Refactoring, Code Smells, Coupling and Cohesion

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Code Smells

Symptoms of a problem

Code Smells

A code smell is a surface indication that usually corresponds to a deeper problem in the system.

- Quick to spot
- Provide feedback on our decisions
- Don’t always indicate a problem worth solving

Categories of code smells

Bloaters
- Long Method
- Large Class
- Primitive Obsession
- Long Parameter List
- Data Clumps

Object-orientation abusers
- Switch Statements
- Temporary Fields
- Refused Bequest
- Alternative Classes with Different Interfaces

Couplers
- Feature Envy
- Inappropriate Intimacy
- Message Chains
- Middle Man

Change preventers
- Divergent Change
- Shotgun Surgery
- Parallel Inheritance Hierarchies

Dispensables
- Lazy Class
- Data Class
- Duplicated Code
- Dead Code
- Speculative Generality
- Comments

Have a look at https://refactoring.guru/refactoring/smells.

Primitive Obsession

Use of primitive types instead of small objects for simple tasks.

- Replace data value with object
- Replace type code with class
- Replace array with object
- …

```
1  package it.esteco.pos;
2
3  import java.util.HashMap;
4  import java.util.Map;
5
6  public class Sale {
7
8      private Display display;
9      private final Map<String, String> pricesByBarcode;
10
11     public Sale(Display display, HashMap<String, String> pricesByBarcode) {
12         this.display = display;
13         this.pricesByBarcode = pricesByBarcode;
14     }
15
16     public void onBarcode(String barcode) {
17         if ("".equals(barcode)) {
18             display.setText("Scanning error: empty barcode!");
19         } else{
20             if (pricesByBarcode.containsKey(barcode)) {
21                 display.setText(pricesByBarcode.get(barcode));
22             } else {
23                 display.setText("Product not found for " +
24                         barcode);
25             }
26         }
27     }
28 }
```

Feature Envy

A method accesses the data of another object more than its own data.

- Move method
- Extract method

```
1  public class Coordinate
2  {
3    public int X {get; set}
4    public int Y {get; set}
5  }
6
7  public class PositionUpdater
8  {
9    public Coordinate MoveUp(Coordinate coordinate)
10   {
11     return new Coordinate{X = coordinate.X, Y = coordinate.Y + 1};
12   }
13 }
```

Message Chains

A message chain occurs when a client requests another object, that object requests yet another one, and so on.

```
master.getModelisable()
  .getDockablePanel()
    .getCustomizer()
      .getSaveItem()
       .setEnabled(Boolean.FALSE.booleanValue());
```

- Hide delegate
- Extract method
- Move method

Message Chains

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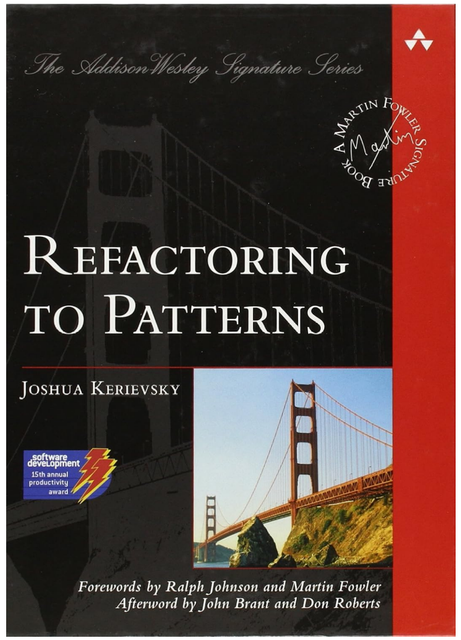
```
master.getModelisable()
  .getDockablePanel()
    .getCustomizer()
      .getSaveItem()
       .setEnabled(Boolean.FALSE.booleanValue());
```

```
master.allowSavingOfCustomizations();
```

More Code Smells

Five additional code smells described in the book “Refactoring to Patterns”.

- Conditional Complexity
- Indecent Exposure
- Solution Sprawl
- Combinatorial Explosion
- Oddball Solution



Exercise

Let’s find some code smells.

https://github.com/nicoleorzan/berlin_clock/blob/master/src/main/java/berlinclock

Coupling and Cohesion

Metrics that (roughly) describe how easy it will be to change the behavior of some code.

Coupling

Measures the degree of interdependence between software components.

- Elements are coupled if a change in one forces a change in the other.
- We want to make changes in a component without impacting other components.
- We want coupling to be as low as possible, but not lower.

Cohesion

Measures how strongly related and focused the responsibilities of a software module are.

- Indicates a component’s functional strength and how much it focuses on a single point.
- Low cohesion results in behavior being scattered instead of existing in a single component.
- We want high cohesion.

LIFE Magazine (March 4, 1946)

Cohesion, coupling and code smells

- Divergent Change
- Feature Envy
- Inappropriate Intimacy
- Message Chains
- Middle Man
- Shotgun Surgery

High coupling

Indicators of possible high coupling.

- Data Class
- Lazy Class
- Middle Man
- Primitive Obsession
- Shotgun Surgery

Low cohesion

Indicators of possible low cohesion.

Smelly Tic Tac Toe

A TicTacToe implementation with quite a few code smells.

https://github.com/dario-campagna/CodeSmells

- Start by identifying the smells.
- Then slowly refactor the code.