

****Advanced Heuristic****

- What features of the game does your heuristic incorporate, and why do you think those features matter in evaluating states during search?

I added to the original “#ofMyMoves - #ofOpponentsMoves” heuristic a measure for distance of players to the board’s center (positive for opponent’s distance to center and negative to own distance to center).

The idea is that at the beginning stages, blocked locations are scarce, most locations on the center $5 * 7$ of the $9 * 11$ board have similar “#ofMyMoves - #ofOpponentsMoves” values. At this point, it is useful to stay near the center while driving the opponent away from the center. A weight $w = x$ [$x = 1, 2, 3$] is added to either component at different stages.

- Analyze the search depth your agent achieves using your custom heuristic. Does search speed matter more or less than accuracy to the performance of your heuristic?

My agent gets to depth 6-7 within the 150msec limit.

Comparing to the baseline (the original “#ofMyMoves - #ofOpponentsMoves” heuristic) agent, since it reaches similar depth, search speed matters less than accuracy.

Comparing to minimax agent, which reaches to about half depth, search speed matters more than accuracy.

Below are some experimental results (only time_limit = 150msecs and w = 2 were chosen for sampling for depth = 5)

Sample rounds: 150; Depth: 3

Heuristics Time limit (msecs)	Baseline	Custom (w = 1)	Custom (w = 2)	Custom (w = 3)
150	50.0%	51.2%	53.8%	58.8%
300	50.0%	53.0%	53.8%	53.2%

Sample rounds: 150; Depth: 5

Heuristics Time limit (msecs)	Baseline	Custom (w = 1)	Custom (w = 2)	Custom (w = 3)
150	61.7%	/	74.6%	/