vs. Composite
    Simple values cannot be broken down
    Composite values composed of simple values

    Are the following values simple or composite?
    - 3
    - "welcome"
    - The point (3,5) on the Cartesian plane
    - M
    - 2.9783

Types

- Type: Set of values and associated operations
  - Example: integers with +, -, /, *
- In Java
  - Primitive types   sample values   operations
    ```
    int
    double
    char
    boolean
    etc.
    ```
  - Object types (composites)
    ```
    2D Points
    Strings
    Performers
    etc.
    ```

Objects and Design

- When designing a system
  - Determine objects (properties and responsibilities)
  - Responsibilities can be "knowing" or "doing"
  - Knowing
    Properties of object
    About other objects in system
  - Doing
    Computing
    Actions to modify state
    Creating other objects
    Coordinating activities
  - Give examples of knowing and doing responsibilities in the role-playing

Online Retail Store (1)

- Suppose we want to model an online retail store that sells shirts and pants
  - What objects would you use?

Online Retail Store (2)

- Let's model a shirt:
  - Property   Type   Value

Online Retail Store (3)

- Shirt
  - Responsibility   Command or Query   Changes state?

Online Retail Store (4)

- Let's model an online shopping cart
  - Property   Type   Value

Online Retail Store (5)

- Online shopping cart
  - <u>Responsibility</u>   <u>Command or Query</u>   <u>Changes state?</u>

Summary

- Values are pieces of information manipulated by a program
- A type consists of a set of values and operations on those values
- Objects have properties with associated values
- The set of property values is the state of the object
- Objects have responsibilities that consist of queries and commands (messages that are passed to the object)