Heuristics analysis for isolation game-playing agent

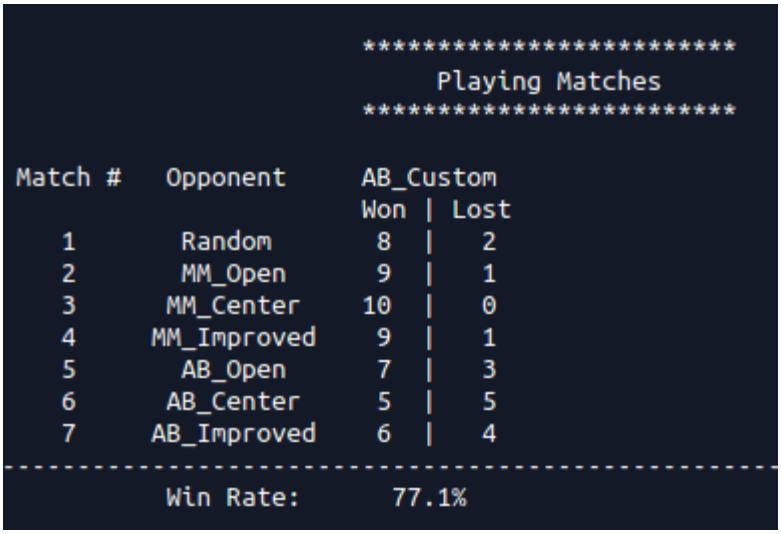
Custom_Score:
My main heuristic is split up into 3 parts:
1- terminal conditions:
These have the highest priorities because if a move will lead to win it must be played , if it leads to lose it must not be played thus using scores of infinity and -ve infinity.
2- If we have more available moves than the opponent then this gives us the advantage and could result in us being ahead and winning in late game , so it is our first resort if no end-game state is reached, if the moves are equal we use positional advantage instead.
3-In our second approach we use Manhattan distance , that is the x and y distances from the center of the board. The heuristic assumes that it being near to the center is better as it avoids getting the player being cornered.(P.S: we divide over 10 because we want our manhattan distance score to have less impact than the more moves score as more moves seems to be better than positional advantage of equal moves.)

```
                      *************************
                           Playing Matches
                      *************************

Match #   Opponent     AB_Custom
                       Won  |  Lost
   1       Random      10   |    0
   2       MM_Open      8   |    2
   3      MM_Center    10   |    0
   4     MM_Improved    7   |    3
   5       AB_Open      6   |    4
   6      AB_Center     5   |    5
   7     AB_Improved    6   |    4
-----------------------------------------------------------
          Win Rate:      74.3%
```

Custom_score_2:
My 2nd Heuristic is very similar to my main Heuristic , it is made up of terminal state score, player moves minus opponent moves, and finally difference of manhattan differences, however instead of using either moves difference or manhattan difference we use both. We use manhattan distance to reinforce or decrease the score returned by the moves difference in order to increase the score of moves that will grant you both more moves and better positioning.
The Heuristic scored close to our main one but is not quite better.

```
                      *************************
                           Playing Matches
                      *************************

Match #   Opponent     AB_Custom
                       Won  |  Lost
   1       Random      10   |    0
   2       MM_Open      9   |    1
   3      MM_Center     6   |    4
   4     MM_Improved    8   |    2
   5       AB_Open      5   |    5
   6      AB_Center     6   |    4
   7     AB_Improved    6   |    4
-----------------------------------------------------------
          Win Rate:      71.4%
```

Custom_score_3:
My 3rd Heuristic is split up into 3 parts:
1- terminal conditions:
These have the highest priorities because if a move will lead to win it must be played , if it leads to lose it must not be played thus using scores of infinity and -ve infinity.
2- If we have more available moves than the opponent then this gives us the advantage and could result in us being ahead and winning in late game.
3- We divide our 7x7 grid into 4 quadrants (unequal) and detect which quadrant is most empty, then if the player can move into the most empty quadrant then the move is assigned a higher score(0.4 or 0.5 because it is still not as good as having an extra move than the opponent).
(part 2 and 3 of the Heuristic are summed).
Even though The Hueristic had a high win rate this time but it is very unreliable thus isnt the best choice.



```
                      *************************
                           Playing Matches
                      *************************

Match #   Opponent     AB_Custom
                       Won  |  Lost
   1        Random       8  |    2
   2        MM_Open      9  |    1
   3       MM_Center    10  |    0
   4      MM_Improved    9  |    1
   5        AB_Open      7  |    3
   6       AB_Center     5  |    5
   7      AB_Improved    6  |    4
-----------------------------------------------------
           Win Rate:      77.1%
```

Conclusion:

To sum up, the 3rd Heuristic that uses empty spaces for scoring best move is unreliable thus not the chosen one. The 2nd Heuristic super-imposes two methods yet is not as powerful as the 1st Heuristic. Finally, the first heuristic that seeks to encourage moves difference advantage else positional advantage proved to be better and more reliable is our chosen main Heuristic.