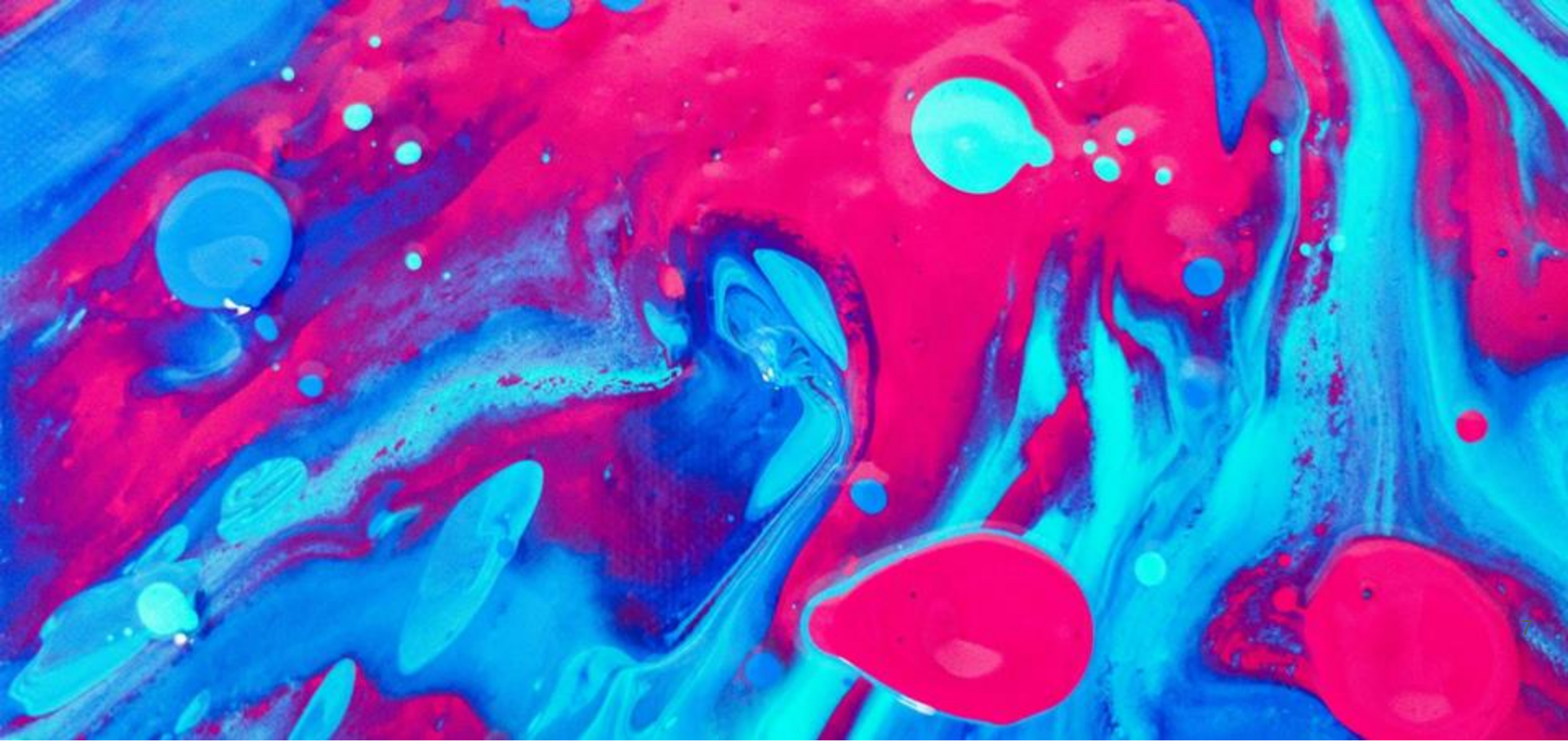

SOLID Principles

Mathias COUSTÉ

03.03.2022

S ingle responsability

O pen/Closed

L iskov substitution

I nterface segregation

D ependency inversion

S

Single responsability

Single responsability: definition

A class should have one and only one reason to change, meaning that a class should have only one job.

Problem

- Game
  - run() : void
  - createTeamLogsFiles() : void
  - executeAction(PlayerAction) : void
  - initGame() : void
  - initGameForPlayer(Player) : void
  - activePlayers() : List<Player>
  - initRound() : List<PlayerAction>
  - nextRoundForPlayer(List<PlayerAction>) : Consumer<? super Player>
  - generateGameInitializationMessage(int, Player) : String
  - generateNextRoundGameMessage(Player) : String
  - visibleEntities(Sea, Ship) : List<SeaEntity>
  - isVisible(Ship, SeaEntity) : boolean

How many responsibilities in this class?

