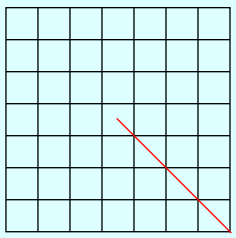
Distance



0 ~ 1

The further it got
More score it achieve

Ratio

$$\frac{\text{Blank space left}}{\text{Total space}}$$

1 –〉 0

As the game goes
the ratio goes lower

Flipping minus to plus

$$\frac{\frac{1}{2}\text{ Total space} - \text{Blank space left}}{\text{Total space}}$$

$-\frac{1}{2}$ –〉 $+\frac{1}{2}$

As the game goes
the ratio goes lower

Name	Algorithm	Time complexity	Space complexity	Win rate
AB_Improved	My move − Opp move	O(5)	O(3)	61~78%
AB_custom_1	My move − ☐ Opp move	O(5)	O(3)	
	1			67.1%
	2			67.1%
	2.5			70.1%
AB_custom_2	☐ My move − Opp move	O(5)	O(3)	62.9%
	0.5			72.9%
	1			72.9%
	2			71.4%
AB_custom_3	Distance	O(6)	O(6)	65.7%
AB_custom_4	My move − Ratio * Opp move	O(9)	O(8)	75.7%
AB_custom_5	My move − Opp move + Distance	O(8)	O(8)	64.3%
AB_custom_6	My move − Opp move + Distance * Flipping minus to plus	O(11)	O(13)	70.4%
AB_custom_7	My move − Ratio * Opp move + Distance * Flipping minus to plus	O(12)	O(14)	74.3%

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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        18 |   2      18 |   2      19 |   1      20 |   0
   2       MM_Open       17 |   3      14 |   6      15 |   5      15 |   5
   3      MM_Center      18 |   2      17 |   3      19 |   1      19 |   1
   4     MM_Improved     15 |   5      14 |   6      11 |   9      15 |   5
   5       AB_Open       11 |   9      11 |   9       8 |  12      11 |   9
   6      AB_Center       9 |  11      11 |   9      12 |   8      11 |   9
   7     AB_Improved     12 |   8       9 |  11       6 |  14       9 |  11
-------------------------------------------------------------------------------
          Win Rate:      71.4%         67.1%         64.3%         71.4%
```

AB_custom_4 AB_custom_6 AB_custom_7

3) I tried to add distance. And just distance give bad results. But when I multiply distance with flipping minus to plus it got good results. Trying to be close to middle in the beginning of the game and far when the end is close. The results got constant when I add distance.

I choosed the AB_custom_7 heuristic

1) About 400 games played about AB_Improved the Win Rate varies by 61~78%. It means its does not give constant results. I find other. AB_custom_7 gives constant results around 70%.

2) When giving a change in my move and to opp moves, compared to others giving opp move a ratio multiply ended the best results 75.7%. So I choosed the one with the ratio.

4) Seems with just normal heuristics making time complexity less is sometimes more effective because it goes more deeper. Still cant figure out whats the best algorithm to beat out the AB_Improved with more time complexity.