

Isolation Heuristic Analysis

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After implementing the required algorithms for the Isolation game agent, we finally have to write the game agent heuristics.

The simplest heuristics that we could think of, would be number of possible moves for the player, and the difference between the number of player's open moves and the opponent's open moves. But, these are already implemented, and we should come up with other heuristics and compare those with the improved score heuristics.

Custom Score 1

Following the same path of open scores and improved score, we have:

$$\text{number of player's open moves} - \alpha [\text{number of opponent's open moves}]$$

Where α is weight for penalizing the opponent's open moves.

I've tried three values for α : 1.5, 2, and 3. The one which performed better was 2.

Custom Score 2

Another idea, could be instead of penalizing the number of the opponent's open moves, maximize the relationship player's open moves against opponent's open moves:

$$\text{number of player's open moves} / \text{number of opponent's open moves}$$

And, even use a weight like the previous heuristics:

$$\text{number of player's open moves} / \alpha [\text{number of opponent's open moves}]$$

Unlike the previous one, no test was done to select the best weight and we used the value of '2' as in custom score 1.

Custom Score 3

And, the final combination of the heuristics present at the code, was to combine 'Custom Score 1' with center score:

$$\text{number of player's open moves} - \alpha [\text{number of opponent's open moves}] - \text{distance to centre}$$

Results

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

Win Rate: 70.0% 71.4% 71.4% 72.9%

There were 18.0 timeouts during the tournament -- make sure your agent handles search timeout correctly, and consider increasing the timeout margin for your agent.

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	10	0	9	1	10	0
2	MM_Open	9	1	9	1	10	0	<u>8</u>	<u>2</u>
3	MM_Center	10	0	10	0	9	1	10	0
4	MM_Improved	<u>7</u>	<u>3</u>	<u>9</u>	<u>1</u>	6	4	<u>7</u>	<u>3</u>
5	AB_Open	4	6	6	4	6	4	<u>5</u>	<u>5</u>
6	AB_Center	7	3	8	2	4	6	<u>5</u>	<u>5</u>
7	AB_Improved	<u>6</u>	<u>4</u>	<u>5</u>	<u>5</u>	4	6	<u>4</u>	<u>6</u>
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Win Rate:		75.7%		<u>81.4%</u>		68.6%		70.0%	

There were 2.0 timeouts during the tournament -- make sure your agent handles search timeout correctly, and consider increasing the timeout margin for your agent.

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	10	0	9	1	10	0
2	MM_Open	9	1	9	1	8	2	<u>9</u>	<u>1</u>
3	MM_Center	8	2	9	1	10	0	10	0
4	MM_Improved	<u>8</u>	<u>2</u>	<u>7</u>	<u>3</u>	9	1	8	2
5	AB_Open	5	5	7	3	5	5	<u>3</u>	<u>7</u>
6	AB_Center	10	0	7	3	3	7	7	3
7	AB_Improved	<u>3</u>	<u>7</u>	<u>6</u>	<u>4</u>	6	4	<u>7</u>	<u>3</u>
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Win Rate:		75.7%		<u>78.6%</u>		71.4%		77.1%	

There were 1.0 timeouts during the tournament -- make sure your agent handles search timeout correctly, and consider increasing the timeout margin for your agent.

Custom Score 2

For this heuristics we don't have any doubt, it is the worst performer between the custom and the ID Improved Agent - regardless if we use or not a weighted value (alpha) for the opponent's open move.

Custom Score 3

Although it has won one of tournaments above, it seems to be the second worst performer of those. It is true that it has good performance against the other heuristics, but it has some difficulties against the AB_Improved, Open, and sometimes the AB Center.

As I side note, the timeout seems very likely to be in this heuristics, which I prevents us to do a definitive diagnosis.

Custom Score 1

From the custom heuristics seems to be the best performer. The current data suggests that it performs better than the AB_Improved - two wins against one win out of four. But, more tournament runs would be needed to assure that. And even more tests around the weight alpha, particularly on the range between 1.5 and 2.0.

The reason it seems to perform better on a tournament than the AB_Improved, is that the weight (alpha) acts like a fine tune against other heuristics, when comparing to AB_Improved, but doesn't play as good as when it runs against the AB_Improved.

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