Problem

```
> Game
    run() : void
    createTeamLogsFiles() : void
    executeAction(PlayerAction) : void
    initGame() : void
    initGameForPlayer(Player) : void
    activePlayers() : List<Player>
    initRound() : List<PlayerAction>
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Resolution

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  - visibleEntities(Sea, Ship) : List<SeaEntity>
  - isVisible(Ship, SeaEntity) : boolean

Moved to Team class

How many responsibilities in this class?

Resolution

- Game
  - run() : void
  - createTeamLogsFiles() : void
  - executeAction(PlayerAction) : void
  - initGame() : void
  - initGameForPlayer(Player) : void
  - activePlayers() : List<Player>
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  - generateGameInitializationMessage(int, Player) : String
  - generateNextRoundGameMessage(Player) : String
  - visibleEntities(Sea, Ship) : List<SeaEntity>
  - isVisible(Ship, SeaEntity) : boolean

Moved to Team class

New ActionExecutor class

How many responsibilities in this class?

Resolution

- Game
  - run() : void
  - createTeamLogsFiles() : void
  - executeAction(PlayerAction) : void
  - initGame() : void
  - initGameForPlayer(Player) : void
  - activePlayers() : List<Player>
  - initRound() : List<PlayerAction>
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  - generateGameInitializationMessage(int, Player) : String
  - generateNextRoundGameMessage(Player) : String
  - visibleEntities(Sea, Ship) : List<SeaEntity>
  - isVisible(Ship, SeaEntity) : boolean

Moved to Team class

New ActionExecutor class

Moved to helper class

How many responsibilities in this class?

Resolution

- Game
  - run() : void
  - createTeamLogsFiles() : void
  - executeAction(PlayerAction) : void
  - initGame() : void
  - initGameForPlayer(Player) : void
  - activePlayers() : List<Player>
  - initRound() : List<PlayerAction>
  - nextRoundForPlayer(List<PlayerAction>) : Consumer<? super Player>
  - generateGameInitializationMessage(int, Player) : String
  - generateNextRoundGameMessage(Player) : String
  - visibleEntities(Sea, Ship) : List<SeaEntity>
  - isVisible(Ship, SeaEntity) : boolean

Moved to Team class

New ActionExecutor class

Moved to helper class

New MessageBuilder class

How many responsibilities in this class?

Resolution

- Game
  - run() : void
  - createTeamLogsFiles() : void
  - executeAction(PlayerAction) : void
  - initGame() : void
  - initGameForPlayer(Player) : void
  - activePlayers() : List<Player>
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  - nextRoundForPlayer(List<PlayerAction>) : Consumer<? super Player>
  - generateGameInitializationMessage(int, Player) : String
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  - isVisible(Ship, SeaEntity) : boolean

Moved to Team class

New ActionExecutor class

Moved to helper class

New MessageBuilder class

Moved to Vision helper class

How many responsibilities in this class?

O

Open / Closed

Open / Closed: definition

Objects or entities should be open for extension, but closed for modification.

Problem

```java
switch (action.getType()) {
case OAR:
    Optional<Oar> optOar = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Oar.class);
    if (optOar.isEmpty() || optOar.get().isUsed()) {
        logger.warn("Cannot execute action, no available oar in the sailor position");
        return;
    }
    break;
case MOVING:
    Moving moving = (Moving) action;
    if (!sailor.canMove(moving.getXDistance(), moving.getYDistance()) || !player.getShip().getDeck()
            .isIn(sailor.getX() + moving.getXDistance(), sailor.getY() + moving.getYDistance())) {
        logger.warn("Cannot execute action, no available oar in the sailor position");
        return;
    }
    break;
case TURN:
    Turn turn = (Turn) action;

    if (turn.getRotation() < -Math.PI / 4 || turn.getRotation() > Math.PI / 4) {
        logger.warn("Cannot execute action, turn rotation is out of range");
        return;
    }

    Optional<Rudder> optRudder = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Rudder.class);
    if (!optRudder.isPresent() || optRudder.get().isUsed()) {
        logger.warn("Cannot execute action, no available rudder in the sailor position");
        return;
    }
    break;
case LIFT_SAIL:
    Optional<Sail> optLiftSail = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Sail.class);
    if (!optLiftSail.isPresent() || optLiftSail.get().isUsed()) {
        logger.warn("Cannot execute action, no available sail in the sailor position");
        return;
    }
    break;
```

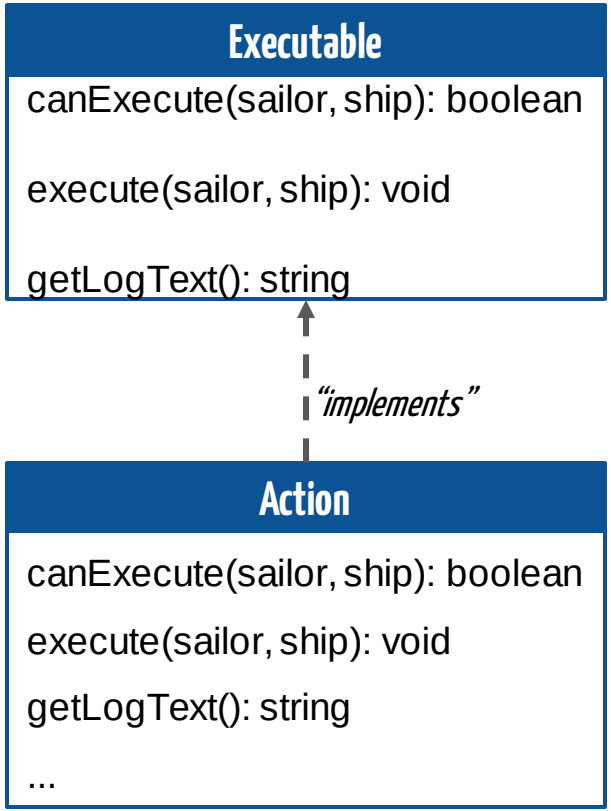
Problem

