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CS 4200

Project 3: Tic-Tac-Toe and Alpha-Beta pruning

This project focuses on creating an 8-by-8 Tic-Tac-Toe board game with victory requiring a horizontal or vertical line of 4. In order to do this in a timely manner the computer will be utilizing Alpha-Beta pruning in order to make decisions that will challenge the player. With Alpha-Beta pruning, the hope is that the algorithm will be more efficient and will expend less time in order to consider the computer's next move.

Luckily, since the conditions for winning do not include diagonals, the algorithm must only consider 3 spaces up, down, left, and right of the current space it is observing. For example, noticing that a space would complete a line of 3 would obviously be a high priority for the algorithm to consider. And likewise, an empty board may provide little variation in priority.

In my own testing the algorithm starts rather slowly with its own sort of analysis paralysis when starting, where each tile on the board is equally important. It is only as more moves are present that it becomes more apparent for the algorithm that certain tiles become more important than others. Another observation I noticed was that the best strategy the algorithm often stumbles into is generating diagonals. While diagonals are not a win condition, they often set up positions with a higher likelihood of victory. An X formation can easily be filled between the spaces in order to create a three line, and with enough space it can be filled at both ends making it difficult to block. The computer also does well in generally blocking player actions.

The project's code itself was rather challenging to complete. Breaking the problem into smaller components definitely alleviated some of the difficulties in this project. While I understood the broad idea of the goals of the project and how I would generally complete it, implementing took a lot more time and planning than expected. Luckily the provided material gave a good amount of guidance for what I should do when approaching this problem.