Lecture 2- Object Orientation



Object-Oriented Systems Analysis and Design

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Topic covered



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- ♦ Object-Orientation Concepts
- ♦ Object-Orientation Benefits

Object



An object is "an abstraction of something in a problem domain, reflecting the capabilities of the system to keep information about it, interact with it, or both."

→ "We define an object as a concept, abstraction, or thing with crisp boundaries and meaning for the problem at hand. Objects serve two purposes: they promote understanding of the real world and provide a practical basis for computer implementation."

Object



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♦ "Objects have state, behavior and identity."

- Identity (Who am I?)
 - each object is unique
- State (What do I know?)
 - the conditions of an object at any moment that affect how it behaves
- Behaviour (What can I do?)
 - the way in which an object responds to messages

Object



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Object	Identity	States	Behaviour
A person	'Hussain Pervez'	Studying Resting Qualified	Speak Walk Read
A shirt	'My favourite button- down white denim shirt'	Pressed Dirty Worn	Shrink Stain Rip
A sale	'Sale no 0015, 15/06/02'	Invoiced Cancelled	Earn loyalty points
A bottle of ketchup	'This bottle of ketchup'	Unsold Opened Empty	Spill in transit

Class



♦ A class is "a set of objects that share the same specifications of features (attributes, operations, links), constraints (e.g. when and whether an object can be instantiated)"

Moreover, "The purpose of a class is to specify a classification of objects an to specify the features that characterize the structure and behavior of those objects"

Class



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- An object = An instance of some class
 - Every object must be an instance of some class
- A class = A set of objects that share the same
 - structure
 - what information it holds
 - what links it has to other objects
 - behaviour
 - what things it can do

Message Passing



♦ Objects collaborate to fulfil some system function, and they communicate by sending each other messages:

- A question message asks an object for some information
 - How much is the balance?
- A command message tells an object to do something
 - Withdraw 100 pounds



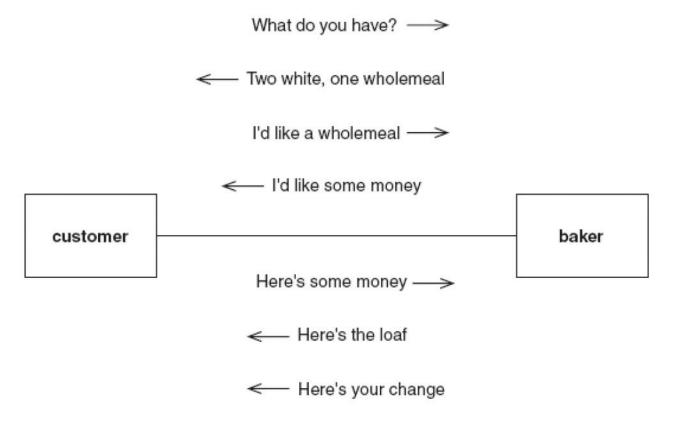


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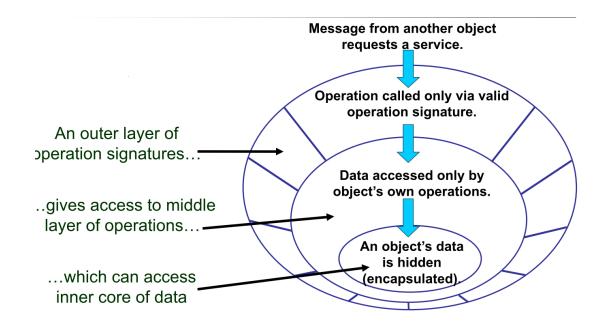
Encapsulation



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Inheritance



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- ♦ A subclass always inherits all the characteristics (data structure and behavior) of all its superclasses.
- ♦ The definition of a subclass should always include at least one detail not derived from any of its superclasses.





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♦ A subclass inherits the structure and behavior of its superclass.