```java
switch (action.getType()) {
case OAR:
    Optional<Oar> optOar = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Oar.class);
    if (optOar.isEmpty() || optOar.get().isUsed()) {
        logger.warn("Cannot execute action, no available oar in the sailor position");
        return;
    }
    break;
case MOVING:
    Moving moving = (Moving) action;
    if (!sailor.canMove(moving.getXDistance(), moving.getYDistance()) || !player.getShip().getDeck()
            .isIn(sailor.getX() + moving.getXDistance(), sailor.getY() + moving.getYDistance())) {
        logger.warn("Cannot execute action, no available oar in the sailor position");
        return;
    }
    break;
case TURN:
    Turn turn = (Turn) action;

    if (turn.getRotation() < -Math.PI / 4 || turn.getRotation() > Math.PI / 4) {
        logger.warn("Cannot execute action, turn rotation is out of range");
        return;
    }

    Optional<Rudder> optRudder = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Rudder.class);
    if (!optRudder.isPresent() || optRudder.get().isUsed()) {
        logger.warn("Cannot execute action, no available rudder in the sailor position");
        return;
    }
    break;
case LIFT_SAIL:
    Optional<Sail> optLiftSail = player.getShip().findEntityAt(sailor.getX(), sailor.getY(), Sail.class);
    if (!optLiftSail.isPresent() || optLiftSail.get().isUsed()) {
        logger.warn("Cannot execute action, no available sail in the sailor position");
        return;
    }
    break;
```

This code needs to be updated every time I want to add a new Action.

With half of the actions implemented, this function is already 50 lines long :(

Resolution




