

Heuristic Analysis

Below are the three evaluation functions for my game playing agent:

1. The first function calculates the difference between the the square of the number of my legal moves and 2 times the square of the opponent's legal moves.
2. The second function Maximize the distance between me and the opponent. This strategy is basically to move away from the opponent.
3. The third function focuses on distance from center. It calculates the sum of the absolute number of squares from the player's position to the center of the board along x and y axes. This puts a positive coefficient to the player's distance to the center, effectively pushing it towards the edges of the board.

All of the above mentioned evaluation functions are relatively simple, but could be combined to deliver positive results.

The results from utilizing these evaluation functions are as follows:

Match #	Opponent	AB_Improved	AB_Custom	AB_Custom_2	AB_Custom_3
		Won Lost	Won Lost	Won Lost	Won Lost
1	Random	7 3	9 1	10 0	10 0
2	MM_Open	8 2	8 2	6 4	7 3
3	MM_Center	9 1	8 2	9 1	9 1
4	MM_Improved	8 2	5 5	5 5	9 1
5	AB_Open	5 5	3 7	4 6	4 6
6	AB_Center	4 6	7 3	4 6	4 6
7	AB_Improved	4 6	4 6	6 4	4 6
Win Rate:		64.3%	62.9%	62.9%	67.1%

All of the evaluation functions perform somewhat similarly and are almost 3% apart from each other when looking at the overall win rate. The only function that beat AB_Improved is the third heuristic that looks at distance from center. This heuristic probably needs to be combined with the first heuristic to be more successful.

Based on this information, I would recommend utilizing the third function as it has the highest win rate overall. Another reason is that it performed the best against random opponents. It is also a fairly simple heuristic which does not require unnecessary overhead. But seeing from the table there is room for improvement as it fails when Alpha Beta Pruning is used by the opponent. A simple and fast heuristic needs to be designed which is beter that this because the simpler function allows the search to proceed deeper in the game tree, which can be more valuable than a better estimate at a shallow depth.