MANCALA

Artificial Intelligence

RHAYDRICK TAVARES
UP202204391

SILVIA TAVARES
UP202204392

Summary :

- Game Definition & Rules
- Formulation of the Problem
- Implementation Details
- Algorithm
- Results
- Next Steps

Game Definition :

- Mancala is a two-player, turn-based strategy game where the objective is to collect the most pieces by the end of the game.
- To play a game, its needed a Mancala board, which is a board made up of two rows of normally six pockets, also known as pits with four seeds inside and two "stores".

Game Rules :

- One of the player starts by collecting the seed of one pit that is on his side and distributes it in a counter-clockwise direction.
- If the final seed end on the store of the player, he plays again.
- If the final seed end on his own side, the opponent plays.
- If the final seed ends on a pit that was empty before, the player captures his seeds and the oppents seed.
- If the player ends with no seeds on his side of the board, but the opponent still have seeds on his side, the opponent collects his seeds and adds to his store.
- The player that collect more seeds, wins.

Formulation of the Problem:
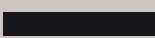
- State Representation: ([seed] * pit_num + [0]) * 2
- Initial State: chosen position
- Objective Test:

    The game is over if either of the players has no stones left in their pits.

    The player with the most stones in their store at the end of the game wins.

- Operator:

=== Name ===	=== Precondition ===	=== Effect: ===
make move	The pit selected by the current player must contain at least one seed.	The seed in the selected pit are distributed one by one in a counter-clockwise direction among the pits of both players. If the last stone lands in the player's store, they get an extra turn. If the last stone lands in an empty pit on the player's side, they capture all the stones in the opposite pit and place them in their store.

- Heuristic/Evaluation function:

    Calculate the difference between the two stores too see how favorable the move will
   be for the player

Implementation Details :

- Game Mode : Human-Human, Human-Computer, Computer-Computer
- Two versions : One that allows to capture the seeds and another that doesnt.
- Level of difficulty - 6 levels
- Dimention of the board - Defined by the User

Algorithm and moves :

- Manual
- Random
- Min-Max
- Min-Max with Alpha-Beta Prunning
- Genetic Algorithm (for exploratory analysis)

Min-Max with Alpha beta Prunning :

Game Board State Search Tree
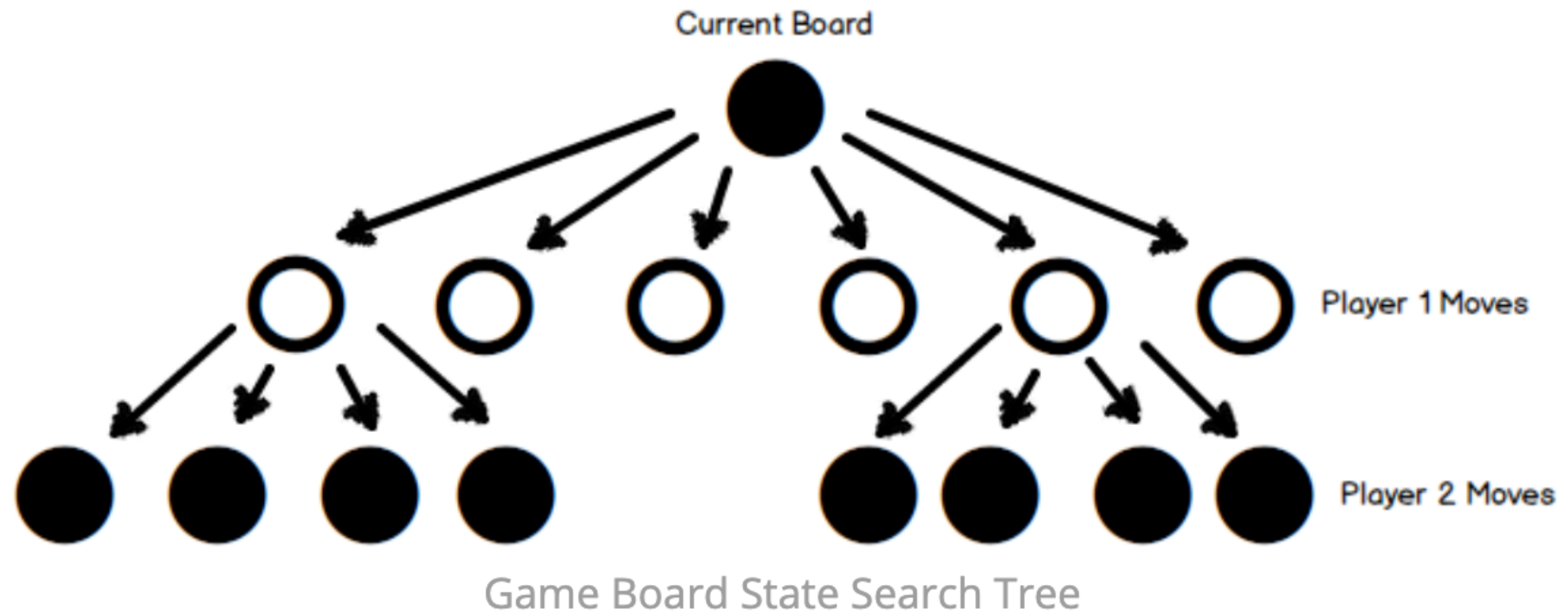
Results :

=== Elapsed time: 5 seconds ===	=== Elapsed time: 0 seconds ===	=== Elapsed time: 0 seconds ===
Number of Pit : 4	Number of Pit : 4	Number of Pit : 6
Number of Seeds = 3	Number of Seeds = 3	Number of Seeds = 4
Number of Matches: 10	Number of Matches: 5	Number of Matches: 2
Alpha-Beta prunnig for two players	Alpha-Beta prunnig for two players	Alpha-Beta prunnig for two players
Depth : 6	Depth : 2	Depth : 2 , 4
Player 1: 0 victories	Player 1: 5 victories	Player 1: 2 victories
Player 2: 0 victories	Player 2: 0 victories	Player 2: 0 victories
Draws: 10	Draws: 0	Draws: 0
Maximum memory usage: 25.35546875 MB	Maximum memory usage: 25.41796875 MB	Maximum memory usage: 25.46875 MB
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Next Steps:

- Incorporate the Genetic Algorithm within the game glow.
- Continue the graphical Interface

THANK YOU!

QUESTIONS?