

KONOBİ GAME

SOFTWARE DEVELOPMENT METHOD PROJECT

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INTRODUCTION

The **goal** of our project is to implement the **Konobi game** in Java, giving also the user the opportunity to choose between two interfaces: **console version** or **GUI version**

Tools

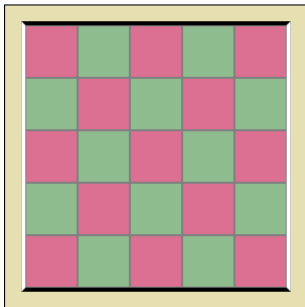
- ▶ IntelliJ;
- ▶ OpenJDK11 and JavaFX;
- ▶ GitHub;
- ▶ Gradle: building;
- ▶ TravisCI: continuous integrations;
- ▶ Other?

KONOBI GAME

KONOBI

Konobi is a drawless connection game for two players: **Black** and **White**. It's played on a square board, which is initially empty.

The top and bottom edges of the board are coloured black; the left and right edges are coloured white.



KONOBI RULES

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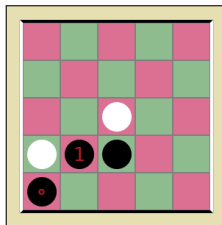
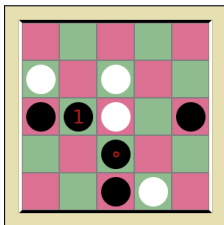
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It's **illegal** to make a weak connection to a certain stone unless it's impossible to make a placement which is both strongly connected to that stone and not weakly connected to another.

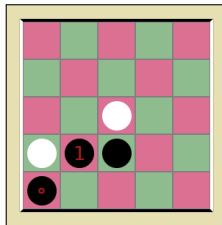
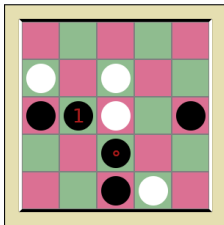
LEGAL AND ILLEGAL MOVES

Legal moves:

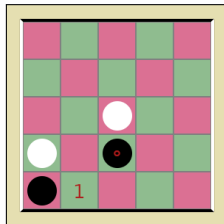
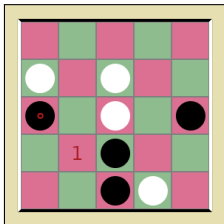


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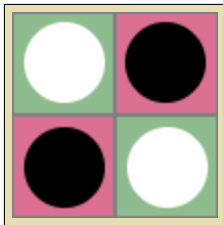


Illegal moves:



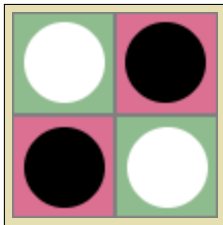
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If a player can't make a move on his turn, he must **pass**. Passing is otherwise not allowed. There will always be a move available to at least one of the players.

KONOBI RULES CONT.

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The game is **won** by the player who completes a chain of his color touching the two opposite board edges of his color. **Draws are not possible.**

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- ▶ user interface

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The **core package** contains all the elements concerning the functional logic of the game.

The **UI package**, on the other hand, contains all the elements that are used to create the two different user interfaces: **command line** and **desktop interface**.

CORE PACKAGE























BUILDING BLOCKS

Cell class is the fundamental building block of the game engine. It is associated to a **Colour**, and has a **Point** for the coordinates.

Board class is a collection of **Cells**, and implements the **Iterable** interface. It conveys a notion of geometrical arrangement among the **Cells**.

Player class represents each of the two players.

BUILDING BLOCKS - TDD

player second test and switch sides pigozzif committed 24 days ago ✓	 46e534e	
player first test pigozzif committed 24 days ago	 6d1909a	
Commits on Jan 23, 2020		
Cell coordinates test enricofallacara committed 25 days ago ✓	 d2682b5	
Cell coordinates test enricofallacara committed 25 days ago	 bb0106f	
Board size test enricofallacara committed 25 days ago ✓	 02f1d33	
Board size test enricofallacara committed 25 days ago	 009a3ce	
Fixed spacing pindri committed 25 days ago ✓	 1937a0e	
Color test pindri committed 25 days ago ✓	 63de5a7	
Coordinate test pindri committed 25 days ago ✓	 898abac	
Coordinate test pindri committed 25 days ago	 ce63025	
color test passed pindri committed 25 days ago ✓	 5959eb3	

Test Driven Development was adopted from the very onset, committing after every red-light/green-light pattern.

