

KONOBİ GAME

SOFTWARE DEVELOPMENT METHOD PROJECT

FALLACARA E., INDRI P., PIGOZZI F.

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

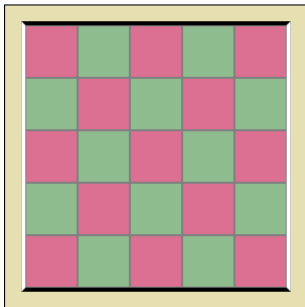
- ▶ IntelliJ;
- ▶ OpenJDK11 and JavaFX;
- ▶ GitHub;
- ▶ Gradle: building;
- ▶ TravisCI: continuous integrations;
- ▶ Other?

KONOBİ GAME

KONOBI

Konobi is a drawless connection game for two players: **Black** and **White**. It's played on the 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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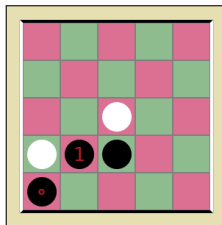
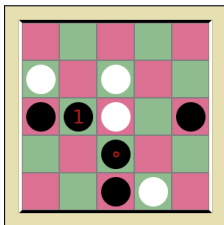
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Two like-coloured stones are **strongly connected** if they are orthogonally adjacent to each other, and **weakly connected** if they are diagonally adjacent to each other without sharing any strongly connected neighbour.

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.

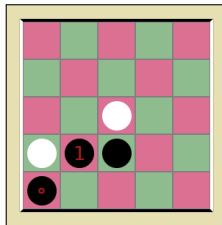
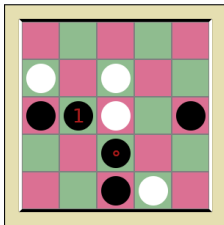
LEGAL AND ILLEGAL MOVES

Legal moves:

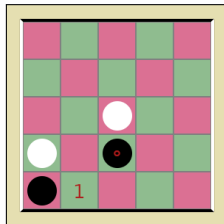
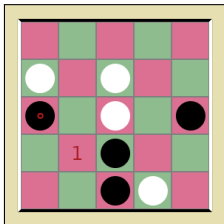


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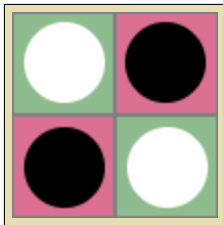


Illegal moves:



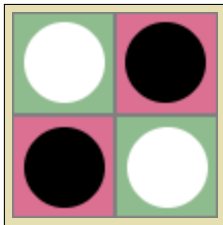
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It's also **illegal** to form a **crosscut**, i.e., a 2x2 pattern of stones consisting of two weakly connected Black stones and two weakly connected White stones.



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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



SINGLE RESPONSIBILITY PRINCIPLE

Just Because You Can, Doesn't Mean You Should



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

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

UI PACKAGE

STARTING GAME

The console version of the game can be started using:

```
> ./gradlew runConsole
```

The GUI version of the game can be started using:

```
> ./gradlew runGUI
```

CONSOLE USER INTERFACE

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

Messages are contained in the `Messages` class: its messages are used by the GUI implementation as well.

GRAPHICAL USER INTERFACE

- ▶ GUI: implements the game flow in a JavaFX application;
- ▶ GUIBoardWriter: board and GUI display;
- ▶ GUIAsker: `boh`;
- ▶ GUIMessageWriter: messages to the players.

The Events package defines events for the rules (PieRule, PassRule and EndGameRule); the events are processed by the Handlers package, which handles mouse inputs as well.