Sachin Solkhan
AIND - Isolation

Heuristic Analysis

The project scope was to build an Isolation game playing agent. It was implemented using -

- Minimax algorithm
- Alphabeta pruning technique

To improve the performance of the agent, a particular heuristic called “iterative deepening search” was applied to alphabeta pruning. It is referred as AB_Improved below.

Additionally, following 3 different custom heuristics were implemented to improve the performance -

1. This heuristic improves upon the AB_Improved by heavily rewarding those positions with more possible remaining moves than those of opponents. Referring to table below, it gives the maximum % improvement of 70% winning compared to 62.9%.
   It is expected given that
   - it promotes chasing and blocking of opponent moves.
   - It is still very simple and efficient within the search space
2. A variation of 1) with weighted difference of possible moves with respect to those of opponents. There is no % improvement applying this heuristic.
3. This heuristic favors those positions that are farther from opponents. It uses the Euclidean formula to calculate the distance to the position of opponent. It favors and rewards higher distance. This gives few percentage points improvement, 65.7% compared to 62.9%.

Looking at the results for all the heuristics, recommend the evaluation function within 1). The reasons are -

1. It is simple logic, easy to understand and compute. Hence efficient within the search space.
2. It rewards those positions with more possible remaining winning moves.
3. It promotes chasing and blocking of opponent moves.

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Win	Lost	Win	Lost	Win	Lost	Win	Lost
1	Random	9	1	8	2	8	2	9	1
2	MM_Open	5	5	6	4	8	2	8	2

3	MM_Center	7	3	9	1	6	4	7	3
4	MM_Improved	5	5	9	1	9	1	6	4
5	AB_Open	7	3	5	5	5	5	7	3
6	AB_Center	7	3	6	4	5	5	4	6
7	AB_Improved	4	6	6	4	3	7	5	5
	Win Rate		62.90%		70.00%		62.90%		65.70%

Your ID search forfeited 161.0 games while there were still legal moves available to play.