Advanced Java

LESSON 10: STRATEGY PATTERN

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Agenda

- **Design Patterns**
- **Association, Composition and Aggregation**
- **Strategy Pattern**

Design Patterns

Design Patterns

A general, reusable solution to a commonly occurring problem within a given context in software design.

Creational patterns

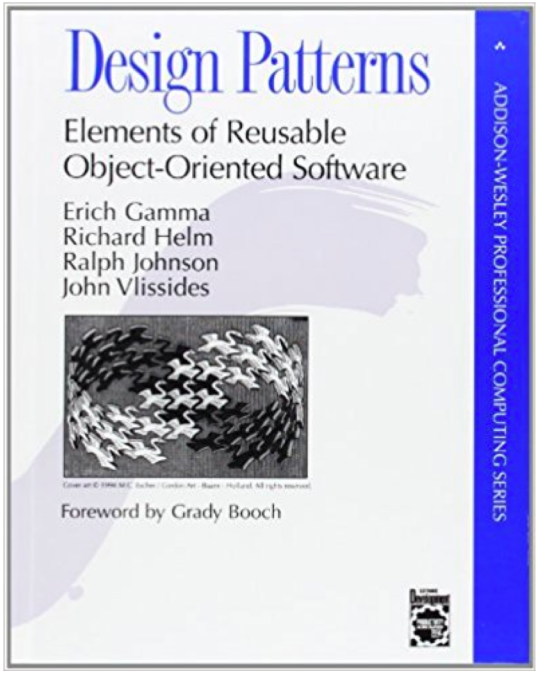
- Singlton
- Factory

Structural patterns

- Decorator
- Façade

Behavioral patterns

- Memento
- Observer
- Strategy



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Association, Composition and Aggregation

Association, Composition and Aggregation

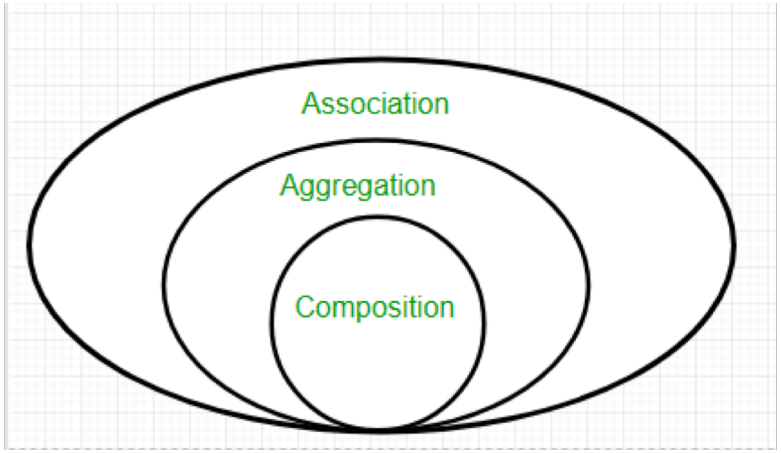
Inheritance is an "is-a" relationship. Composition is a "has-a". You do composition by having an instance of another class C as a field of your class, instead of extending C .

Stack Overflow

Association, Composition and Aggregation

Association

- Association is relation between two separate classes which establishes through their Objects. Association can be one-to-one, one-to-many, many-to-one, many-to-many.



Geeksforgeeks.org

https://www.geeksforgeeks.org/association-composition-aggregation-java/

Association, Composition and Aggregation

Aggregation

It is a special form of Association where:

- It represents Has-A relationship.
- It is a unidirectional association i.e. a one way relationship. For example, department can have students but vice versa is not possible and thus unidirectional in nature.
- In Aggregation, both the entries can survive individually which means ending one entity will not effect the other entity

Geeksforgeeks.org

Association, Composition and Aggregation

Aggregation vs Composition

1. **Dependency:** Aggregation implies a relationship where the child can exist independently of the parent. For example, Bank and Employee, delete the Bank and the Employee still exist. whereas Composition implies a relationship where the child cannot exist independent of the parent. Example: Human and heart, heart don't exist separate to a Human
2. **Type of Relationship:** Aggregation relation is "has-a" and composition is "part-of" relation.
3. **Type of association:** Composition is a strong Association whereas Aggregation is a weak Association.

