

Heuristic Analysis

Scoring functions

1. The ratio of remaining legal moves multiplied by weight(AB_Custom)

This approach showed the best result for the game as in the image below.

***** Playing Matches *****									
Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	9	1	10	0	7	3	8	2
2	MM_Open	7	3	7	3	6	4	5	5
3	MM_Center	9	1	9	1	8	2	6	4
4	MM_Improved	5	5	7	3	7	3	6	4
5	AB_Open	4	6	5	5	5	5	6	4
6	AB_Center	6	4	6	4	4	6	6	4
7	AB_Improved	6	4	7	3	2	8	4	6
Win Rate:		65.7%		72.9%		55.7%		58.6%	

In order to decide the value, I used not only remaining legal moves of player and opponent, but also the value of current position of both players.

Considering the position of a player, the value must be different because knight moves can be restricted by the game board's width and height.

2	3	4	4	4	3	2
3	4	6	6	6	4	3
4	6	8	8	8	6	4
4	6	8	8	8	6	4
4	6	8	8	8	6	4
3	4	6	6	6	4	3
2	3	4	4	4	3	2

The figure above explains the counts of knight moves in each position. As we can see, there are cells which has 8 possible moves in the center of the boards whereas cells on the corders have only 2. Therefore, these value must be calculated in the game score. I created the value function which returns position value as a weight and finally the formula for scoring is:

player's legal moves * player's current position value - opponent's legal moves * opponents's current position value

2. Player's remaining legal moves multiplied by weight(AB_Custom_2)

As already mentioned, I created a value function to know player's current position value. Using this function, I used formula:

player's legal moves * player's current position value

However, shown on the result of the top page, this approach gave me poor result and tells me that I should consider the opponent's status as well to get more optimized result.

3. The ratio of remaining legal moves((AB_Custom)_3)

Formula is very simple:

player's legal moves / (opponent's legal moves + 0.0001)

. 0.0001 is just to avoid error.

This approach seems to be not enough, but have certain effect as fundamental calculations because the win rate is nearly 60% even if the method is so simple.

Conclusion and recommendation

I definitely recommend to add the value function to evaluate position to any scoring methods. In short, it is the 1st scoring function mentioned above.

There are at least three reasons for this.

First, each cell has different value in terms of a state.

Second, considering position value does not cost so much, once we decide the rule of it.

Third, we need to consider the opponent's current position value even if the player's position has got good evaluation, otherwise it may not be relatively best position by itself.

For these reasons, I recommend to use the value function to evaluate the proper next move.