SRP AND BOARD



```
52 public Stream<Cell> getNeighbours(Point point, int level) {
53     return Arrays.stream(
54         slice(Math.max(0, p.y - level),
55             Math.min(p.y + level + 1, size),
56             Math.max(0, p.x - level),
57             Math.min(p.x + level + 1, size))
58     );
59 }
60
61 public static boolean isStrongNeighbour(Point target, Point query) { return manhattanDistance(target.x, query.x, target.y,
62     query.y) == 1; }
63 public static boolean isWeakNeighbour(Point target, Point query) { return manhattanDistance(target.x, query.x, target.y, q
64     uery.y) == 2; }
65
66 @SafeVarargs
67 public final Stream<Cell> getNeighbours(Point point, int level, BiPredicate<Point, Point>... functions) {
68     return getBoardNeighbours(point, level).filter(cell -> Arrays.stream(functions).allMatch(x -> x.test(point, cell.getCo
69     ord())));
70 }
71
72 @SafeVarargs
73 public final Stream<Cell> getColoredNeighbours(Point point, int level, Color color, BiPredicate<Point, Point>... functions)
74     {
75     return getNeighbours(point, level, functions).filter(x -> x.hasThisColor(color));
76 }
77
78 public boolean isOnBoard(Point point){
79     return (0 <= point.x && point.x < size && 0 <= point.y && point.y < size);
80 }
81
82 public boolean isBendingEdge(Point point, Color color) {
83     return (color == Color.WHITE ? point.x == size - 1 : point.y == size - 1);
84 }
85
86 private static double manhattanDistance(int x1, int x2, int y1, int y2) { return Math.abs(x1 - x2) + Math.abs(y1 - y2); }
```

Board class was doing too much, so we performed a **refactor**...

...and created the `Neighbourhood` class. It shows a **Monostate Pattern**, having only static methods to compute different flavours of neighbourhoods from an instance of `Board` and a target `Point`.

BUILDING BLOCKS CONT.

StatusSupervisor is in charge of holding the state of the game, and updating it whenever it changes (new move, pass rule, pie rule).

It is employed as an interface between the **UI** module and the **core** module, allowing the two to communicate without knowing anything of each other.

The package **Rules** contains the true logic of the game. We started off by defining a class per rule, later to realize there was room for abstraction...

...we introduced **StatusSupervisor** as a **Preserve Whole Object**, and allowed each of the classes to implement the **Rule** interface.

Each **Rule** can be queried by passing a **Supplier** for it to the **Rulebook**.

ValidPositionRule class had something wrong...

```
8 public class ValidPositionRule implements Rule {
9     private ArrayList<Rule> positionRules;
10
11     public ValidPositionRule() {
12         positionRules = new ArrayList<>(Arrays.asList(new EmptyRule(), new CrosscutRule(), new WeakRule()));
13     }
14
15     @Override
16     public boolean isValid(Supervisor supervisor) {
17         // TODO: spostare questo if in una nuova regola
18         if(!supervisor.getBoard().isOnBoard(supervisor.getCurrentPoint()))
19             return false;
20         return positionRules.stream().allMatch(x => x.isValid(supervisor));
21     }
22 }
```

RULES CONT.

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```



Violation was solved creating `ValidPositionRulesFactory` class, which follows the **Factory Pattern**.

`AbstractKonobi` provides an abstraction for the game itself, containing functions to check and apply the various rules; it is extended by:

- ▶ `KonobiConsole`;
- ▶ `KonobiGUI`.

UI PACKAGE

INTERACTING WITH THE GAME

At first, we considered abstracting the console and the graphical interfaces with a common Java interface.

We realised this was leading us to *conceptualisation abuse*.

```
7  public interface UserInterface {  
8  
9      Point getInput(Player player);  
10     boolean askPieRule();  
11     void notifyEndGame(Player player);  
12     int askSize();  
13     void notifyPass();  
14     void display(Board board);  
15     void notifyInvalidMove();  
16     int initialize();  
17  
18 }
```

Implementation of `UserInterface` would have led to violations of the *SRP*.

The two interfaces are diverse enough, so we decided to create two distinct packages with different classes.

COMMON ELEMENTS

The two interfaces do have something in common. They use the same `Messages` and they both implement an `InputHandler` to ask the users for input and a `MessageWriter` to communicate with them.

CONSOLE USER INTERFACE

- ▶ `ConsoleBoardWriter`: board display;
- ▶ `ConsoleCellRepresentation`: conversion between cell color and its representation;
- ▶ `ConsoleInputHandler`: player input handling, implements `InputHandler`;
- ▶ `ConsoleMessageWriter`: messages to the players, implements `MessageWriter`.

GRAPHICAL USER INTERFACE

- ▶ **GUI**: implements the game flow in a JavaFX application;
perché non lo fa KonobiGUI? Perché non si può estendere da due classi è una buona giustificazione?
- ▶ **GUIBoardWriter**: board and GUI display;
- ▶ **GUIAsker**: asks the user for interaction; Cambiare nome
- ▶ **GUIMessageWriter**: messages to the players.

The **Events** package defines events for the rules (pie, pass and end-game rules); the events are processed by the **Handlers** package, which handles mouse inputs as well.

LONG METHOD SMELL IN GUI?

GUI verbosity, code snippet.

STARTING GAME

For portability, the project is shipped with the `gradlew` (`gradlew.bat` for Windows) executable to run the code without manually handling dependencies.

The console version of the game can be started using:

```
> ./gradlew runConsole
```

The GUI version of the game can be started using:

```
> ./gradlew runGUI
```