Isolation Score Heuristics

After accomplishing the Minimax and Alpha-beta pruning algorithms, we were tasked with generating multiple scoring algorithms and providing the best heuristic for scoring a game of Isolation. Certain scoring heuristics performed consistently well such as the Improved Score provided by the stub sample_players.py code. After working with multiple options for scoring and incorporating some of the advice from the course, I discovered that a straightforward and simpler approach generally performed the best as opposed to attempting to accommodate multiple game stages and scenarios.

Heuristic 1 (Chosen as best performer)

The chosen heuristic performed most consistently and was fairly simple in its approach. After running the tournament script multiple times, I found that center move heuristics performed well. After a fair bit of research I realized the added benefit of comparing my player's location relative to center and the opponent's proximity to center. This heuristic performed highest of all the scoring algorithms at 68.33% after 420 games.

AB_Custom		
	Win	Loss
Random	55	5
MM_Open	54	6
MM_Center	47	13
MM_Improved	41	19
AB_Open	31	29
AB_Center	32	28
AB_Improved	27	33
	0.68333333	

Heuristic 2

This algorithm included more complex heuristics recommended in the course, but proved to be less effective than the more straightforward approach of comparing distance to center. One of the recommended heuristics was to consider moves that were mirrors of the opponent. The theory behind mirroring the opponent is my player would effectively make the last move if every move of the opponent could be mirrored from center.

Two additional considerations were whether the game was in a late stage with less spaces available or whether the board was segmented across one of the axes. If either of these happened to be true, we considered having more moves than the opponent better than having less. In all other cases, the returned score was strictly how many moves our player had.

Despite the addition of "smarter" scoring, these factors did not seem to perform well. More modifications and research would be necessary to determine the best application for these heuristics.

AB_Custom_2		
	Win	Loss
Random	57	3
MM_Open	49	11
MM_Center	50	10
MM_Improved	43	17
AB_Open	28	32
AB_Center	23	37
AB_Improved	24	36
	0.652380952	

Heuristic 2

The final heuristic was a focus on center moves without consideration for the opponent. This scoring heuristic performed the worst of all, but was a starting point for the other heuristics.

AB_Custom_3		
	Win	Loss
Random	55	5
MM_Open	44	16
MM_Center	49	11
MM_Improved	38	22
AB_Open	28	32
AB_Center	32	28
AB_Improved	23	37
	0.640476	

All in all, scoring heuristics are a difficult practice and require much patience and meticulous modifications. Certain factors like available moves perform better at different stages of the game as well as what the opponent's strategy is. An optimal solution would include considerations for how the opponent is playing as well as what stage and the current state of the board.