PSI Project Presentation

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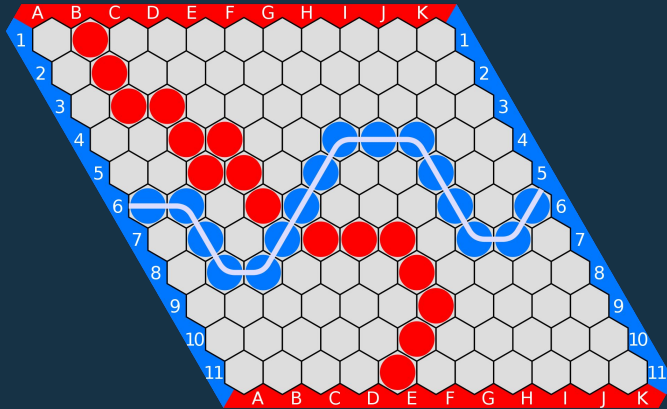Alexander Pazos Lago
Laura González Lemos

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Hex Game

Hex or Nash Game

Hex is a two player board game in which players attempt to connect opposite sides of a rhombus-shaped board made of hexagonal cells.

In our implementation:
- Smaller game board: 7×7 board.
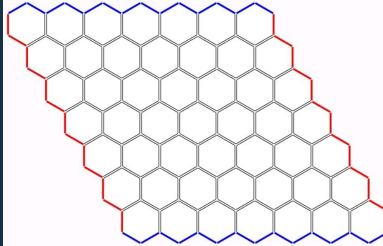- The human player starts.

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GUI

Application Screens

HexGAME

New Game

Universida_{de}Vigo

RESTART GAME

Blue player wins!

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Game Core

From rhombus to square
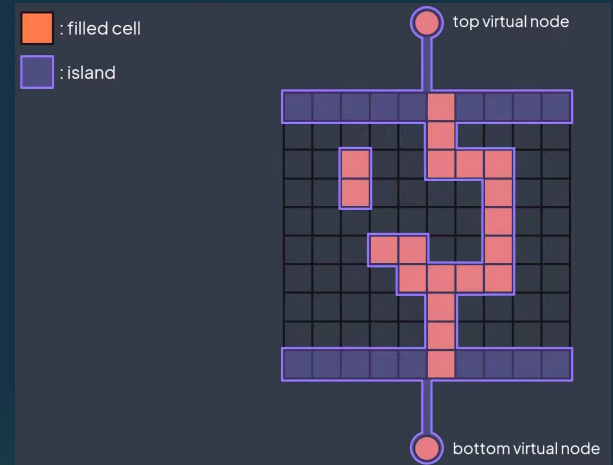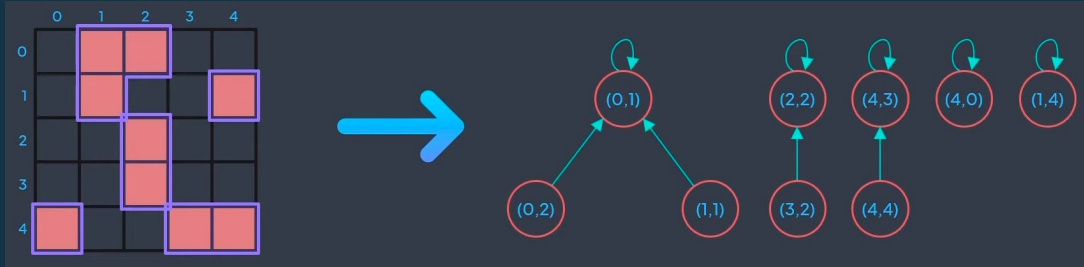

(i, j) has 6 adjacent cells:

$$[(i + 1, j), (i + 1, j - 1), (i, j + 1), (i, j - 1), (i - 1, j), (i - 1, j + 1)]$$

How we detect the winner?

Each side of the board works like a cell and each set of cells of the same player have a father cell to identify the group.
The idea is simple. If opposite sides have the same father cell, then they are connected.

