Heuristic Analysis of Scoring Functions for 'Isolation'

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Heuristics

After some research and based on what was presented during the lectures, the implemented heuristics were:

1. Custom_score:

   This is a heuristic scheme which takes into consideration the normalized relative mobility, comparing the amount of moves available for you and your opponent. It also considers the ability the player has to block the opponent's moves and the domination of the corner areas.

2. Custom_score_2:

   This heuristic scheme concedes a bonus to the player if there are overlapping moves between the player and the opponent and it is the players turn. That way the player is stealing the opponents possible moves.

3. Custom_score_3:

   This heuristic scheme tries to chase down the opponent in an aggressive style of play.

   The results obtained can be seen in the following table:

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                ************************
                    Playing Matches
                ************************

Match #    Opponent    AB_Improved     AB_Custom     AB_Custom_2    AB_Custom_3
                       Won | Lost     Won | Lost     Won | Lost     Won | Lost
   1        Random      7  |  3        10 |  0        7  |  3        9  |  1
   2       MM_Open      6  |  4        5  |  5        4  |  6        9  |  1
   3      MM_Center     7  |  3        8  |  2        7  |  3        8  |  2
   4     MM_Improved    4  |  6        5  |  5        7  |  3        7  |  3
   5       AB_Open      4  |  6        5  |  5        5  |  5        6  |  4
   6      AB_Center     5  |  5        6  |  4        6  |  4        6  |  4
   7     AB_Improved    4  |  6        4  |  6        4  |  6        8  |  2
-------------------------------------------------------------------------------
           Win Rate:     52.9%          61.4%          57.1%          75.7%
```

Figure 1: Results for different heuristic schemes

The first custom heuristic outperforms the one implemented in the example, but it doesn't seem to be very consistent. The data seems to be better than I reckon it actually is because this strategy is not as generic, due to a corner domination bias. What this means is that, while it has stellar records against some of the other heuristics (10 to 0 and 8 to 2) it also has 3 ties and a loss (in the series).

The second custom heuristic scheme was one which I hoped would perform better due to the responsive characteristic of it's evaluation, where it seeks to rob the opponent of possible moves.

The third heuristic scheme has the best performance by far, which shows that an aggressive strategy at Isolation outperforms conservative play. This shows that all heuristics improved the results in relation to the avail- able AB_Improved, and that the more aggressive heuristic function outper- forms the others by far. There is another possible heuristic which I had trouble implementing but that showed up often in research that was the killer heuristic. It might have performed better.

My recommendation among these three heuristics would obviously be the third one since it shows a 15% improvement over the others. Not only does this heuristic provide a much better winning record, it also doesn't have a losing record against any of the implemented algorithms. On top of those

qualities, the third heuristics is very simple in it's implementation, given that it suffices to give a larger weight to the number of moves left to the opponent. It might also be interesting to implement and test the "killer" heuristic, which has an adaptative quality according to the phase of the game.