Geeksforgeeks.org

Association, Composition and Aggregation

Before Refactoring

```
public class Dessert {
    private String name;
    private int calories;
    private boolean isSweat;

    public Dessert(String name, int calories, boolean isSweat) {
        this.name = name;
        this.calories = calories;
        this.isSweat = isSweat;
    }
    public String getName() {
        return name;
    }
    public int getCalories() {
        return calories;
    }
    public boolean isSweat() {
        return isSweat;
    }
}
```

Association, Composition and Aggregation

Aggregation – "Has A"

```
public class Food {
    private String name;
    private int calories;
    public Food(String name,
                int caloriest) {
        this.name = name;
        this.calories = calories;
    }
    public String getName() {
        return name;
    }
    public int getCalories() {
        return calories;
    }
}
```

```
public class Dessert {
    private boolean isSweat;
    private Food food;
    public Dessert(String name,
            int calories, boolean isSweat) {
        food = new Food(name, calories);
        this.isSweat = isSweat;
    }
    public String getName() {
        return food.getName();
    }
    public int getCalories() {
        return food.getCalories();
    }
    public boolean isSweat() {
        return isSweat;
    }
}
```

In-Class Activity

1. Download, "CompisitionExample" project from Blackboard.
2. Read the "ReadMe.txt" file and follow the instructions.

Strategy Pattern

Strategy Pattern

Law of Demeter (LoD) or **principle of least knowledge**

A design guideline for developing software, particularly object-oriented programs. In its general form, the LoD is a specific case of loose coupling.

- Each unit should have only limited knowledge about other units: only units "closely" related to the current unit.
- Each unit should only talk to its friends; don't talk to strangers.
- Only talk to your immediate friends.

Strategy Pattern

In computer programming, the **Strategy Pattern** (also known as the **Policy Pattern**) is a behavioral software design pattern that enables selecting an algorithm at runtime.

The strategy pattern

1. defines a family of algorithms,
2. encapsulates each algorithm, and
3. makes the algorithms interchangeable within that family.

