CS 247 Midterm Review

ADT Design

- Bullet point here

Documentation

Exceptions

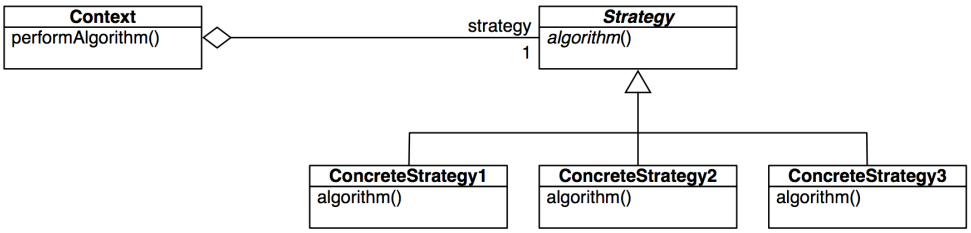
RAII Idiom

UML

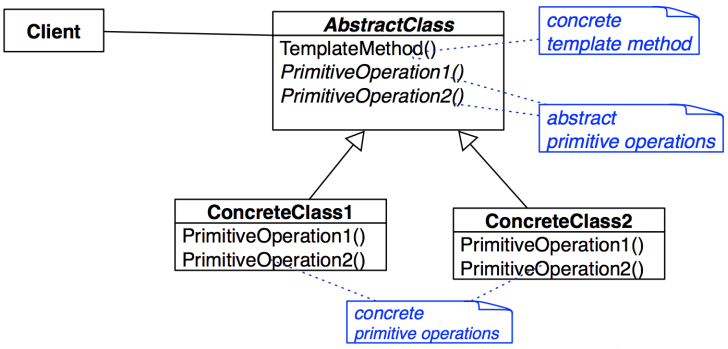
- **Unified Modelling Langauge**
- Class diagrams
  - Attributes
    - `[visibility] name: [type] [multiplicity] = [default value] {property}`
  - Operations
    - `[visibility] name (parameter list) : [return type] {property}`
    - + public; - private; # protected; static; *pure virtual*
    - `property` = read-only (aka. const), query (aka. accessor), abstract, etc.
- Associations: physical or conceptual links between classes
  - Classes being associated may have role names
  - Navigability: direction of association; e.g. A *has* B
- Multiplicity (of attributes or associations)
  - a: exactly a
  - $m..n$: between m and n
  - $*$: many (at least zero)
- Aggregate: a collection of members
  - Collection has many members
  - Member can belong to many collections
- Composition: a stricter collection of members
  - Member cannot exist without its collection
  - Member belongs to exactly one collection
- Generalization = inheritance
- Sequence diagrams: describe how information is passed between objects (e.g. via function calls), throughout execution of a program

Design Patterns

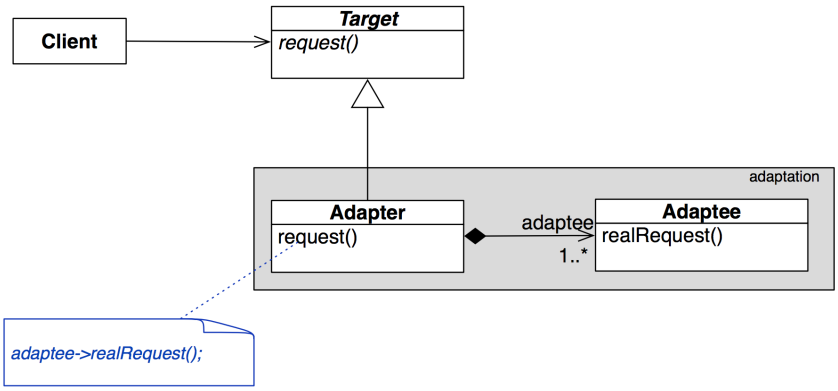
- **Inheritance**
  - Parent class's methods are inherited by child classes
    - Classes' methods share the same implementation structure
    - Only differences are the data values
  - Downside: not all subclasses may want to inherit parent behaviour
  - Downside: code duplication
- **Strategy pattern**
  - Allows the implementation of an algorithm/method to be changed at runtime (encapsulation of algorithm)
  - Allows the algorithm vary independently from clients that use it
  - e.g. data structure holds an instance of base Strategy class, calls the algorithm/method (which is *pure virtual* in base class)
    - Concrete methods with differing behaviour are implemented in Strategy subclasses
    - Strategy can be changed (to other subclasses) at runtime, changing the method's behaviour



