

# Heuristic Analysis

As shown on table 1, there are 3 custom evaluation heuristic functions which I try against the ID\_Improved agent.

Table 1 - Tournament Results

Opponent	AB_Improved		AB_Custom		AB_Custom2		AB_Custom3	
	Won	Lost	Won	Lost	Won	Lost	Won	Lost
Random	18	2	17	3	18	2	19	1
MM_Open	14	6	12	8	16	4	15	5
MM_Center	12	8	17	3	17	3	17	3
MM_Improved	10	10	11	9	11	9	13	7
AB_Open	8	12	12	8	10	10	14	6
AB_Center	11	9	10	10	11	9	10	10
AB_Improved	10	10	11	9	13	7	13	7
Win Rate	59.29%		64.29%		68.57%		72.86%	

## Heuristic 1 - AB\_Custom:

This heuristic returns the difference between current player possible moves and the opponent moves multiply by a factor that take influence from the ratio between remains blank spaces and max blank spaces which give more important to the opening move.

We try to give more important to the opening in order to get max benefit when we have more moves then in the late game.

As we can see on the data at table 1, the win rate of AB\_custon is better than AB\_Improved by 5%

## Heuristic 2 - AB\_Custom2:

This heuristic as in heuristic 1, return the difference between current play moves and his opponent, but this time the opponent move get more weight by multiply with 2 and also multiply with the square of the distance from the center for the current player position, this way we give more important to moves from the center of the board which may have more possibilities and important.

As we can see on the data at table 1, the win rate of AB\_custon2 is better than AB\_Improved by 9.28%

## Heuristic 3 - AB\_Custom3:

This heuristic as in heuristic 2, return the difference between the numbers of moves and get more important to the move from near to the center of the board, but this time when we calculate the moves we also multiply by the sum of available 'next' moves – sum of all the available move for each current available move, by doing so we may lose some calculating time but it only moving on the current board state so it is still much more efficient than moving one more depth level, and we benefit from having much more correct score.

As we can see on the data at table 1, the win rate of AB\_custon3 is better than AB\_Improved by 13.57%

## Recommendation for the best evaluation function:

My Recommendation for the best evaluation function is Heuristic 3 - AB\_Custom3, I base my decision on the following:

1. As shown in Table 1, AB\_custon3 gets the best score comparing to all others custom heuristics function
2. It has impressive 13.57% better win rate than AB\_Improved.
3. Although it needed more calculations, it's still light calculation and much more efficient than moving to another depth, and still, have big benefits from looking more forward for the available moves.