Konobi 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**
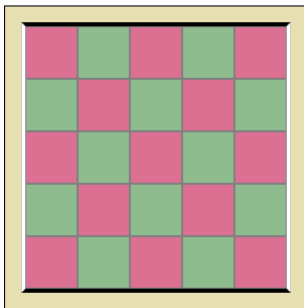
Tools

- ▶ 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

Starting with Black, the players take turns placing stones of their
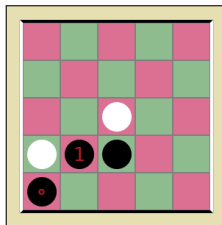own color on empty points of the board, one stone per turn.

Konobi Rules

Starting with Black, the players take turns placing stones of their own color on empty points of the board, one stone per turn.

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.
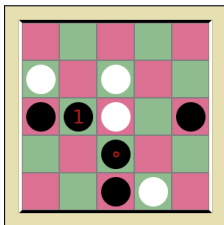
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Two like-coloured stones are **strongly connected** if they are orthogonally adjacent to each other, and **weakly connected** if they are diagonally adjacent to each other without sharing any strongly connected neighbour.

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.
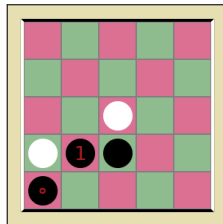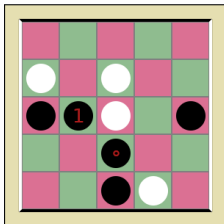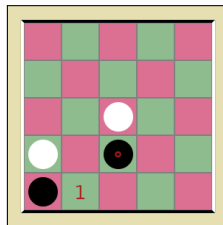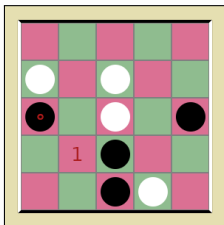
Legal moves:
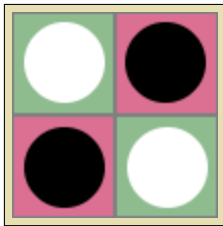
Legal and Illegal Moves
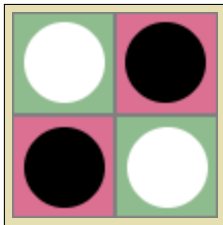
Legal moves:

Illegal moves:

Konobi rules Cont.

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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.

The **pie rule** is used in order to make the game fair. This means that White will have the option, on his first turn only, to change sides instead of making a regular move.

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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**.

PROJECT STRUCTURE

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- core
- user interface

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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 **Cell**s, and implements the **Iterable** interface. It conveys a notion of geometrical arrangement among the **Cell**s.

Player class represents each of the two players.

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

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.

Rules

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...

```java
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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OPEN CLOSED PRINCIPLE
Open Chest Surgery Is Not Needed When Putting On A Coat

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

UI Package

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

```java
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  }
```

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

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.

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**: asks the user for interaction;

- ▶ **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.

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
```