Heuristic Analysis

The three heuristics I experimented used only the number of moves the player had, and the number of moves the opponent had, in each ply.

The heuristic custom_score uses 2 times the number of legal player moves, minus the number of opponent moves. This will cause the agent to try to run away from the opponent, in a defense type of game. By trying to maximize this function, the agent will try to maximize his number of moves and minimize the number of opponent moves. However, since the formula gives more weight to the agent moves, his efforts will go more to try to amplify his number of moves than minimizing the opponent (for example, when given the choice, the agent will give less importance to a play that minimizes the opponent moves to 1 than to one that amplify his moves by 1). Since to minimize the opponent's moves the player will have to be in situations in which his moves are also minimized, this formula will give the impression the agent is running away from the opponent. This heuristic got a winning rate of 70% , being the worst score of the 3 heuristics.

The heuristic custom_score_2 uses the number of legal player moves minus the number of opponent moves. This formula gives a baseline to the other 2 custom scores. In this heuristic the agent will give the same importance to minimize the opponent's moves and to maximize its own, alternating between offense and defense. This heuristic got a winning rate of 72,9%, below the 78,6% of the baseline.

The heuristic custom_score_3 uses the number of legal player moves minus 2 times the number of opponent moves. This heuristic makes the agent chase after the opponent, because the heuristic gives more importance to minimize the opponent's moves than to maximizing its own (given the choice of minimizing the opponent's moves by 2 or maximizing its own moves by 2 this agent will choose the first alternative). This gives the impression the agent is chasing the opponent. This heuristic got a winning rate of 80%, the only heuristic above the baseline.

With these results we can conclude that between the 3 heuristics used, the most aggressive one could obtain much better results than the others.

Before choosing these heuristics I've tried heuristics that rewarded locations near the edges, and heuristics that used the number of blank spaces as offset, for example: number of blanks – (number of opponent moves – number of player moves) . I didn't use these heuristics because their results weren't satisfactory.