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Evaluation Heuristics Comparison

Project 2: Build a Game-Playing Agent

As part of this project, I evaluated three simple heuristics that can be used to score positions in the game of Isolation against each other. The first was the heuristic that the "score" of a move is simply the number of open moves that you have. The second scoring heuristic - an improvement over the first - is to score moves subtracting the number of moves your opponent has from the number of moves you have. The third heuristic was to use a measure of centrality - that is, to look at how close to the center a resulting move gets you. All of these were combined with alpha-beta search and iterative deepening.

Playing Matches
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Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	9	1	7	3	10	0	8	2
2	MM_Open	6	4	5	5	6	4	6	4
3	MM_Center	8	2	8	2	8	2	6	4
4	MM_Improved	6	4	6	4	5	5	5	5
5	AB_Open	3	7	5	5	6	4	3	7
6	AB_Center	5	5	6	4	7	3	5	5
7	AB_Improved	5	5	6	4	6	4	4	6
	Win Rate:	60.0%		61.4%		68.6%		52.9%	

The results from the tournament shown above show that the second heuristic - subtracting the number of available moves for the opponent from your available moves - performs significantly better than the other two. This makes sense: the "centrality" heuristic is really trying to proxy for how much room on the board your agent has to move, which is better captured by the number of available moves than it is by a looser notion such as centrality. And, it is clear why the second heuristic is better than the first: for a given number of available moves, it should

always be better to make a move that leaves your opponent with fewer moves. So, these simulations confirm our intuition.

Nevertheless, this suggests where we could further improve our evaluation function. For a given difference between the number of moves we have and the number of moves our opponent has, being closer to the center may be a good proxy for the number of moves we are likely to have in the future. So, a heuristic function that combines the "move difference" with "centrality" is likely to ultimately be best.