```
if (action.canExecute(sailor, player.getShip()) {
        action.execute(sailor, player.getShip());
} else {
        logger.warn("Cannot execute action" +
action.logText());
}
```

L

Liskov substitution

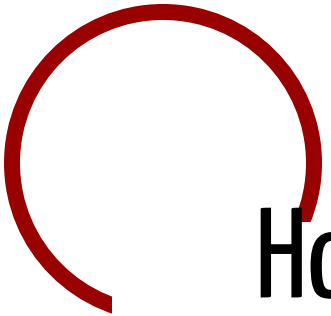
Liskov substitution: definition

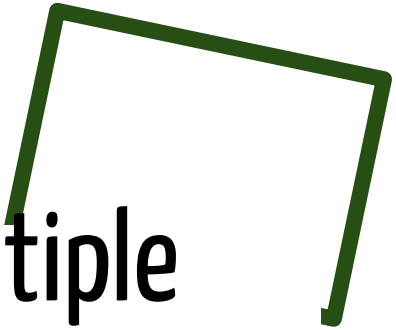
Let q(x) be a property provable about objects of x of type T. Then q(y) should be provable for objects y of type S where S is a subtype of T.

Liskov substitution: definition

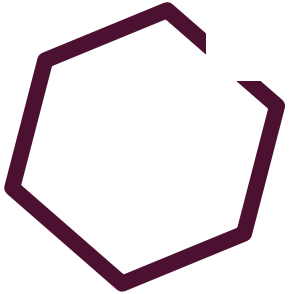
If you replace a class by one of its siblings or children, the program should keep working.

Benefits

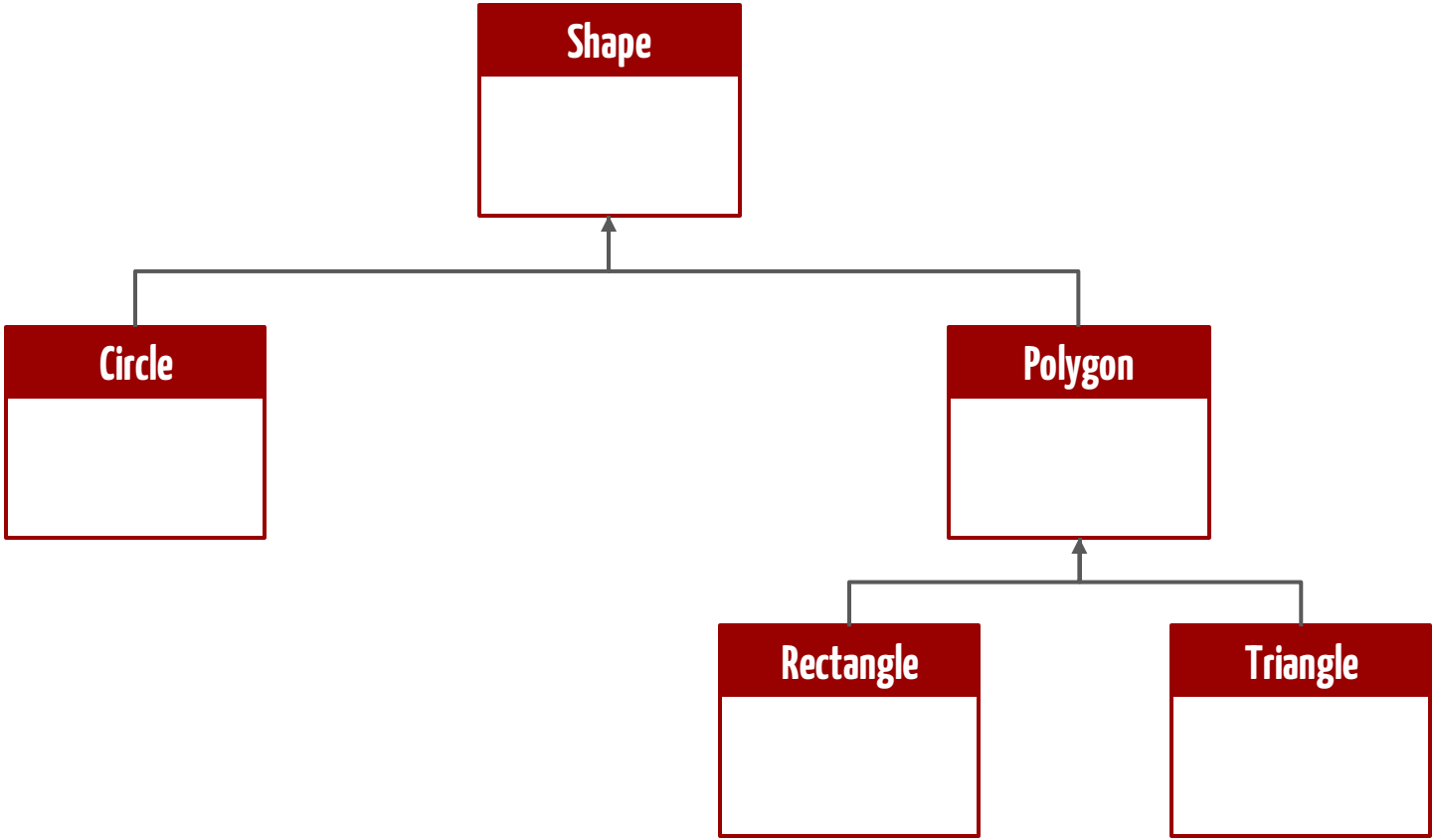




How to support multiple shapes in my game without breaking it?



Benefits



I

Interface segregation

Interface segregation: definition

A client should never be forced to implement an interface that it doesn't use or clients shouldn't be forced to depend on methods they do not use.

Problem

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

This interface matches all the requirements for sea entities...

Problem

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

Can a reef move?

Problem

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

Does a sea flag need a shape?

Resolution

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

→ Positionnable

Resolution

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

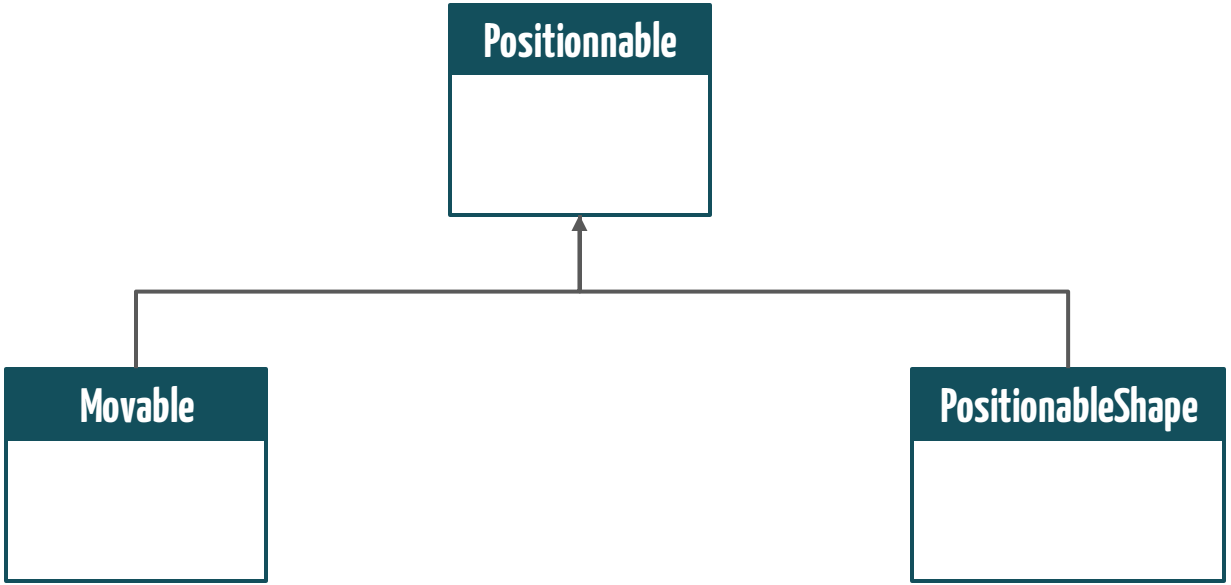
→ Movable

Resolution

