I used three custom functions, two were similar in architecture and had >=60% win rates the third had 70%.

AB_Custom

The AB_Custom heuristic returns float(own_moves - 5**exp(.035*-step)*opp_moves) Where own_moves is the players legal moves for a given board, opp_moves is the opponents legal moves and step is the total board – blank spaces. The exponent dampens the aggressiveness of the player so it is more aggressive at the beginning of the game and conservative at the end. The idea is that the player should try to box the opponent early and if not successful, stay alive.

AB_Custom_2

AB_Custom_2 returned float(own_moves - 5**exp(.035*-(49-step))*opp_moves), which has the opposite effect of the previous heuristic. The player becomes more aggressive at the end of the game. The rational is that the earlier moves do not mean as much because there is so much open board, but spaces become more valuable as the game proceeds.

AB_Custom_3

AB_Custom_3 returns float(own_moves - 5*opp_moves). The heuristic maintains a consistent level of aggressiveness throughout the game. The game is not complex and space is always a premium. If there is a chance to box an opponent in at any moment of the game it should be taken.

Results and Discussion

AB_Custom and AB_Custom_2 won >=60% of the games and AB_Custom_3 won 70% of the games seen in table 1 below. I think that AB and AB2 have the potential to perform better with more testing, but I do not think they will ever perform better than AB3. Space is important throughout the game and I do not believe that slowly changing strategy as it proceeds will ever result in a better win rate than consistently attacking the opponent player's board space. I recommend the AB# heuristic because its simplicity matches the games. It attacks the opponent's board space and beat out the other heuristics by more than 8 percentage points.

Match #	Opponent	AB_Improved Won | Lost	AB_Custom Won | Lost	AB_Custom_2 Won | Lost	AB_Custom_3 Won | Lost
1	Random	8 | 2	6 | 4	8 | 2	9 | 1
2	MM_Open	6 | 4	8 | 2	6 | 4	8 | 2
3	MM_Center	7 | 3	8 | 2	8 | 2	8 | 2
4	MM_Improved	9 | 1	7 | 3	6 | 4	7 | 3
5	AB_Open	4 | 6	4 | 6	5 | 5	4 | 6
6	AB_Center	6 | 4	5 | 5	6 | 4	8 | 2
7	AB_Improved	6 | 4	4 | 6	4 | 6	5 | 5
	Win Rate:	65.7%	60.0%	61.4%	70.0%