Heuristic Analysys

The below picture shows the performance of the agents using the implemented evaluation functions.

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

Match #   Opponent    AB_Improved   AB_Custom   AB_Custom_2   AB_Custom_3
                      Won | Lost   Won | Lost   Won | Lost   Won | Lost
    1       Random      9   |  1     8   |  2     8   |  2     8   |  2
    2       MM_Open     8   |  2     7   |  3     7   |  3     5   |  5
    3      MM_Center    7   |  3     7   |  3     7   |  3     8   |  2
    4     MM_Improved   6   |  4     6   |  4     4   |  6     6   |  4
    5       AB_Open     3   |  7     6   |  4     8   |  2     4   |  6
    6      AB_Center    6   |  4     8   |  2     7   |  3     7   |  3
    7     AB_Improved   6   |  4     6   |  4     3   |  7     5   |  5
--------------------------------------------------------------------------
          Win Rate:      64.3%        68.6%        62.9%        61.4%
```

custom_score()

This function evaluates each action by ratio of inactive player's legal moves count and active player's legal moves count.

Opponent	Won	Lost
Random	8	2
MM_Open	7	3
MM_Center	7	3
MM_Improved	6	4
AB_Open	6	4
AB_Center	8	2
AB_Improved	6	4

Win Rate: 68.6%

Win rate is improved from **custom_score_2()** instead of decreasing wins against *AB_Open* and *MM_Open* opponent. Especially this becomes getting better score against *AB_Improved*.

custom_score_2()

This function evaluates each action by subtract inactive player's legal moves from active player's legal moves. Each count of moves are squared to emphasis the difference. This function based on the simple consideration: The more action able to choice, the harder to be checkmated.

Opponent	Won	Lost
Random	8	2
MM_Open	7	3
MM_Center	7	3
MM_Improved	4	6
AB_Open	8	2
AB_Center	7	3
AB_Improved	3	7

Win Rate: 62.9%

This rate is not bad, but this function seems difficult to defeat AB_Improved.

custom_score_3()

This function evaluates each action by the distance between each player's location. This function based on the consideration that it is good at keeping long distance in order to be alive.

Opponent	Won	Lost
Random	8	2
MM_Open	5	5
MM_Center	8	2
MM_Improved	6	4
AB_Open	4	6
AB_Center	7	3
AB_Improved	5	5

Win Rate: 61.4%

Conclusion

Based on the result, I would recommend to custom_score. There are two reasons. First, of cause it has the highest win rate. Second, this function has stability, in words, it keeps better win rate even if any opponent comes. AB_Custom (custom_score) is the only function which keeps 50% over win rate against all opponent in the playing matches result.