Heuristic Analysis for the Game-Playing Agent Project

The Game Playing Agent project asks us to create a series of heuristics which calculate the value of a game state from the point of view of the given player.

The "Improved" evaluation function discussed in lecture outputs a score equal to the difference in the number of moves available to the two players. My first attempts involved variations of this heuristic by using different weights for Player 1 v/s Player 2. For example:

1) my_moves - 4*opponent_moves (chase opponent aggressively)
2) 2*my_moves - opponent_moves (chase better positions for yourself)

These did not prove to be an improvement over the basic "Improved" evaluation heuristic. The next heuristic I tried was a ratio of my_moves to opponent_moves which performed reasonably well. I also tweaked the heuristic such that the squares closer to the center have higher weight because the player has more options near the middle of the board. My final heuristic was a combination of the center_square_weights and the diff_moves heuristics.

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Playing Matches

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Match # Opponent AB_Improved AB_Custom AB_Custom_2 AB_Custom_3

		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	0	10	0	10	0	10	0	10
2	MM_Open	0	10	0	10	0	10	0	10
3	MM_Center	0	10	0	10	0	10	0	10
4	MM_Improved	0	10	0	10	0	10	0	10
5	AB_Open	7	3	7	3	7	3	3	7
6	AB_Center	7	3	7	3	7	3	6	4
7	AB_Improved	4	6	2	8	7	3	4	6

Results:

Since Isolation is a zero sum game, it is intuitive that the difference in available moves is one of the best metrics.

Some the heuristics I tried were no better that the heuristic given in the lecture notes. One reason could be that they all took longer to compute resulting in lower depth reached in the game tree before the timer expired. One path I didn't get time to

explore was some sort of metric which rewarded partitioning the board as intuitively that should lead to higher gains.