Assignment 1
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# Xtreme TicTacToe Tournament (3x3)

Team BonJovi

- Abhinav Gupta (20171059)
- Praffullitt Jain (20171142)

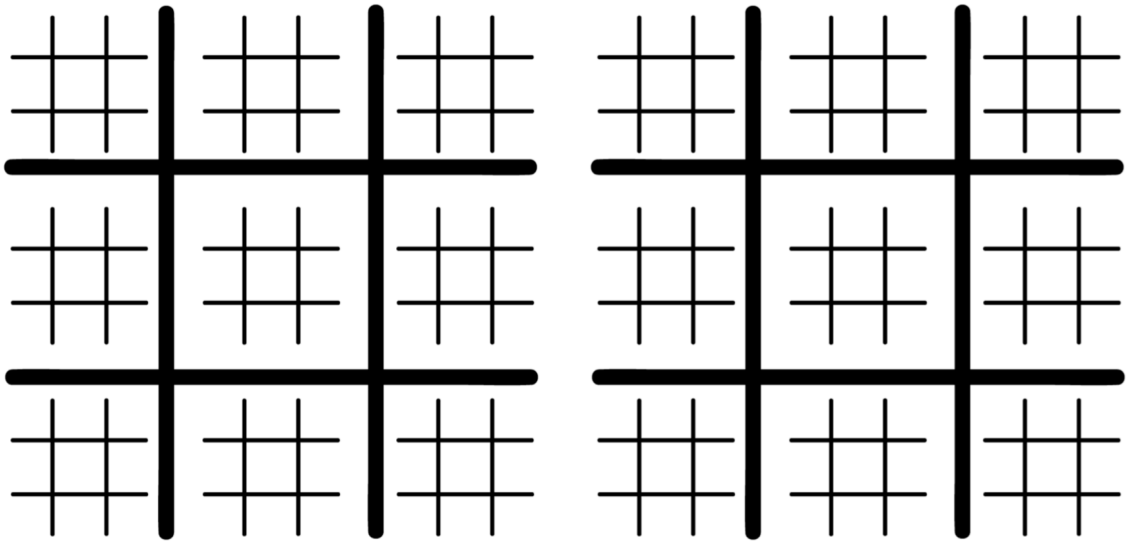

Figure 1: Extreme TicTacToe Board

## Introduction:

- We will refer to the whole board as BigBoard and each small board as SmallBoard.
- So in total, we have 2 BigBoards and each BigBoard has 9 SmallBoards and each SmallBoard has 9 cells

## Algorithms Used:

- We used min-max algorithm with alpha-beta pruning and iterative deepening starting with a max depth of 6, and upto 7-8 in the end. (tentatively)

- Bonus move is also considered where the bot can play again if it wins in a SmallBoard. Whenever during search, if bot wins a SmallBoard, if it is at a max node, it consider its child node also as max nodes instead of min nodes. And Vice-versa.
- We run the search for 20 seconds and then abort and play the best move according to the last fully completed search. (Because 24 sec is limit)

## Heuristic:

- Heuristic score depends on two parts: one is the sum of all block scores and the other is the game status.
- So the SmallBoard score represents how the bot is performing in a particular SmallBoard.

Heuristic Score = $$\sum_{i=1}^{3}\sum_{j=1}^{6} SmallBoard_{ij} + gameStatus$$

So basically, we are visiting each SmallBoard, calculating its score and then adding to gameStatus to complete the heuristic function.

This is how we calculate the score of each SmallBoard:

- This score represents how the bot is performing in a particular SmallBoard. If SmallBoard has been won, the score is smallboardWon. Else, we calculated the total number of rows, columns and diagonals in which we occupied one cell, two cells and three cells.
- Let these values be cellCount1, cellCount2 and cellCount3 respectively. We ignore those rows, columns or diagonals in which opponent's marker is present.
- Consider a set of 3 cells forming a row, column or diagonal. Let's call this set a 1-attack if we can win it in one move, 2-attack if we can win it in two

moves, and 3-attack if we can win it in three moves. 3attack means CellCount1 and so on..

ourScore = $$\sum_{i=1}^{2} cellWeight_i * (cellCount_i)^2$$

Similarly we can find Opponent's Score. And the score of the SmallBoard will be

SmallBoardScore = ourScore - OpponentScore.

## Game Status

The game status is computed in a manner similar to the block score. In this, we calculate the total number of rows, columns or diagonals in the board, in which we won one block, two blocks and three blocks. Let these values be blockCount 1 , blockCount2 and blockCount3 respectively. Then,

ourGameScore = $$\sum_{i=1}^{2} SBWeight_i * (SBCount_i)^2$$

Similarly opponent's gameScore is calculated. And so the gameStatus will be:

gameStatus = ourGameScore - OpponentGameScore

## Values of the Weight Variables:

cellWeight1 << cellWeight2 << cellWeight3 << smallboardwon << SBWeight1 << SBWeight2 << SBWeight3