

Object Oriented Concepts

Dave Levitt

CS 2000: Systems Analysis & Design

Agenda

- OO Jeopardy – Part I
- Review Inception Phase
- Object Oriented Concepts
- Outsourcing
- Lab

Object Oriented Concepts

- Systems are complex. OO techniques help us manage complexity through the application of:
 - Abstractions
 - Objects
 - Classes
 - Encapsulation
 - Hierarchy
 - Association
 - Communication with messages

OO Concepts - Abstractions

- OO Modeling help us model the problem domain by using objects, which represent abstractions.
 - An abstraction is “describing the essential and omitting the irrelevant”.
 - What determines relevance lies in the eyes of the beholder. Example: TV set, pets.
 - OO provides the ability to describe abstractions and their relationships in user terms. These same abstractions can then be used by developers so they can add the detail they need for implementation.
 - The overall effect of OO, if applied properly, is that it can lead to better communications, with less distortion.

Abstractions (cont'd)

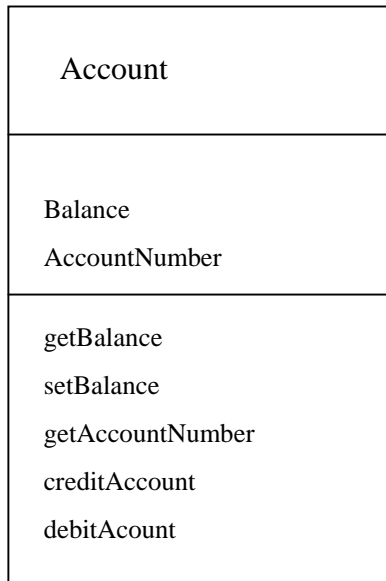
- In OO parlance, we represent abstractions through *objects*.
 - Objects contain data (attributes) and behavior (methods)
 - What objects / abstractions might you think of for an ATM.
- *Object Oriented Analysis* models the problem domain through objects and their responsibilities and interactions.
 - Analysis Models need to communicate with end-users and developers.
- *Object Oriented Design* builds on the OOA model(s) and add details and constructs that will foster implementation.
 - Design models need to communicate with developers only.
 - The line between OOA and OOD is 'fuzzy'.

Object Oriented Concepts

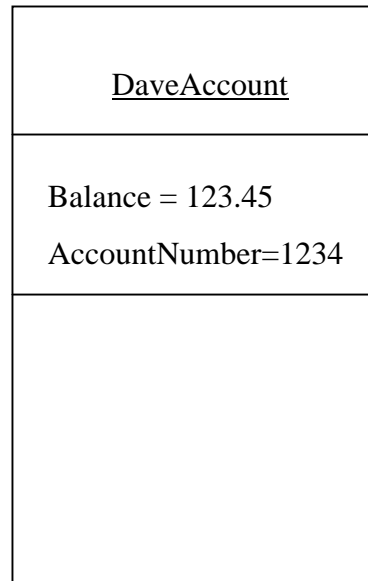
- Like developing a use case model, developing OOA / OOD models is not an exact science.
 - The challenge is to model the right set of objects.
 - One person's model may be different from another persons.
 - Models are not necessarily right or wrong, they are more or less useful.
Martin Fowler.
 - Useful for what?
 - As we will see, there are heuristics that we can use to evaluate 'goodness'.

Object Oriented Concepts

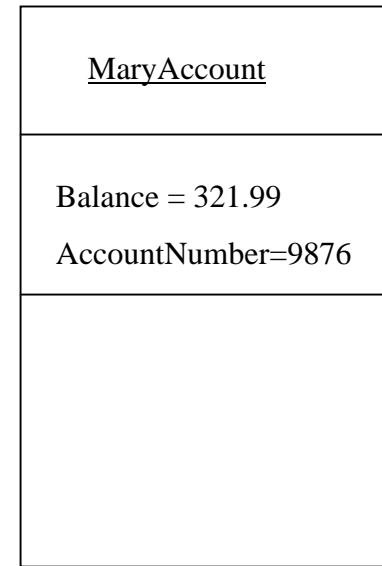
- A *class* is a template for creating objects



Class



DaveAccount=new Account()
Week 7



MaryAccount=new Account()

