Report

In this experiment I had the computer play itself a total of 200 times, utilizing two different heuristics. The first heuristic, *h1* , used two functions to determine a heuristic value. One function was used for movement. A value of +1 was given if the next move contained more adjacent squares with tokens than the last space, a +0 was given if the next move had the same number of adjacent squares with tokens, and a -1 if it had less adjacent spaces with tokens. The second function was used for removing a token. A +2 was given if removing a token resulted with the opponent having less tokens in adjacent tiles, a +0 if the number of tiles around opponent remained unchanged, and a +100 if the number of adjacent tiles with tokens was 0. The second heuristic, *h2*, was very similar to *h1*. The function that gave movement a heuristic value remained the same but the function that returned a value based on token removal was modified. The same logic was used with the added logic of if the removal of a tile would result in blocking a path past 2 diagonal tiles. This would result in a +4 value. It also accounted for if the opponent was on a perimeter tile. It would first block a tile directly opposite of the edge to attempt to keep the opponent on the perimeter. It would then choose perimeter tiles to try and box the opponent in, resulting with the same +4 value.

I had hypothesized that the second heuristic would have a higher winning percentage than the first heuristic. This was because the second heuristic would strategically try and block the opponent from accessing sections of the board. Looking at the results, out of 200 games, 50 of those games were played using *h1* for player 1 and *h2* for player 2. Player 1 had a total of 19 wins and player 2 had a total of 31 wins, with an average of 17 turns. This was expected because of the nature of picking surrounding opponent tiles to remove and my program randomly picking one of them to remove, assuming the total heuristic value for the simulated moves were the same. In another 50 games, *h2* was used for player 1 and *h2* was used for player 2. This resulted in player 1 with 26 wins and player 2 with 24 wins, with an average pf 17 turns. These results were much closer together than the last, suggesting this *h2* provides more balanced and predictable gameplay. Finally in the last 100 games *h1* was used with player 1 and *h2* was used with player 2, with both players going first a total of 50 times each. The results showed player 1 won 61 times, player 2 won 39 times, and an average turn rate of 17. With the same estimated turn rate as the other tests, it shows the choice of heuristics *h1* and *h2* did not significantly affect the game’s duration. However, the same cannot be said with the game’s outcome. Contrary to my hypothesis, *h1* outperformed my implementation of *h2* in direct matches.