```java
public interface ISeaEntity {
    public Position getPosition();

    public double distance(Positionable other);

    public double getX();

    public void setX(double x);

    public double getY();

    public void setY(double y);

    public double getOrientation();

    public void setOrientation(double orientation);

    public double getNextX();

    public void setNextX(double x);

    public double getNextY();

    public void setNextY(double y);

    public double getNextOrientation();

    public void setNextOrientation(double orientation);

    public Shape getShape();
}
```

PositionnableShape

Resolution



D

Dependency inversion

Dependency inversion: definition

Entities must depend on abstractions not on concretions. It states that the high level module must not depend on the low level module, but they should depend on abstractions.

Problem

```java
public class Game {

    private static Logger logger = Logger.getLogger(Game.class);

    private RegattaResolver resolver;
    private RegattaGameGoal goal;

    private RoundMovementsRunner roundMovementsRunner;
    private Sea sea;
    private List<Player> players;

    private int maxRounds;
    private int currentRound;
```

Problem

```java
public class Game {

    private static Logger logger = Logger.getLogger(Game.class);

    private RegattaResolver resolver;
    private RegattaGameGoal goal;

    private RoundMovementsRunner roundMovementsRunner;
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```

Problem

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    private RegattaResolver resolver;
    private RegattaGameGoal goal;

    private RoundMovementsRunner roundMovementsRunner;
    private Sea sea;
    private List<Player> players;

    private int maxRounds;
    private int currentRound;
```

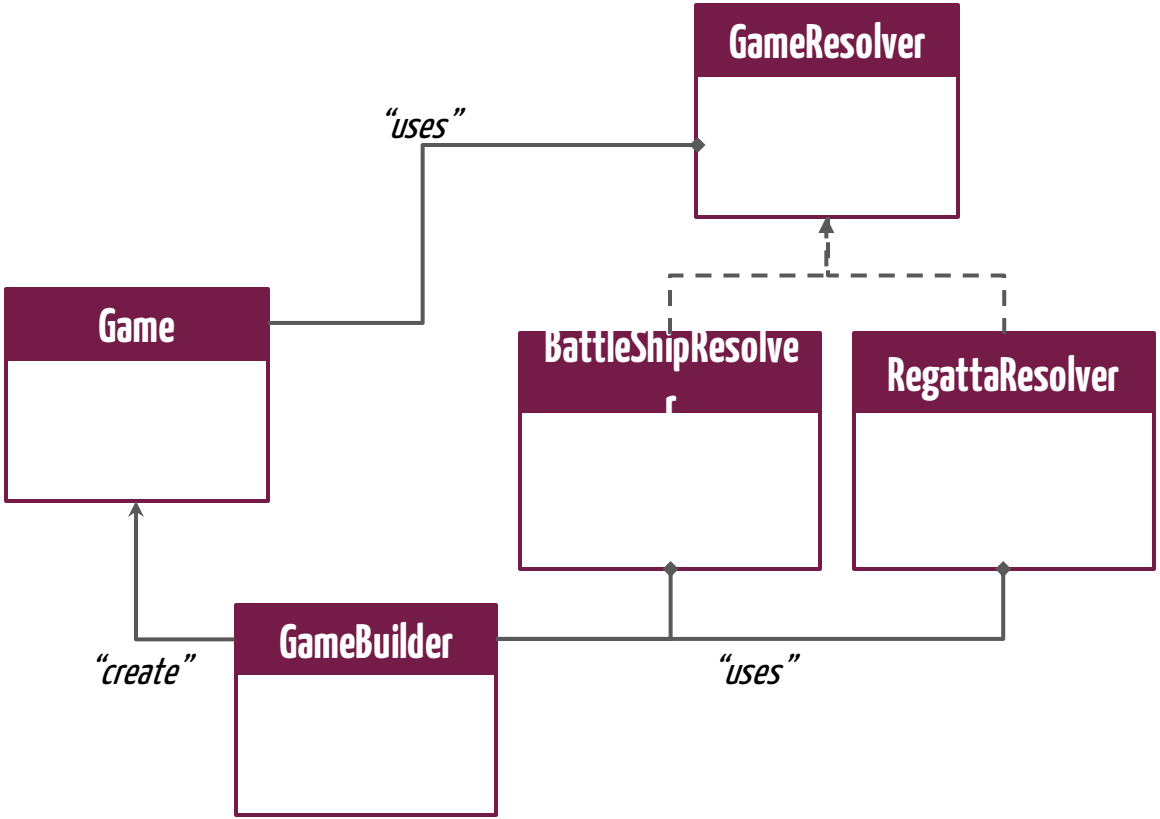
Do I need to create a ***BattleGame*** class when I will add the *BattleGameGoal* and *BattleResolver*?

Resolution

