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Straight 4

`Prolog` Implementation of a Board Game

PLOG 2019

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Introduction

This project's objective is to implement a board game using PROLOG, with 3 different modes: Player vs Player, Player vs Bot and Bot vs Bot, with the Bot having 2 different difficulties. Our game is Straight 4.
We are implementing all of game's rules (see below) and creating proper abstractions and compound terms to represent boards, game states, and other repetitive data elements.

Overview and History

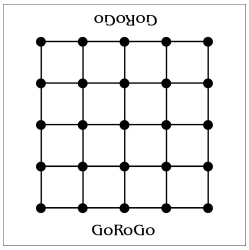

Figure 1: 5x5 *GoRoGo* board.

Straight 4 is an *abstract strategy board game*, played usually by two players, in which the aim is to create a straight line with 4 pieces.
It was created in 2019 by the company Binary Cocoa[1].
The game uses a board like *GoRoGo* board (Figure 1) where the players can put their pieces on the intersections. Game play is very straightforward. Each player takes turns placing a piece on board in an attempt to have their 4 pieces in a straight line. If, after initial placement no one is winning, then each player takes turn moving their pieces along any lines. This creates quite a bit of strategy as each player must strike a balance between trying to get their 4 in a row, or stopping their opponent from doing so.

Game Rules

The game has very very simple rules with 2 phases: Positioning and Moving

Positioning

Each player starts with 4 pieces and they have to put them all alternately in the intersections of the board before advance to the next phase.

Moving

Having each player placed 4 pieces on the board. They can now move them, one piece per round, in order to get a straight line of 4 pieces.

Win

There is only one way to win, same for White and Black: form an unbroken chain of 4 consecutive friendly stones — vertically, horizontally or diagonally.

Internal Representation

Representing the game's board is fairly simple. Every position in the 5x5 board is in one of three states: white piece, black piece, or empty. We'll represent the board using an SxS matrix (list of lists), whose elements are **2**, **1** or **0**, for each state respectively. This matrix will be called `Board`.
The overall game state will be represented by a *play/4* data compound:

play(Player1, Player2, Side, Board)

Board Display

To draw the board with text (on the console) we used unicode box-drawing characters. The white and black pieces become filled and empty unicode circles, respectively. This assumes a dark-themed console — white consoles will have the colors swapped.
For examples see Figure 2, Figure 3 and Figure 4 below.

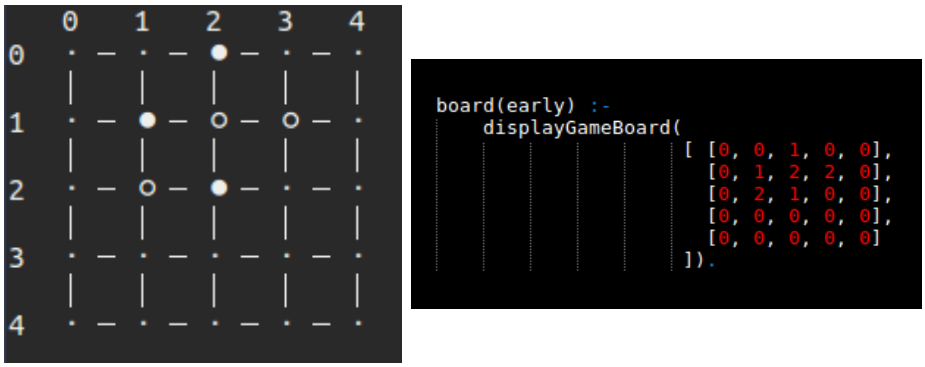

Figure 2: A game after placed 3 pieces by each player.

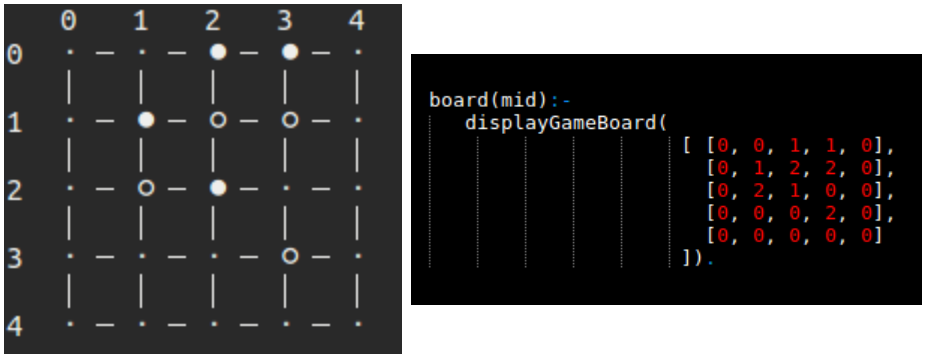

Figure 3: A game after placed all the pieces from each player.

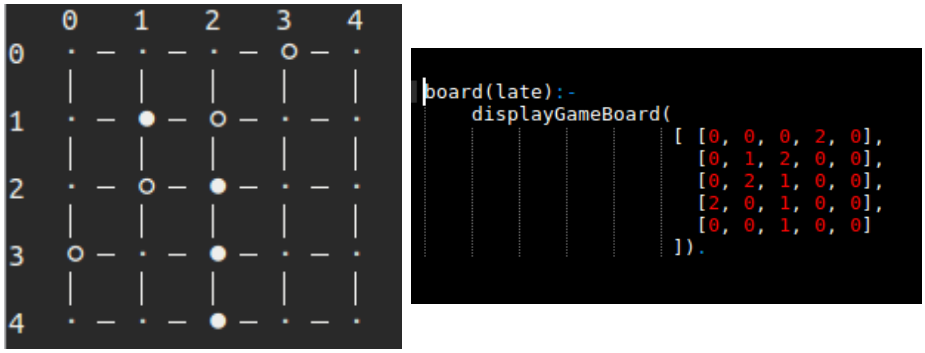

Figure 4: Game win for white.

References

[1] Binary Cocoa. *Straight*. URL. (Visited on 10/17/2018).