
CSE 142

Objects, Values and Types

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Outline for Today

- Role-Playing Demonstration
- Discussion of Demonstration
- Major concepts
 - More about objects (properties and responsibilities)
 - Types
 - Values
 - State
 - Queries and commands (messages)

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Acrobat Role-Playing

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

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What did we see? (1)

- Acrobats 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?

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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?

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Technical Terminology

- *type, value, object, state, message, command, query, parameter, return value...*
- These are not just random English words
- They are widely used in programming, with specific technical meanings
- Unfortunately, giving precise technical definitions for some of them is difficult, especially at this stage of the course
- Nevertheless, try to use the terms, and use them appropriately!
- (Are those previous two statements contradictory??)

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Values

- Information manipulated by a program
- May describe a property of an object
- Examples: numbers, characters, point on a plane
- Simple vs. Composite values
 - *Simple* (or elementary) values: cannot be broken down
 - *Composite* values: composed of multiple simple values

Are the following values atomic or composite?

- 3
- "welcome"
- The point (3,5) on the Cartesian plane
- M
- 2.9783

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State

- At any given time, a particular object can be described by the *values* of its properties.
- The set of all an object's values is called its *state*
- The state of an object changes over time

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Types

- **Type:** Set of possible 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
 - Acrobats
 - etc.

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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

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Online Retail Store (1)

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

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Online Retail Store (2)

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

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Online Retail Store (3)

- **Shirt**
 - Responsibility Command or Query Changes state?

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Online Retail Store (4)

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

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Online Retail Store (5)

- **Online shopping cart**
 - Responsibility Command or Query Changes state?

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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)**

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