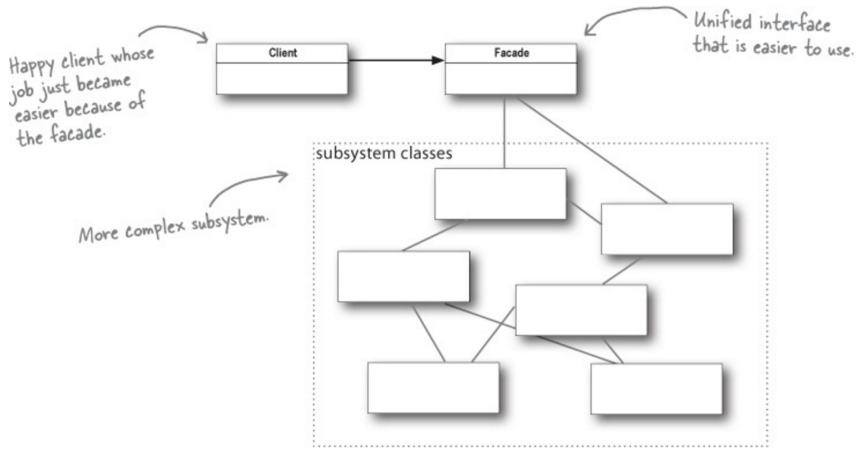
- **Template pattern**
  - **Template method** is a method in a base class that defines code structure but leaves holes to be defined by subclasses
  - Holes are operations defined as *pure virtual* in the base class, but have varying implementations in subclasses



- **Adapter pattern**
  - Adapter maps one interface to another
  - e.g. interfaces of an existing module does not match with a new module
  - e.g. wrapping an existing data structure interface to create a new data structure

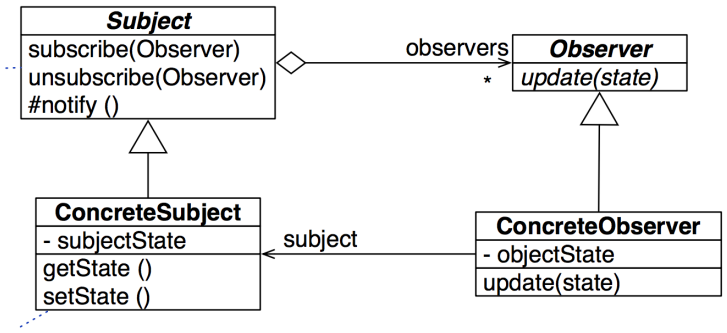


- **Facade pattern**
  - Simplies and unifies classes and interfaces in a subsystem into only a high-level interface and hides individual interfaces within the subsystem
  - Subsystem components and interfaces can be changed without affecting client



- **Singleton pattern**
  - Ensures only one instance of a class can exist
  - Private constructor; only instantiated through static `getInstance()` method

- **Observer pattern**
  - Subject → (one-to-many) Observers
  - Subject can notify all subscribed observers to update
  - Observers can subscribe/unsubscribe at runtime
  - **Push model**: subject pushes state information to observers through `notify(State)`
  - **Pull model**: subject notifies observers, who request information via subject's accessors
  - **Loose coupling**: subjects and observers only know about each other's interfaces, not the concrete classes that implement them



OOP Principles