```java
public class Game {

    private static Logger logger = Logger.getLogger(Game.class);

    private GameResolver resolver;
    private GameGoal goal;

    private RoundMovementsRunner roundMovementsRunner;
    private Sea sea;
    private List<Player> players;

    private int maxRounds;
    private int currentRound;
```

Change for a “high level” class instead.

Resolution


GameResolver
"uses"
Game
BattleShipResolve
r
RegattaResolver
GameBuilder
"create"
"uses"

Q&A

Refactoring & clean code

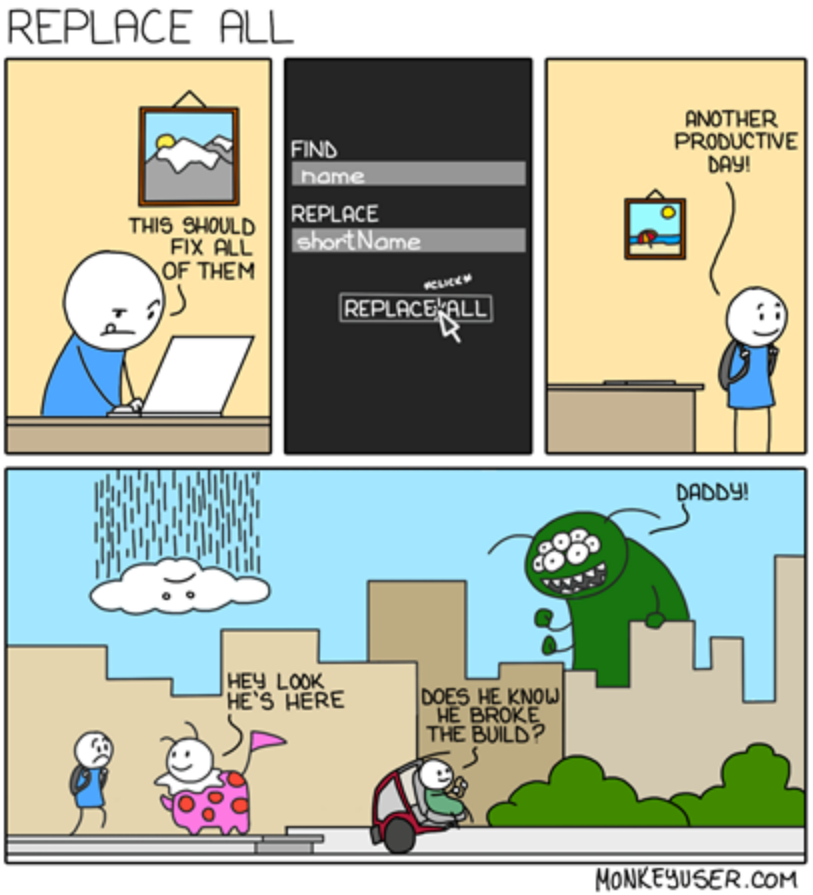
Mathias COUSTÉ

03.03.2022

1

Refactoring

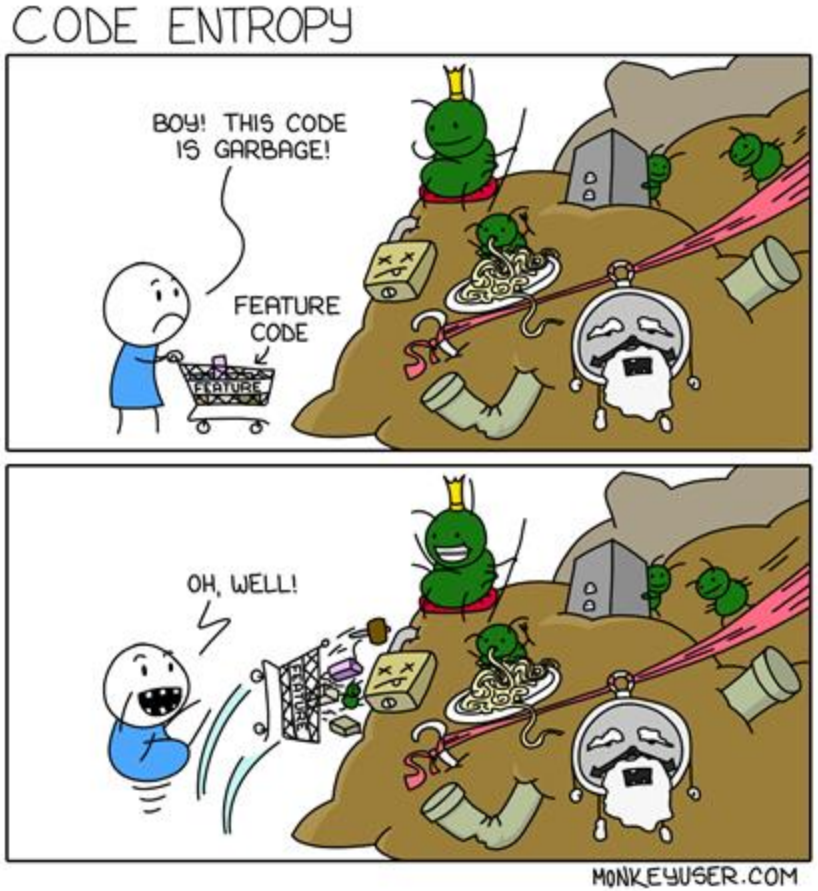
Renamings stuff



Renamings stuff

Your IDE reads and understands your code, you should use its power!

Clean-up your room!



Clean-up your room!

Add, rename, move folders along with code addition to your project...

Avoid code duplication

...

Car

- getWheels: Wheel[]
- engine: Engine
- controller: SteeringWheel
- getRods: Rod[]
- exhaustPipe
- gearbox: Gearbox
- pedals: Pedal
- ...

Only expose a useful interface

Car

- getWheels: Wheel[]
- engine: Engine
