Artificial Intelligence Assignment 1

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Turtle War Zone

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Overview

Turtles are at war, however they are too nice to kill, and can only convince each other to switch sides. Convincing is a special skill, and in case of turtles, all it takes to convince is a jump. If a turtle can jump over another turtle the, the one jumped over, is convinced to switch sides. Each player as a set of turtles lined up along the opposite sides of a field. The turtles can march in any direction along the lines. They can also jump over turtles of the other colour, and thereby enslave them. Turtles cannot jump over turtles who are in the same side. The game ends, when one player has a) no turtles left or b) has no moves left for the remaining turtles.

Goals

1. **Implementation:**
    a. Whole game is implemented in python .
    b. Interface(Library : pygame).
    c. Min-Max Algorithm in Python.
    d. Alpha-Beta Pruning Algorithm over Min-Max.

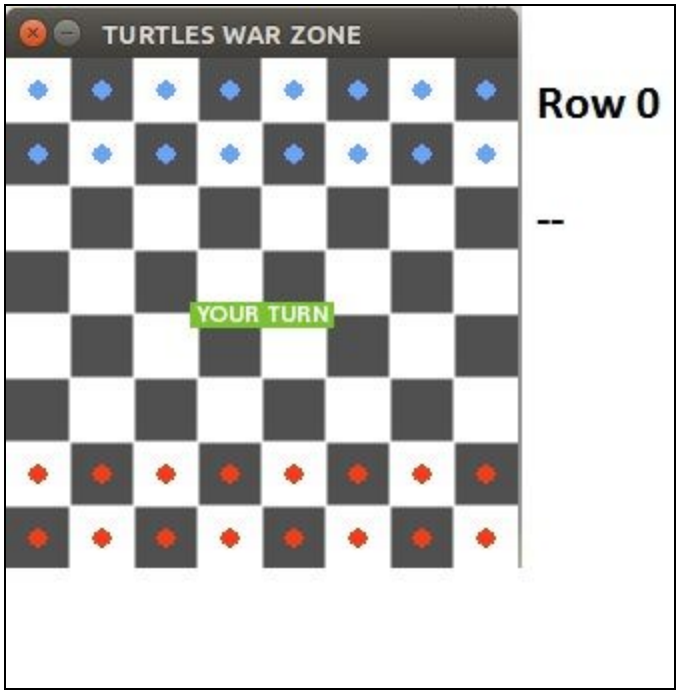
(Please refer to **readme.txt** for the code explanation)

Choice of Heuristics

1. Our First choice of heuristic was based on the count of the number of each type of turtles. For ex. If Turtles are of blue and red type and there are 20 blue and 12 red present then our heuristic for the red is **12 - 20 = -8** and for blue it will be **20 - 12 = 8**.

   We choose this because, it reflects the dominance of a team over other using a linear function.

2. Based on the bonus points of the turtles going in the other players zone. We counted the row differences. The figure here shows the row count starting.



3. The third heuristic was based on the linear sum of the above two heuristic.

   This results in increased defensive nature of Agent.

4. The fourth heuristic we defined on the basis of jumping moves for increasing attacking nature of the Agent , we gave the maximum priority to that move of the Agent which is destroying the opposite turtles.

Gameplay Example:

Please refer to this youtube video for the gameplay.

1. Playing against human with the heuristics defined in (1, 2 and 3) above .https://youtu.be/rYw11i6SNWw
2. Playing against human with the heuristics defined in (4) above https://youtu.be/MMEsx-PTOn0

Win Statistics:

a. A human player (random moves) Vs the agent

   Games played: 5

   Agent Won: 3

   Win Percentage= 60%

b. A human player (precise moves) Vs the agent

   Games played: 5

   Agent Won: 2

Win Percentage= 40%

Loss Analysis:

With the heuristic selected, the agent is playing very defensive. It is less attacking. So it usually loses to a player who plays attacking.

In case (a.) of Win statistics, the agent plays for a longer duration against the human player facing his random moves. Although it is not too much attacking, that eventually leads the agent to lose.

In case (b), there are precise moves by human player, so the agent didn't last too much in the game because of its defensive and non-attacking strategy. It loses by a greater margin compared to case (a) because of the preciseness of the moves.

Bonus:

We have implemented the diagonal moves for the turtles along with the moves mentioned in the assignment.

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