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Intelligence
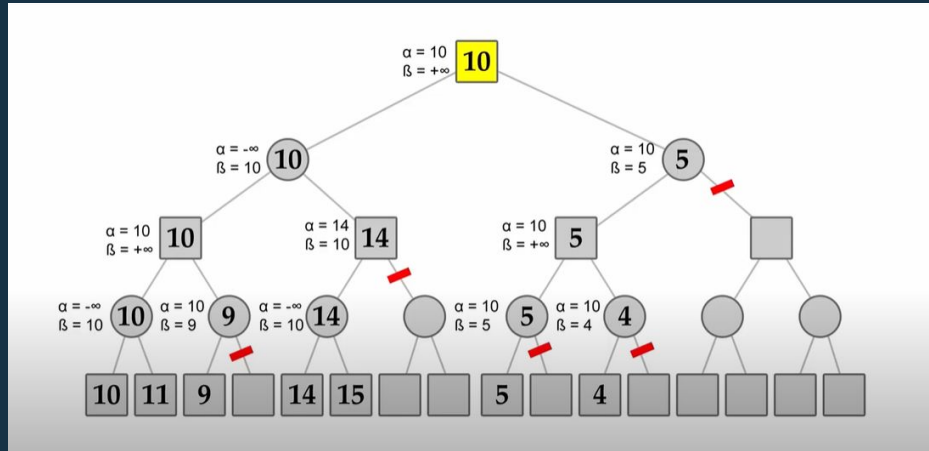
Minimax Algorithm

Minimax is a kind of backtracking algorithm that is used to find the optimal move for a player, assuming that your opponent also plays optimally.

In Minimax the two players are called maximizer and minimizer. The **maximizer** tries to get the highest score possible while the **minimizer** tries to do the opposite and get the lowest score possible.

The values of the leafs are obtained from the Evaluation Function.
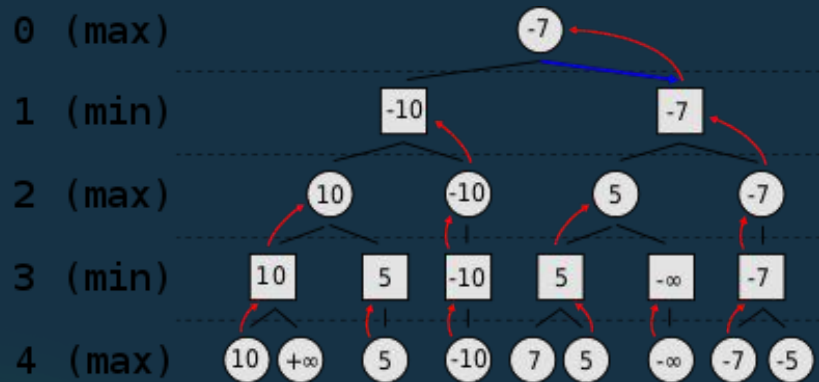
Alpha-Beta Pruning

Alpha-Beta pruning is an optimization technique for the minimax algorithm. It cuts off branches in the game tree which need not be searched because there already exists a better move available.
Alpha is the best value that the maximizer currently can guarantee at that level or above.
Beta is the best value that the minimizer currently can guarantee at that level or below.
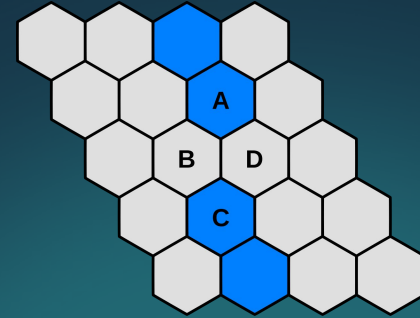
Evaluation Function

1. To optimize AI speed, the depth progressively increases.

It's a better state for the Maximizer Player if:

2. He wins, and the state is better with fewer moves needed for victory.
3. Central cells are prioritized over border cells.
4. He has a set of cells oriented from top to bottom.
5. He has two or more cells that can make a "bridge".
6. Opponent tries to prevent the Player from connecting cells and he stops the opponent from doing it.

It's a worse state for the Maximizer Player if:

7. Opponent successfully prevents cell connection.
8. Opponent successfully prevents the Player from having a "cell bridge."

Thanks!