CMSC 131
Object-Oriented Programming I
this reference, Encapsulation, API
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This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane
Overview

- Code duplication avoidance
- this reference
- Abstraction
- Encapsulation
- API
For the current project and future projects we will be grading for comments and code duplication avoidance.

**Code Duplication**
- If there is a fragment of code that appears in several section of your program, then that code should be factored out and placed in an auxiliary method.

**Example:**
- `ExperimentWithCodeDup.java`
- `ExperimentNoCodeDup.java`
this Reference

- Current Object
  - Represents the object a non-static method operates on

- this
  - Represents a reference to the current object
  - It is a special reference initialized for you
  - It does not make sense in a static method

- When we use it? (See Example: CD.java/CDDriver.java)
  - To tell parameters from instance variables
    - Notice that we could refer to instance variables by using \texttt{this.<instanceVariableName>}
  - To call constructors from another constructors
    - \texttt{this} must be the first statement in the constructor
  - In equals method implementation
  - To return a reference to the same object (cascading of method calls)
  - To define non-static methods based on static ones

- Eclipse capitalizes on the use of this when automatically defining code
  - Source $\rightarrow$ ”Generate Constructors using fields”
Abstraction (Technique)

- Abstraction
  - Provide high-level model of activity or data
- Procedural abstraction
  - Specify what actions should be performed
  - Hide algorithms
- Data abstraction
  - Specify data objects for problem
  - Hide representation
Encapsulation (Technique)

- Encapsulation
  - Confine information so it is only visible/accessible through an associated external interface
  - Makes possible **Information hiding**

- Approach
  - For some entity $X$ in program
    - Abstract data in $X$
    - Abstract actions on data in $X$
    - Collect data & actions on $X$ in same location
  - Protects and hides $X$

- Extension of **abstraction**
Abstraction of a **Roster**

- **Data**
  - List of student names

- **Actions**
  - Create roster
  - Add student
  - Remove student
  - Print roster

**Encapsulation**

- Only these actions can access names in roster
API (Application Programming Interface)

- API → Application Programming Interface
- Interface implemented by a software that enables interaction with other software
- API designed in such a way that ...
  - You can develop programs that will not break when the system represented by the API is updated
    - Example: We can change how we represent a phone number internally from string to integers
  - The only thing in the API are things the user will absolutely need
- Example: Java API
  - Project BattleField API
    - http://download.oracle.com/javase/6/docs/api/index.html
Visibility via private/public
The public access specifier allow us to define what will represent the interface
The private access specifier allow us to encapsulate
Only make something public if there is a reason to. Why?
- As long as interface is preserved, class can change without breaking other code
- The more limited the interface, the less is to maintain
- To avoid giving object users unnecessary information
- **Example:** Let’s add a `getSalary` method to the `ExperimentNoCodeDup` class
  - Let’s change it so we use string as a salary instead of double

Rule of thumb
- Make instance variables private
- Implement set/get methods
  - Needed as private instance variables cannot be accessed outside the class declaration
  - Notice that we don’t always need to provide set/get methods for a class
- Make auxiliary methods private