

Heuristic Analysis on different evaluation functions

Overview

This analysis is done on different evaluation functions used for (L-Shaped) Isolation Game AI Agent. Evaluation function calculates legal moves for current and opponent player.

Technique/Method	custom_score_1	custom_score_2	custom_score_3
Various Strategy used for best available position	The idea behind this technique was to punished the opponent more than rewarding myself. I took value of 2.0 towards the punishment, which can be tested on various positive range between 2 to 3, after that it start diminishing the whole logic.	The idea behind this technique was to reward big to yourself whenever offensive attack is greater than opponent moves. Compared to other Heuristics functions this method was consistent winner throughout the tournament with all different types of opponent.	The idea behind this technique was to play defensive and to give chance to opponent to play under the rules of <i>Nash equilibrium</i> , which obviously didn't seem to work. Although playing defensive did give me chance to go for offensive strategies for other heuristics functions
Offensive/ Defensive	Offensive	Offensive	Defensive
Core logic	$\text{our_moves} - (2.0 * \text{opp_moves})$	$\text{our_moves} / (\text{opp_moves} + 0.0001)$	$\text{our_moves} - \text{opp_moves}$

Results

The results show below are from tournament played with a baseline agent and 3 custom agents played 10 matches with each agent in tournament of total 40 matches.

Playing Matches									

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	8	2	7	3
2	MM_Open	8	2	5	5	8	2	5	5
3	MM_Center	8	2	9	1	9	1	10	0
4	MM_Improved	8	2	7	3	5	5	7	3
5	AB_Open	3	7	7	3	5	5	5	5
6	AB_Center	3	7	5	5	6	4	4	6
7	AB_Improved	7	3	7	3	8	2	5	5

Win Rate:		64.3%		70.0%		70.0%		61.4%	

Recommendation

I will conclude that Heuristic function # 2 as a winner, although it tied with Heuristic function #1, I will still recommend it for following reasons:

- Best-average win rate in tournament for all opponent types
- It counts for opponent wrong moves and reward you for best moves
- Simple beautiful logic.