HEURISTIC ANALYSIS

Isolation Game agent, AI nanodegree, Udacity

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Heuristic score functions:

1. custom_score(game,player):

- It represents the improve score(IS) which is the difference between the number of possible movies of the player - number of possible movies of the opponent player.
- len(game.get_legal_moves(player)) - len(game.get_legal_moves(game.get_opponent(player))

2. custom_score_2(game,player):

- This one checks whether there is a partitioning or not by checking the players current positions and check if there is any separation between them or not.
- This separation is formed if there are occupied cells which form column or raw that separate the two players.
- If there is a partitioning the function will return double the improve score(IS) otherwise it will return only IS.

3. custom_score_3(game,player):

- The probability of getting blocked is higher at the borders of the board than its center.
- Our goal to get the move which player1 is close to the center and player2 is far away from it.
- This function use the distance between the players and the center to update the score.
- It returns IS - (distance between player1 and the center - distance between player2 and the center)

Tournament Results

This script evaluates the performance of the custom_score evaluation function against a baseline agent using alpha-beta search and iterative deepening (ID) called `AB_Improved`. The three `AB_Custom` agents use ID and alpha-beta search with the custom_score functions defined in game_agent.py.

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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	8 | 2	8 | 2	9 | 1	9 | 1
2	MM_Open	6 | 4	7 | 3	7 | 3	7 | 3
3	MM_Center	7 | 3	8 | 2	9 | 1	7 | 3
4	MM_Improved	5 | 5	9 | 1	5 | 5	7 | 3
5	AB_Open	4 | 6	5 | 5	5 | 5	7 | 3
6	AB_Center	7 | 3	7 | 3	6 | 4	6 | 4
7	AB_Improved	4 | 6	5 | 5	4 | 6	6 | 4
Win Rate:		58.6%	70.0%	64.3%	70.0%

Your agents forfeited 245.0 games while there were still legal moves available to play.

Heuristic Function Decision

AB_Improved	58.6%
AB_Custom	70%
AB_Custom_2	64.3%
AB_Custom_3	70%

Win rate table

- Custom_score_3 is more complex than costum_score and the results of both is the same, but give weight to how far the players from the center of the board.
- Custom_score_3 and Custom_score almost have the same executable time.
- Custom_score_2 has the most complex implementation and longest executable time and lowest win rate, so I will exclude it.
- So I will choose custom_score_3 as my heuristic score function in my agent.