Object Oriented Concepts

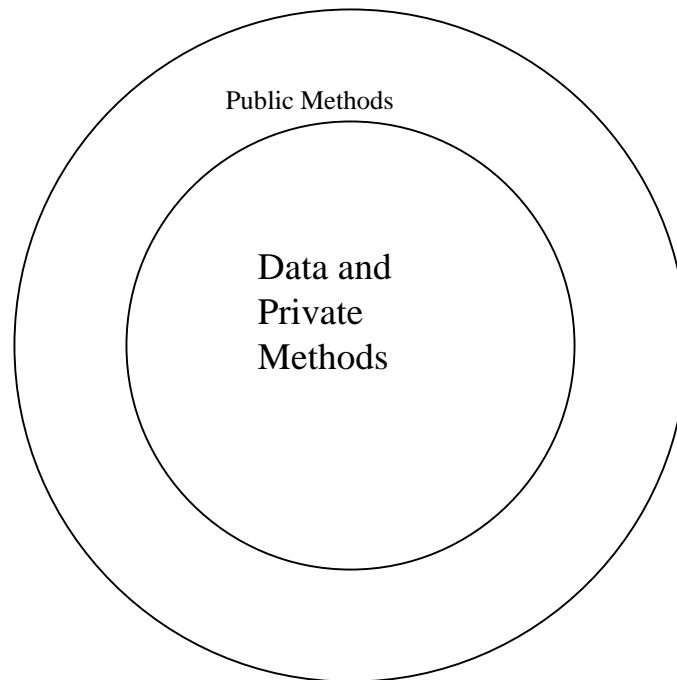
- Objects vs. Classes
 - A class is like a template from which objects are created. Analogy: cookie cutter
 - An object is a specific instance of an object. Analogy: actual cookies
 - A class does not take up space in memory, an object does.
 - A class has no state, identity, or behavior, an object does. Analogy: cookie_1, cookie_2

Object Oriented Concepts

- *Encapsulation* is the process by which details that do not contribute to its abstraction are hidden.
 - Abstraction represents an external view of an object.
 - Encapsulation / information hiding represents an internal view of an object.
 - Encapsulation a.k.a. information hiding and private interface.
- In java speak, what constitutes the abstraction? What constitutes the encapsulation?

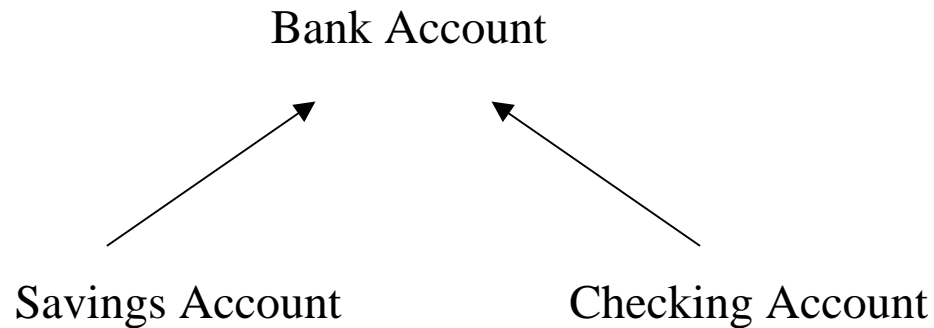
Object Oriented Concepts

Through Encapsulation / Information Hiding, we protect the elements we do not want to expose.



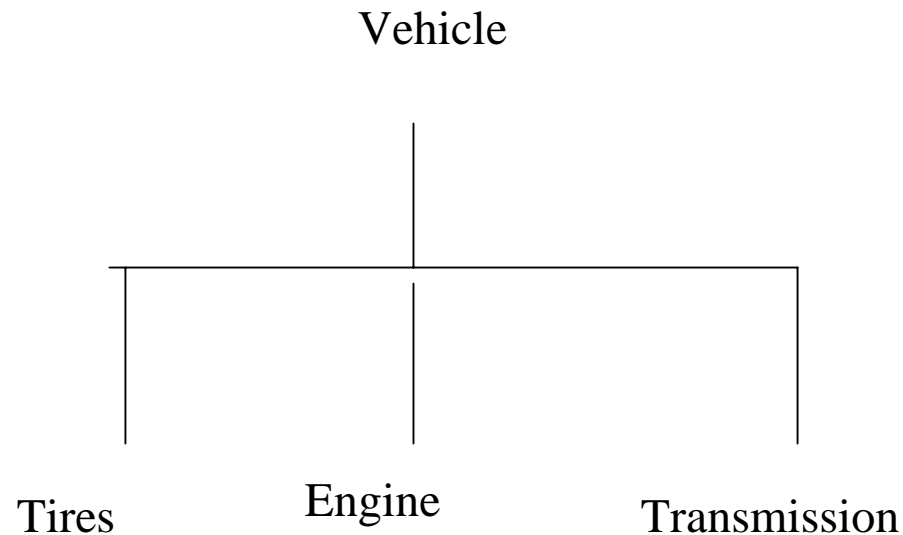
Object Oriented Concepts

- *Hierarchy* allows us to provide an order to the abstractions.
 - *Inheritance* allows us to share the data and behavior of one abstraction into another.



