# Analysis of Evaluation Function

## Restrict Opponent

As an easy introduction I tried a slightly modified version of the improved score. This change was also suggested during the lectures.

own\_moves - (2 \* opp\_moves)

It’s focus is to minimize the opponent’s move as much as possible.

The performance against the test opponents was under 50% and performed considerably worse than the original improved score evaluation, which showed a performance of 70.71%, whereas ID\_Improved showed a performance of 72.86%. The values of ID\_Improve over all tournaments seem to vary between 5-6% points.

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Evaluating: Student

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Playing Matches:

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Match 1: Student vs Random Result: 5 to 15

Match 2: Student vs MM\_Null Result: 10 to 10

Match 3: Student vs MM\_Open Result: 7 to 13

Match 4: Student vs MM\_Improved Result: 5 to 15

Match 5: Student vs AB\_Null Result: 9 to 11

Match 6: Student vs AB\_Open Result: 9 to 11

Match 7: Student vs AB\_Improved Result: 8 to 12

Results:

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Student 37.86%

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Evaluating: ID\_Improved

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Playing Matches:

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Match 1: ID\_Improved vs Random Result: 19 to 1

Match 2: ID\_Improved vs MM\_Null Result: 14 to 6

Match 3: ID\_Improved vs MM\_Open Result: 10 to 10

Match 4: ID\_Improved vs MM\_Improved Result: 11 to 9

Match 5: ID\_Improved vs AB\_Null Result: 14 to 6

Match 6: ID\_Improved vs AB\_Open Result: 16 to 4

Match 7: ID\_Improved vs AB\_Improved Result: 18 to 2

Results:

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ID\_Improved 72.86%

## 3/2 Ratio

Since the “Restrict Opponent” performed badly, it is only logical to adapt the ration of my\_moves and opponent\_moves in the opposite way:

(3 \* own\_moves) - (2 \* opp\_moves)

Although it still lays an emphasis on the reduction of the opponents moves, its main objective is to maximize my possibilities. The results are promising. Surprisingly, the algorithm performed flawlessly against AB\_Improved. Overall there is a 10 %-points performance increase over ID\_Improved.

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Evaluating: Student

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Playing Matches:

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Match 1: Student vs Random Result: 18 to 2

Match 2: Student vs MM\_Null Result: 15 to 5

Match 3: Student vs MM\_Open Result: 14 to 6

Match 4: Student vs MM\_Improved Result: 16 to 4

Match 5: Student vs AB\_Null Result: 17 to 3

Match 6: Student vs AB\_Open Result: 15 to 5

Match 7: Student vs AB\_Improved Result: 20 to 0

Results:

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Student 82.14%

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Evaluating: ID\_Improved

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Playing Matches:

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Match 1: ID\_Improved vs Random Result: 16 to 4

Match 2: ID\_Improved vs MM\_Null Result: 17 to 3

Match 3: ID\_Improved vs MM\_Open Result: 14 to 6

Match 4: ID\_Improved vs MM\_Improved Result: 12 to 8

Match 5: ID\_Improved vs AB\_Null Result: 15 to 5

Match 6: ID\_Improved vs AB\_Open Result: 12 to 8

Match 7: ID\_Improved vs AB\_Improved Result: 15 to 5

Results:

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ID\_Improved 72.14%

## 3/2 Late-Game Variation

As in late-game it might be advantageous to increase the focus on limiting your opponents possibilities, a variation was examined where the focus on the opponents move is linearly increased by the move counter of the game.

(3 \* own\_moves) - ((2 + (game.move\_count / 15)) \* opp\_moves)

The evaluation function performed worse than ID\_Improved but still better than the first heuristic:

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Evaluating: Student

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Playing Matches:

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Match 1: Student vs Random Result: 13 to 7

Match 2: Student vs MM\_Null Result: 17 to 3

Match 3: Student vs MM\_Open Result: 13 to 7

Match 4: Student vs MM\_Improved Result: 9 to 11

Match 5: Student vs AB\_Null Result: 14 to 6

Match 6: Student vs AB\_Open Result: 10 to 10

Match 7: Student vs AB\_Improved Result: 14 to 6

Results:

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Student 64.29%

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Evaluating: ID\_Improved

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Playing Matches:

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Match 1: ID\_Improved vs Random Result: 16 to 4

Match 2: ID\_Improved vs MM\_Null Result: 17 to 3

Match 3: ID\_Improved vs MM\_Open Result: 13 to 7

Match 4: ID\_Improved vs MM\_Improved Result: 13 to 7

Match 5: ID\_Improved vs AB\_Null Result: 17 to 3

Match 6: ID\_Improved vs AB\_Open Result: 13 to 7

Match 7: ID\_Improved vs AB\_Improved Result: 17 to 3

Results:

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ID\_Improved 75.71%

## Final Choice

In the end, the only wise choice is to go with the “3/2 Ratio” evaluation function. It has performed outstandingly well with an 10 %-point increase over ID\_Improved and more +20 improvement over the other heuristics. It is hard to say why the “3/2 Ratio” outperforms the other options. Without further empirical testing, a final verdict is not possible.