
CSE 142

Objects and Classes

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Outline for Today

- Short review of objects
- Discussion of objects and classes
- Object and class exercise

- Major concepts
 - Objects as instances of classes
 - Classes as templates
 - Objects as properties

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Object Review

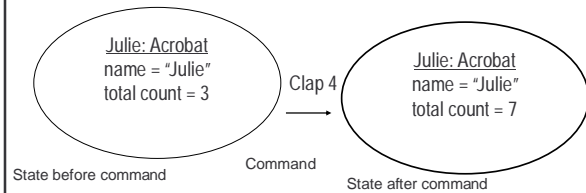
- Objects have properties and responsibilities
- One can send messages to objects
 - Queries [Find out values associated with properties]
 - Commands [Instruct an object to do something]
May cause a change in state
- Acrobat Example
 - Count is a query
 - Clap and Twirl are commands
Increase total count for objects

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State



What is the state after the command Twirl 2?
What is the state after the query Count?

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Classes

- Classes serve as templates or patterns or 'factories' for creating objects
- Objects in a class share same properties and responsibilities
 - Note: "same properties" does not imply "same values"
- Classes define the methods understood by all instances of the class
- Every object is an instance of some class
 - A fancy word: 'Instantiation' means popping out a new object from the 'factory'

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The Fundamental Unit

- *The class is the basic unit of programming in object-oriented programming*
- Typically a system has a small number of classes but may have a large number of instances (objects)
- Example: A university system would need to model students, courses, and buildings
 - One 'student' class
 - Thousands of student instances (objects)
 - One 'course' class
 - Hundreds of course instances
 - One 'building' class
 - Dozens of building instances

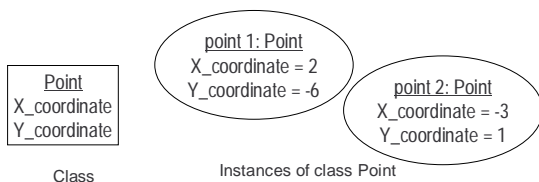
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Drawing Classes and Objects

- Computer scientists are always drawing pictures!
- Drawing: rectangle for class, blob for objects

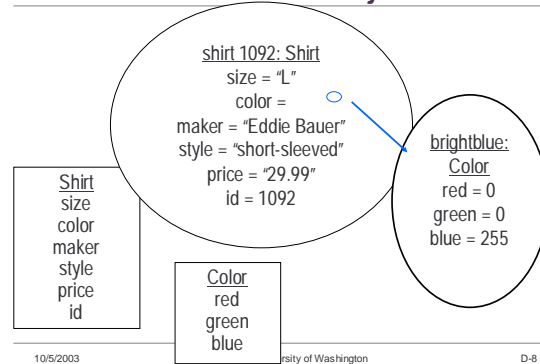


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Shirt Class and Objects



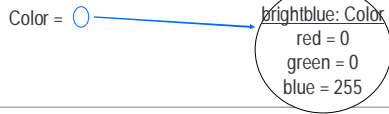
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Relationships Between Objects

- Objects may interact to solve a problem
- Two or more objects may have a well-defined relationship
- Example relation: One object as a property of another object
- **Reference value:** refers or denotes an object
The color property in the Shirt object refers to a Color object



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Type Review

- What is a type?

<u>Shirt Property</u>	<u>Value</u>	<u>Type</u>
Size	"L"	
Color	Reference value	
Maker	"Eddie Bauer"	
Style	"short-sleeved"	
Price	29.99	
ID	1092	

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Student Registration System

- What classes would you use?
 - Remember: a class is a set of objects with the same properties and responsibilities

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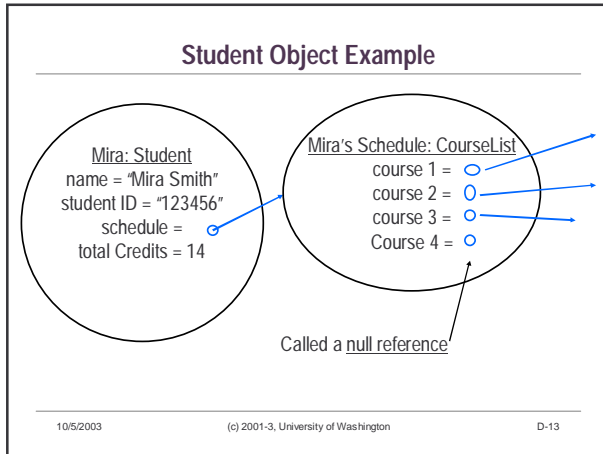
Student Class

- | <u>Properties</u> | <u>Responsibilities</u> |
|-------------------|-------------------------|
| • Student ID | • Add course |
| • Name | • Drop course |
| • Address | • Update address |
| • Schedule | • Get GPA |
| • GPA | • Get transcript |
| • Phone Number | • Get schedule |
| • Transcript | • Get student ID |
| • Total credits | • Get total credits |
| • Full-time? | • Get full-time status |

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Student Registration System Exercise

Student:
 name
 student ID
 schedule
 total Credits

CourseList
 course 1
 course 2
 course 3
 course 4

1. Determine properties for classes for Course and Room
2. Use these classes to create instances (objects) modeling the students and schedules on the sheet
3. Draw object diagrams to represent the objects you create and use arrows to show references to objects

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Example: Mira

Mira Smith, Student ID: 123456

Schedule:

CSE 142	Course ID: 2520	4 credits	Guggenheim 224
			room capacity: 275
MATH 120	Course ID: 5009	5 credits	Mary Gates 095
			room capacity: 40
MUSIC 160	Course ID: 5669	5 credits	Music 126
			room capacity: 220

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Example: Jason

Jason Johnson, Student ID: 234567

Schedule:

MATH 120	Course ID: 5009	5 credits	Mary Gates 095
			room capacity: 40
CSE 142	Course ID: 2520	4 credits	Guggenheim 224
			room capacity: 275
MUSIC 310	Course ID: 4216	4 credits	Music 126
			room capacity: 220
DANCE 105	Course ID: 2655	2 credits	Meany 267
			room capacity: 45

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Example Model of Mira and Jason

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Queries about Mira and Jason

- What is the room number of Mira's first course?
- What department teaches Jason's second course?
- How many seats does the room for Mira's second course have?
- What is the course ID for Jason's third course?
- How many courses is Jason taking?

- To think about:
 - What would happen if the course ID for CSE 142 changed?
 - What if the room capacity for MUSIC 126 changed?

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Classes and Objects in Java

- Preview of what's to come:
 - Objects have properties
 - In Java, we'll call these instance variables

 - Objects have responsibilities
 - In Java, we'll call these methods

 - Now we'll begin studying Java directly
Now you have a solid foundation of concepts we'll use throughout the quarter

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Summary

- Objects are instances of classes
- Classes serve as templates for creating objects
 - Objects in a class share the same properties and responsibilities
- Objects can be properties of other objects
 - Defines a relation between objects

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