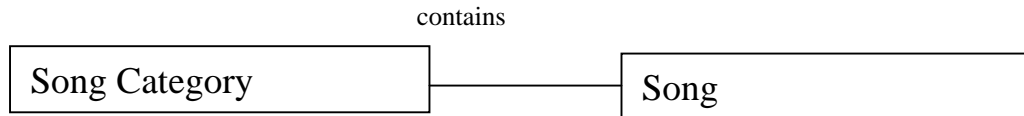
Object Oriented Concepts

- A Whole / Part *hierarchy* allows us to build abstractions out of other abstractions



Object Oriented Concepts

- An *association* allows us to relate abstractions, but not as ‘strong’ as whole/part or hierarchy relationships.



Object Oriented Concepts

- *Communication with messages* occurs when one object invokes a method on another object.
 - The only way objects communicate is through messages.
 - More specifically, one class invokes a public method on another class.
 - What would an object do if it had to send a message to itself?

Object Oriented Concepts

- The OO Advantage:
 - OO supports techniques that help manage complexity.
 - OO promotes reuse *
 - OO promotes better communications. Solutions can be easily mapped to abstractions in the problem domain.
- The OO Disadvantage
 - All of this hasn't happened yet – at least on a grand scale.
 - OO has the potential to introduce as many problems as it solves.
 - The essence of this course is to teach you, and for you to apply, proven techniques to help you to analyze and design effective OO solutions!

Outsourcing

- Comment on the following statements:
 - “The American Programmer is about to share the same fate of the dodo bird. By the end of the decade, I foresee massive unemployment among the ranks of American programmers, systems analysts, and software engineers. ...the reason will be much simpler: *international competition will put American programmers out of work, just as Japanese competition put American automobile workers out of work in the 1970s.* [1]
 - “”Ex- [Bank of America (BOA)] managers and contractors say one-third of these jobs are headed off to India, where work that costs \$100 an hour in the U.S. gets done for \$20.00 [2]

Outsourcing (cont'd)

- How might you want to deal with the outsourcing threat?
 - Take responsibility for YOUR career. You, and only you are responsible for managing it!
 - Stay current. Read journals, books, take classes, etc.
 - Networking – join professional associations such as IEEE, ACM, OTUG.
 - Sharpen your non-technical skills: people, communication, managerial, etc.
 - Set goals and work toward them.
 - CONTINUE WITH YOUR EDUCATION! – FORMAL or INFORMAL
 - Seek out specialties and/or skills that are not as much of a threat.
 - Managerial skills – somebody has to manage an outsourced project.
 - Analytical skills – somebody still needs to elicit, document and manage the requirements and system models.

Outsourcing (cont'd)

- Follow your passions!
 - What skills do think are needed to be a top-notch developer?
 - What skills do you think are needed to be a top-notch Systems Analyst / Modeler?
 - What are you doing to acquire or sharpen these skills?

Outsourcing (cont'd)

- Recent legislation has been passed that gives companies tax breaks for outsourcing. Example: NAFTA and H.R. Bill 4520: American Jobs Creation Act of 2004.
- It is an issue that affects IT professionals and you, as students wanting to enter the field.
- If you are not part of the solution, you are part of the problem. **GET INVOLVED! CONTACT YOUR CONGRESSMAN AND LET THEM KNOW WHAT YOU THINK!**

Outsourcing (cont'd)

- If you want to send your Congressman a letter, here's their contact information:

• Gutknecht, Gil	1 st district	http://www.house.gov/gutknecht/
• Kennedy, Mark	6th	http://markkennedy.house.gov/
• Kline, John,	2nd “	http://www.house.gov/kline/
• McCollum, Betty,	4th “	http://www.mccollum.house.gov
• Oberstar, James L.,	8 th “	http://www.oberstar.house.gov
• Peterson, Collin C.	7th “	http://collinpeteron.house.gov
• Ramstad, Jim ,	3rd “	www.house.gov/ramstad/
• Sabo, Martin Olav ,	5th “	http://sabo.house.gov