

Heuristic Analysis

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This report summarises the result of 3 different heuristic implemented in the game agent verses the iterative deepening heuristic taught in the class. Where iterative deepening is the difference between legal moves of the player vs. the opponent moves.

Custom Score 3

This heuristic `aggressive_with_total_moves_heuristic`, is a cost assign for the opponent move while as game progresses. According to this heuristic agent prefer to move that reduces the options available to its opponent. The return score value is calculated as:

$$\text{my_moves} - 3 * \text{opp_moves}) * \text{game.move_count}$$

Custom Score 2

This evaluation function use the fraction of my moves with all possible moves in order to calculate the score. The score expression is given below.

$$\text{score} = \text{my_moves} / (\text{my_moves} + \text{opponent_moves})$$

Custom Score 1

This heuristic has been chosen to avoid walls and corners because those positions cost more by limiting the further moves and most likely end of the game. So, here the `improves_score` has been modified to subtract `percent_completed*square_distance` from it. Where `percent_completed` is the ratio between moves made by own and opponent to the total number of squares. And `square_distance` it the distance from center of the board.

$$\text{own_moves} - \text{opp_moves} - \text{percent_completed} * \text{square_distance}$$

Results

The outcome of 5 game played with three heuristic along with the improved heuristic is shown below. Among 3 different heuristic the best output given by `AB_custom` from `custom_score` function in `agent.py`.

The output of the 5 game played with 3 different custom heuristic is shown below. Overall, the `custom_score_1` heuristic has better performance. Here this heuristic look

Playing Matches									

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	10	0	8	2	9	1	10	0
2	MM_Open	9	1	8	2	6	4	8	2
3	MM_Center	9	1	9	1	7	3	8	2
4	MM_Improved	5	5	9	1	6	4	7	3
5	AB_Open	4	6	5	5	4	6	5	5
6	AB_Center	5	5	4	6	5	5	4	6
7	AB_Improved	4	6	4	6	6	4	2	8

Win Rate:		65.7%		67.1%		61.4%		62.9%	

for the board position and extend Id_improved(iterative deepening), which improve the overall performance by giving cost in the corners and toward the walls. It also takes into consideration for the possible legal moves which affect the upcoming play. This heuristic is also simple and does not need to search very deep and hence does not affect ability of the algorithm to search deep in the tree.