- controller: SteeringWheel
- getRods: Rod[]
- exhaustPipe
- gearbox: Gearbox
- pedals: Pedal
- ...

Car

- controller: SteeringWheel
- pedals: Pedal
- gearShift: GearShift

Only expose a useful interface

What is true for *classes* is also true for *packages*...

2

Keep in mind

KISS

Keep

It

Simple,

Stupid!

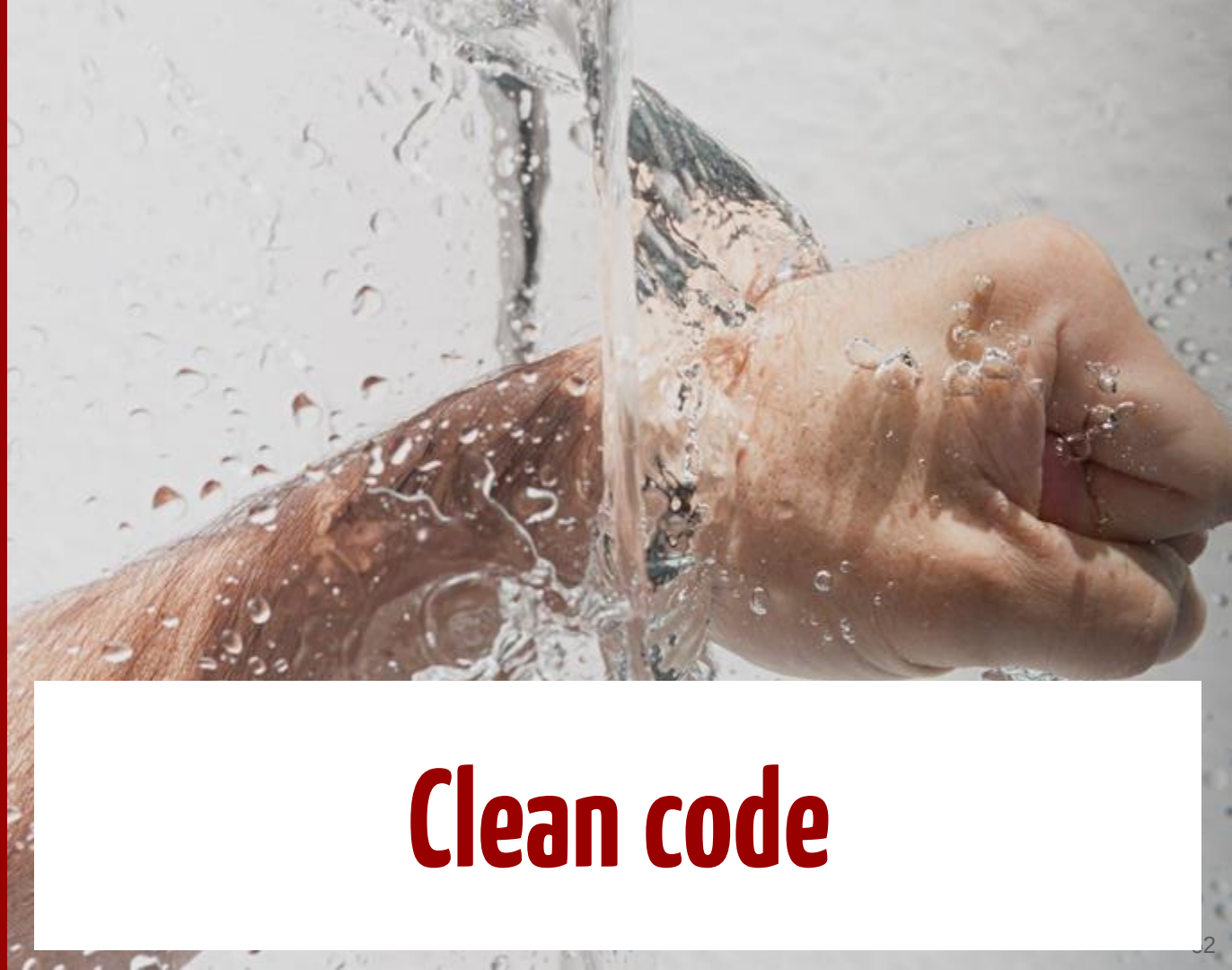
DRY

Don’t
Repeat
Yourself

YAGNI

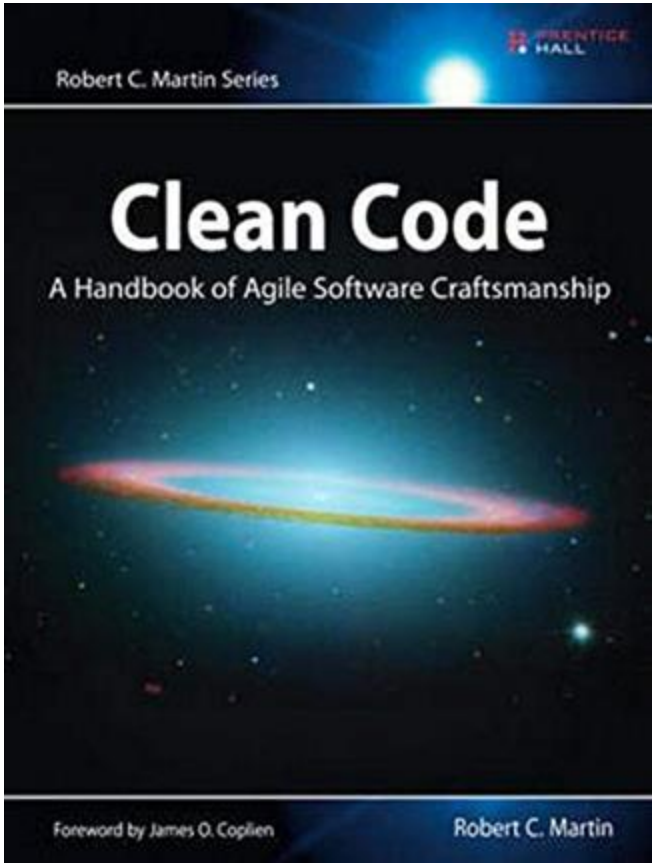
You aren't gonna need it!

3



Clean code

Clean Code: reference



Code readability

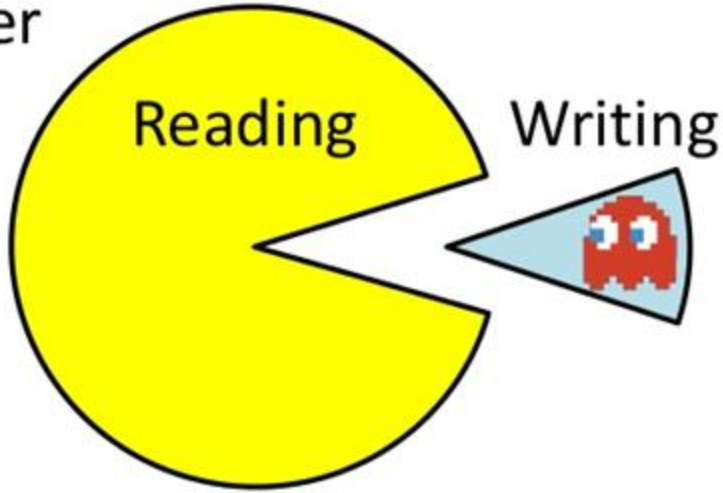
"The ratio of time spent

reading vs. writing

is well over

10:1"

– Clean Code



Stanford University

Naming

bigButt

Naming

bigButt → bigButton

Don't shorten variable names...

Naming

bigButt → bigButton → confirmButton

Keep it functional...

Don’t mix apples and oranges

Each lines of your function should be directly related to your function

Don’t mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(gameId.split(“.”)[0]);
        GameStatus status = game.run();
        new FilePrinter(new File(gameId + “.txt”)).print(status.toString());
}
```