Wikipedia.org

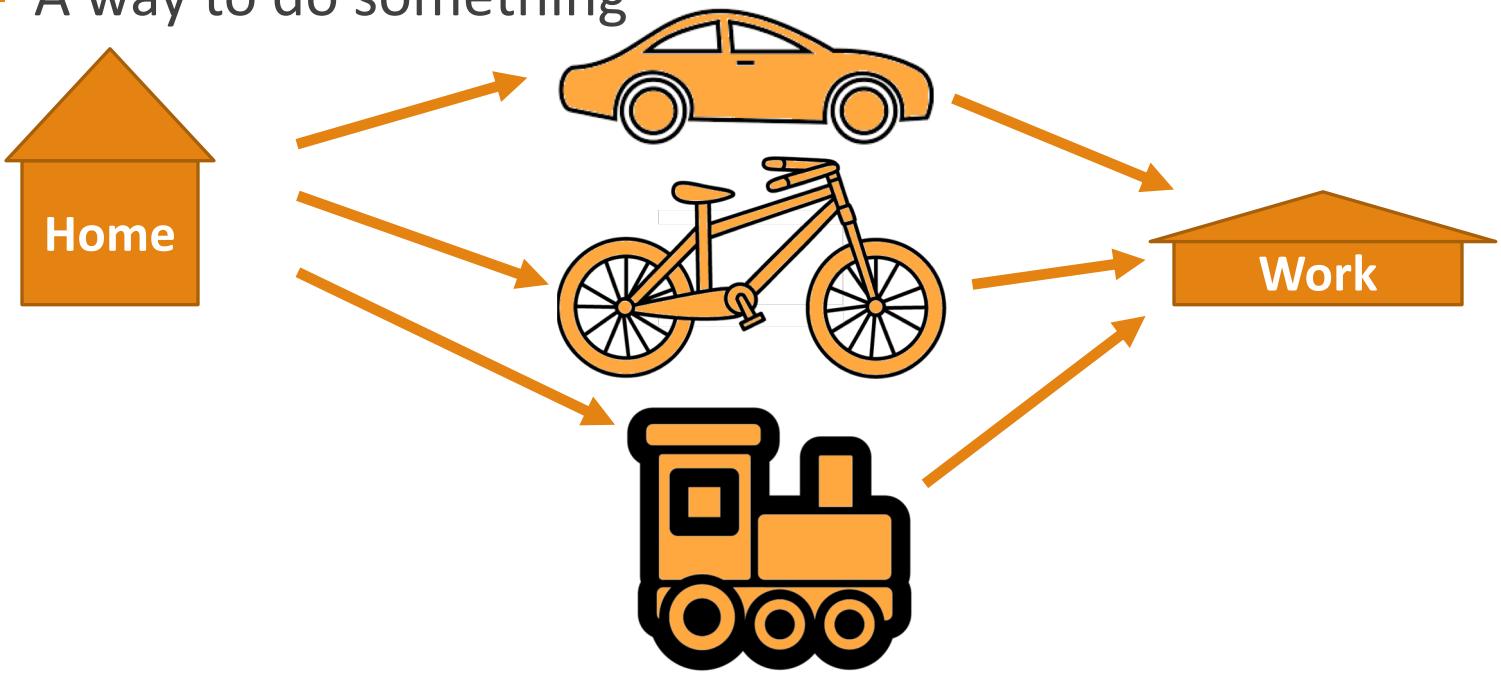
Strategy Pattern

Strategy – "Get to Work"

- Strategy #1 – Drive
- Strategy #2 – Bike
- Strategy #3 –Train

What is a Strategy?

- Plan of Action to achieve a specific Goal
- An algorithm
- A way to do something



Strategy Pattern

```
public interface TravelStrategy {
    public void goToWork();
}

public class DriveStartegy implements TravelStrategy {
    @Override
    public void goToWork() {
        System.out.println("Drove to work");
    }
}

public class BikedStrategy implements  TravelStrategy {
    @Override
    public void goToWork() {
        System.out.println("Biked to work");
    }
}

public class TrainStrategy implements TravelStrategy {
    @Override
    public void goToWork() {
        System.out.println("Road Train to Work.");
    }
}
```

Strategy Pattern

```
public class Day {
    private String dayOfWeek;
    private TravelStrategy travel;

    public Day(String dayOfWeek, TravelStrategy travel) {
        this.dayOfWeek = dayOfWeek;
        this.travel = travel;
    }
    public String getDayOfWeek() {
        return dayOfWeek;
    }
    public TravelStrategy getTravel() {
        return travel;
    }
    @Override
    public String toString() {
        return "Day{" +
                "dayOfWeek='" + dayOfWeek + '\'' +
                ", travel=" + travel +
                '}';
    }
}
```

Strategy Pattern

```
import java.util.ArrayList;
import java.util.List;

public class Main {

    public static void main(String[] args) {
        List<Day> week = new ArrayList<>();
        week.add(new Day("Monday", new BikedStrategy()));
        week.add(new Day("Tuesday", new TrainStrategy()));
        week.add(new Day("Wesnesday",
                                    new TrainStrategy()));
        week.add(new Day("Thursday", new DriveStartegy()));
        week.add(new Day("Friday", new DriveStartegy()));

        for (Day d: week) {
            d.getTravel().goToWork();
        }
    }
}
```

In-Class Activity

1. Download, "StoreStrategyLab" project from Blackboard.
2. Read the "ReadMe.txt" file and follow the instructions.