Generalization in UML

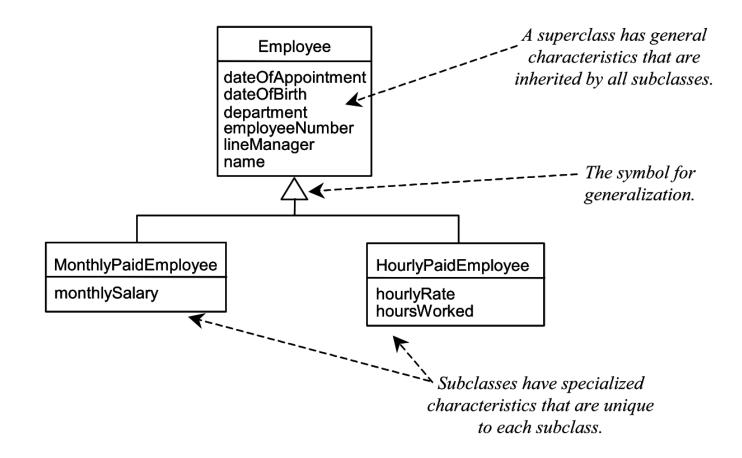


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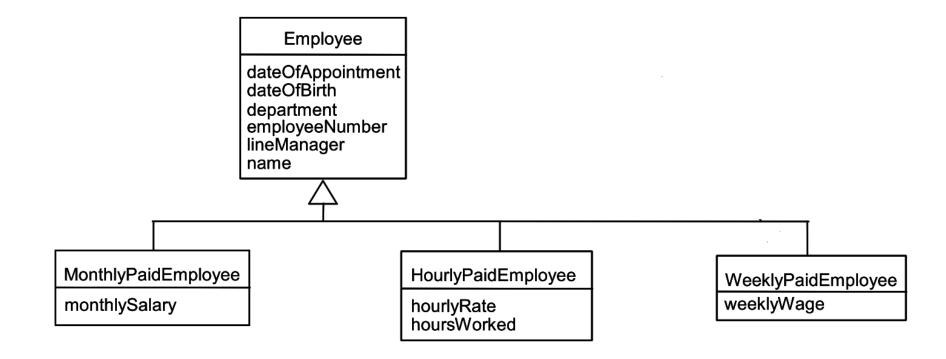




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- ♦ Polymorphism allows one message to be sent to objects of different classes

Polymorphism: Example



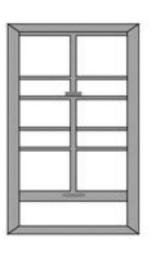
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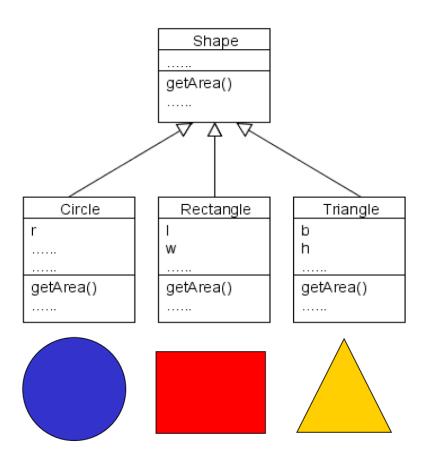




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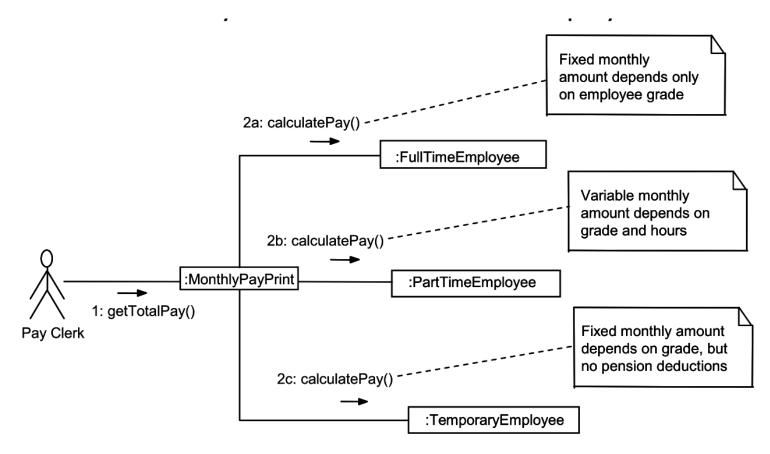
Polymorphism: Example



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Benefits of Object-Orientation



- Object-Orientation concepts and techniques improve both software quality and software productivity.
- ♦ Modularity for easier troubleshooting
- ♦ Reuse of code through inheritance
- ♦ Flexibility through polymorphism
- ♦ Effective problem solving