Don't mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(gameId.split(".")[0]);
        GameStatus status = game.run();
        new FilePrinter(new File(gameId + ".txt")).print(status.toString());
}
```

String splitting...

Don't mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(gameId.split(".")[0]);
        GameStatus status = game.run();
        new FilePrinter(new File(gameId + ".txt")).print(status.toString());
}
```

Array data access...

Don't mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(gameId.split(".")[0]);
        GameStatus status = game.run();
        new FilePrinter(new File(gameId + ".txt")).print(status.toString());
}
```

String concatenation...

Don't mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(gameId.split(".")[0]);
        GameStatus status = game.run();
        new FilePrinter(new File(gameId + ".txt")).print(status.toString());
}
```

File system access...

Don’t mix apples and oranges

```
public void runGame(String gameId) {
        Game game = new Game();
        game.setName(generateGameNameFromId(gameId));
        GameStatus status = game.run();
        printGameStatus(status);
}
```

Keep your methods short

Explain what your function is doing, then code...

Keep your methods short

10 lines of code should be enough...

4

Let’s refactor some code

```java
public double calculateAngle(JsonNode boatPosition, Position position) {
    double orientationBoat = boatPosition.get("orientation").doubleValue();
    double x = position.getX();
    double y = position.getY();

    double[] vectorBoat = new double[2];
    vectorBoat[0] = Math.cos(orientationBoat);
    vectorBoat[1] = Math.sin(orientationBoat);

    double[] vectorDirection = new double[2];
    vectorDirection[0] = x - boatPosition.get("x").doubleValue();
    vectorDirection[1] = y - boatPosition.get("y").doubleValue();

    double normeBoat = Math.sqrt(Math.pow(vectorBoat[0], 2) + Math.pow(vectorBoat[1], 2));
    double normeDirection = Math.sqrt(Math.pow(vectorDirection[0], 2) + Math.pow(vectorDirection[1], 2));
    double scalaire = vectorBoat[0] * vectorDirection[0] + vectorBoat[1] * vectorDirection[1];

    double angle = Math.acos(scalaire / (normeBoat * normeDirection));

    if (vectorDirection[1] - vectorBoat[1] < 0) {
        angle = -angle;
    }

    return angle;
}
```

```java
public double calculateAngle(Point boatPosition, Point position) {
    return Vector.fromPoints(boatPosition, position).angle();
}
```

Q&A