Heuristic Analysis

These are the four heuristic functions I had developed for this project:

HF1: p1 - p2 ^ 2
HF2: p1 - p2 * 2
HF3: HF1+HF2
HF4: HF1 + HF2 * 2

*p1 = len(game.get_legal_moves(player))
*p2 = len(game.get_legal_moves(game.get_opponent(player)))

I performed the benchmark on all four functions (default 20 match tournament). The table below shows the result.

	HF1	HF2	HF3	HF4	Massive HF4
Random	16:4	17:3	19 : 1	17:3	339:61
MM_Null	15:5	13:7	13 : 7	19:1	324:76
MM_Open	13:7	12:8	15 : 5	13:7	253:147
MM_Improved	11:9	12:8	14 : 6	13:7	259:141
AB_Null	15:5	14:6	15 : 5	15:5	299:101
AB_Open	13:7	12:8	13 : 7	14:6	255:145
AB_Improved	10:10	15:5	10 : 10	12:8	235:165
Overall	66.43	67.86	70.71	73.57	70.14

HF1 is an variation from HF2 that gives more weight on reducing opponents moving, because n^2 > n*2 when n>=2.

HF2 is the function covered in the lecture.

By comparing HF1 and HF2, I found out that the overall winning rate were close. Therefore, I decided to combine the two functions which produced HF3. Results show that most of the match results were improved more or less. However, AB_Improved winning rate dropped significantly comparing to the HF2, and remained at the same level as HF1.

Therefore I decided to give more weight to the HF2 result, which produced HF4 which, improved in all aspect.

In conclusion, I chose HF4 as my heuristic function, and it was proved to be effective by massive number of tournaments played. Although overall decreased compared to HF3 and HF4 but still better than any of HF1 and HF2.