In this project, I've used the following three heuristic functions

funciton 1 :

float(1*len(my_moves) - 2 *len(opp_moves))

which get a winning rate of 74.3% in the tournament

In this function, the parameter "2" and the parameter "1" in front of

len(my_moves) can be optimized to get a better outcome. the reason I

choose this function is that , normally,the larger the difference the

better chance my move will win the game.And a weighted average difference

may give more freedom to the function.

function 2:

float(len(my_moves)**2 /(1+ len(opp_moves)))

This function gives a winning rate of 67.1%
This function can be interpreted as the ratio between my_moves and my_opp

moves ,and use the results to time the number of my_moves. My reason is as follows,

a higher ratio is gaining winning strategy for me and winning rate may be higher

if I have lots of moves to choose.

funciton 3:

float(len(my_moves) - 2*len(opp_moves)) / (float(len(my_moves) + len(opp_moves)+1))

this function gives a winning rate of 71.4%

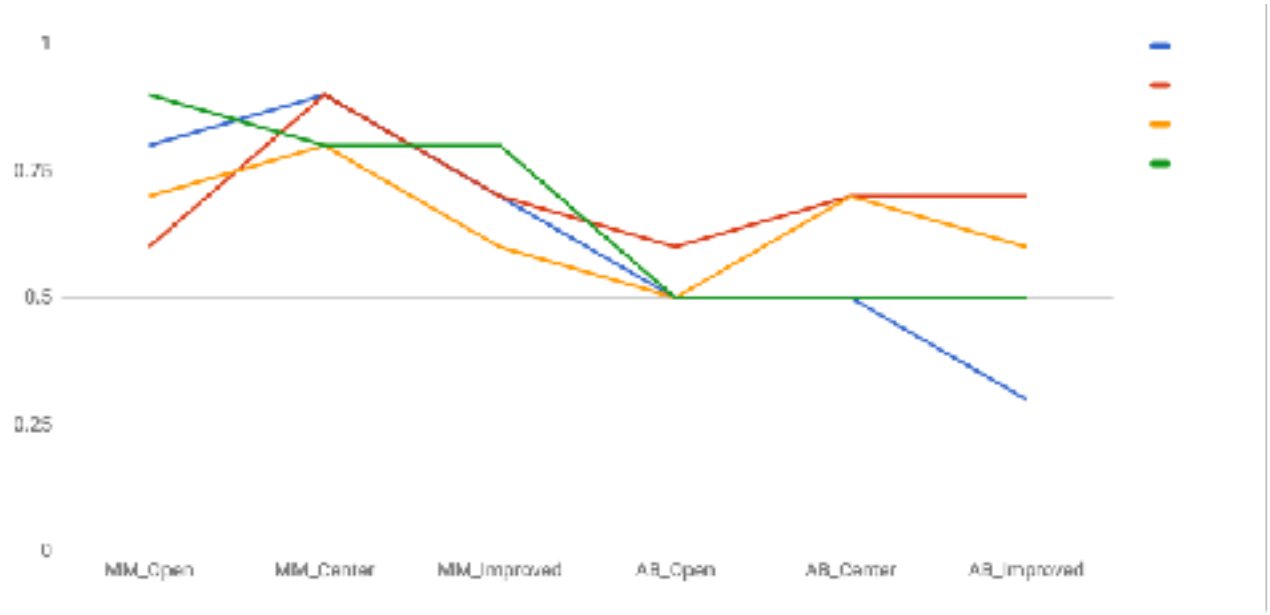
In this function, I'm using the weighted difference to divide the sum of both players' moves

My fundamental asumption is still the same- the larger the difference the better

the winning possibility, the only difference is that ,here, I use the relative difference

rather than the absolute difference as the first heuristic.

Opponent	AB_Improved	AB_Custom	AB_Custom_2	AB_Custom_3
Random	0.9	1	0.8	1
MM_Open	0.8	0.6	0.7	0.9
MM_Center	0.9	0.9	0.8	0.8
MM_Improved	0.7	0.7	0.6	0.8
AB_Open	0.5	0.6	0.5	0.5
AB_Center	0.5	0.7	0.7	0.5
AB_Improved	0.3	0.7	0.6	0.5
Win Rate:	65.70%	74.30%	67.10%	71.40%
standard deviation	0.229906813420444	0.151185789203691	0.111269728052837	0.211570094204982



1.the first and the third one both reached a winning rate higher than 70%.

2.Judging from the result above, the first heuristic function has a lower standard deviation, hence is more stable than the third one.

3. for the third function float(len(my_moves) - 2*len(opp_moves)) / (float(len(my_moves) + len(opp_moves)+1))

If the differences of the moves are the same(give the same numerator), the less moves in total (the smaller the denominator), the higher the value of the third heuristic will be. In this situation, the third heuristic will choose the state with less moves, which may not be a good choice in some situations, compared with the third one, the first heuristic is simple and easy to predict its behavior.

Therefore , the first heuristic function will be the final choice.