- Your analysis should conclude with a comparison of the different heuristics and your reasoning for choosing the heuristic you ultimately use in your submitted agent.

On the heuristic search function, I try three kinds of the value calculation：

1、 AB_Custom: For the three state variables: the number of steps I can walk, the number of steps the opponent can walk, the distance from the center. I try to give different weights to calculate the sum of variables and compare to the winning rate results . Then I iterate the best result of weights expression:

2*own_moves-opp_moves + center*0.01

2、 AB_Custom_2：Using a logic of contrast, when the number of steps I can walk more than the opponent return a positive feedback, when less than the opponent return a negative feedback, when the numbers are same return 0

3、 AB_Custom_3: I try to use two step number with many different non-linear heuristic value calculation, then I found the better expression:

own_moves/(1+opp_moves**2)

Run tournament.py get the result (I ignore the same kinds of value calculations with different weights I iterate to the best result):

```
**************************
    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        8   |  2        9   |  1
   2      MM_Open         9   |  1         7  |  3        7   |  3        6   |  4
   3      MM_Center       7   |  3         8  |  2        8   |  2        7   |  3
   4      MM_Improved     8   |  2         8  |  2        8   |  2        9   |  1
   5      AB_Open         4   |  6         5  |  5        4   |  6        7   |  3
   6      AB_Center       5   |  5         6  |  4        6   |  4        7   |  3
   7      AB_Improved     5   |  5         8  |  2        4   |  6        5   |  5
--------------------------------------------------------------------------------
          Win Rate:      64.3%           74.3%           64.3%           71.4%
```

Compared the result, I found that only use the number of steps I can walk and the number of steps the opponent can walk, it's hard to get a bigger boost，a good choice of function is "2*own_moves-opp_moves". At the beginning I try to add the variable of the distance from the center, I got a worst result of the wining rate. Then I found that when I use a small weight of the distance from the center, it can sort the values when other variables function return same values and do not have any effect when other variables function return different. It's a good way to improve winning rate compare to other heuristic calculation.