Heuristic Analysis

results of three custom heuristic functions

I plan to adjust the weight between the move number of player and its opponent.

- proportional metrics: Take the ratio of the player's legal move number versus that of its opponent.
- Center metrics: Higher value if player is closer to the center. Divide the ID_improved score by the player's distance from the center.
- distance metrics: Also weight the opponent as higher if the opponent is closer to the center.

	Random	MM_Null	MM_Open	MM_Improved	AB_Null	AB_Open	AB_Improved
ID_Improved	16	16	12	12	16	14	13
proportional	19	18	10	10	11	9	13
center	18	18	12	13	13	16	9
distance	19	19	16	12	11	9	9

Compared with ID_improved function, the three heuistic functions does not achieve better success rates.

The proportional metrics take the ratio rather than substract form, which I expect to get more advantage at the end of the game, when both available move number become limited, only a subtle change can dominate the game. But as the result shows, the assumption does no better job.

The center metrics takes the assumption that when the player is closer to the center, it has more freedom to transfer to different parts of the board, rather than being suppressed to the corner. So I add the weight to undermine the distance of player from center. As the result shows, it does not perform better.

The distance metrics substract the weight measure of distance from center of opponent and player and does not perform better.

I figure out the heuristic functions should have discriminate the win and loss opportunities as great as possible. The wining position should have the highest value, while the losing position should get the lowest value. In the absence of enough computational resources, we may not reach the terminal state, so we need to make the assumption to calculate odd chances for us to win and the next player to lose at the current position. We can simulate human player tactics, in the isolation game, for example, the available moves and current position in the view of whole board can affect the winning chances. As the time goes, the available move are scarce, thus the chance to win is also low. The player should take more aggresive moves, in the case that the opponent will always suppress the heuristic value at his turn of the adversarial game. We can also add the time element to our heuristics.

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