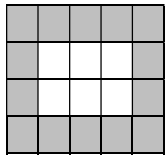


Heuristic Analysis

The following are the heuristics employed in my project 2:

1. custom_score: Square of distance from end units

The grey shaded area shows the region that should be avoided by the player. The shaded area has very few moves possible since the knight cannot move freely in all directions. By avoiding the shaded area, the knight will have a better chance of winning than the opponent. This way, this function is making the current player go towards the center



2. custom_score_2: Square of distance from the opponent

If the current player is constantly moving away from the opponent, the knight gets more room to move freely. This is because the opponent could corner the current player if they are very close. One disadvantage of this function is this way, the opponent also is getting away from the player and so the winning ratio might be random and might not be very predictable

3. custom_score_3: Legal_moves – blank_spaces

This function is an indicator that the current player has less moves but is not using all the available blank spaces. If there is a huge difference between number of legal moves and available blank spaces, it shows that the current player is not utilizing the availability of the board.

Recommendation:

All the three mentioned evaluation functions are straightforward calculations and are time/space efficient. I would recommend using custom_score as the evaluation function for the following reasons

- The custom_score consistently does better than AB_Improved, AB_Custom_2, AB_Custom_3 in the tournaments. Data from a couple of tournaments are shown below.

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	8	2	9	1	9	1	8	2
2	MM_Open	10	0	10	0	10	0	10	0
3	MM_Center	10	0	10	0	10	0	10	0
4	MM_Improved	10	0	10	0	10	0	10	0
5	AB_Open	3	7	6	4	3	7	5	5
6	AB_Center	6	4	6	4	6	4	5	5
7	AB_Improved	5	5	7	3	3	7	4	6
	Win Rate	74.30%		82.90%		72.90%		74.30%	

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	8	2	6	4	8	2	8	2
2	MM_Open	10	0	10	0	10	0	10	0
3	MM_Center	10	0	10	0	10	0	10	0
4	MM_Improved	10	0	10	0	10	0	10	0
5	AB_Open	6	4	5	5	3	7	4	6
6	AB_Center	6	4	8	2	5	5	6	4
7	AB_Improved	4	6	6	4	6	4	6	4
	Win Rate	77.10%		78.60%		74.30%		77.10%	

As shown in the table above, all the functions are similar against MM_Open, MM_Center, MM_Improved. AB_Custom does better than the counterparts against other opponents

- The custom_score function will lead the player towards best position which is towards the middle of the board and is efficient
- One of the main reasons why custom_score is a better indicator for the winner is because the player is able to get more moves and hence play better if it stays away from the edges of the board.

Hence, `custom_score` is the recommended evaluation function for the score.