Heuristic Analysis

Here are the analysis of the 3 heuristics used for Isolation project:

1. Custom_score: This one is based on heuristic introduced in the video Udacity. Primary idea behind the heuristic is aggressive approach that prefer to chose moves which allow move advantage over opponent player and at the same time seek this advantage more at beginning of the game. w = 20 / (“number_of_plys_till_now” + 1)
2. Custom_score_2: This is one of the more complex heuristics, in first part it is trying to take advantage of difference between already used tiles and empty ones (this is significant mainly at the beginning of the game). Second part emphasize moves that do not lead to positions next to game board for current player and opposite for opponent. score += 1 - “(total tiles - remaining empty tiles) / total tiles” * “is near wall” (opponent: score -= 1 - “(total tiles - remaining empty tiles) / total tiles” * “is near wall”)
3. Custom_score_3: This heuristic is the exact implementation of the base one introduced in the video Udacity. This heuristic is based on preferring decisions which leads to positions that have more possible move in the future. (my_move - (2 * opponent_move + 1e-2))

Table below shows result of all three previously mentioned heuristics against benchmark agent (AB_Imporoved).

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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      9  |  1     10  |  0     10  |  0     10  |  0
   2       MM_Open     7  |  3      8  |  2      7  |  3      9  |  1
   3      MM_Center    8  |  2      9  |  1      8  |  2      6  |  4
   4     MM_Improved  10  |  0      6  |  4      7  |  3     10  |  0
   5       AB_Open     5  |  5      6  |  4      6  |  4      6  |  4
   6      AB_Center    7  |  3     10  |  0      6  |  4      6  |  4
   7     AB_Improved   4  |  6      5  |  5      7  |  3      7  |  3
--------------------------------------------------------------------------
          Win Rate:      71.4%        77.1%        72.9%        77.1%
```

As can be seen on the screenshot above the most consistent winning heuristic is Custom_score_3 which do not lost to any other tested agent, despite sharing the winning rate (77.1%) with Custom_score_1 it seems still superior as the Custom_score_1 suffered draw against benchmark agent (AB_Improved). Custom_score_2 seems to be lacking in the performance and combined with its complexity, it does not look like good choice.

According to the result, complexity and scalability is safe to recommend Custom_score_3 as heuristic of choice. This imply that aggressive approach with preferring choices that allow is more move that opponent in future is the best choice found till now. This

also make sense in way that isolation game losing condition is zero possible moves on player side.

The only problem with aggressive approach may be that from a certain degree we may face “greedy” mode when the agent is going to rate even decent moves with low score.

Possible improvement: Fine tuning the weight -> require lot of try and adjust tests.