Heuristic Analysis

The basic idea behind these two heuristics is to improve the score for available moves for a player and penalize for available moves of opponent:

Heuristic 1: my_moves – (2 * opponent_moves)
Heuristic 2: my_moves / opponent_moves

The above-mentioned heuristics are simple and very straightforward but they might not represent the best score for a position w.r.t a player. For example, a position with just 2 open moves might lead to places where both the states have 4 or 5 further moves and a position with 4 open moves might lead to all dead ends with no moves left. Keeping that in mind, I developed the following heuristic, which calculates the ability of a player to move in the next ply.

Heuristic 3: [sum of my_moves for all possible next states of the player] - [sum of opponent_moves for all possible next states of the opponent].

My Choice: Heuristic 3 for the following reasons:

- It makes sure that it gives more score for moves that lead to states with more possible moves.
- It avoids the moves that lead us to losing states.
- It outperforms the ID_Improved (my_moves – opponent_moves) agent better than other heuristics.

The performance results are pasted below.

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**************************
 Evaluating: Student 1
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Playing Matches:
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 Match 1:  Student 1  vs   Random        Result: 317 to 83
 Match 2:  Student 1  vs   MM_Null       Result: 313 to 87
 Match 3:  Student 1  vs   MM_Open       Result: 257 to 143
 Match 4:  Student 1  vs MM_Improved     Result: 254 to 146
 Match 5:  Student 1  vs   AB_Null       Result: 300 to 100
 Match 6:  Student 1  vs   AB_Open       Result: 244 to 156
 Match 7:  Student 1  vs AB_Improved     Result: 239 to 161


Results:
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Student 1         68.71%
```

****
Evaluating: Student 2
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Playing Matches:

Match 1: Student 2 vs Random Result: 329 to 71
Match 2: Student 2 vs MM_Null Result: 293 to 107
Match 3: Student 2 vs MM_Open Result: 256 to 144
Match 4: Student 2 vs MM_Improved Result: 237 to 163
Match 5: Student 2 vs AB_Null Result: 269 to 131
Match 6: Student 2 vs AB_Open Result: 251 to 149
Match 7: Student 2 vs AB_Improved Result: 246 to 154

Results:

Student 2 67.18%

****
Evaluating: Student 3
****

Playing Matches:

Match 1: Student 3 vs Random Result: 345 to 55
Match 2: Student 3 vs MM_Null Result: 318 to 82
Match 3: Student 3 vs MM_Open Result: 249 to 151
Match 4: Student 3 vs MM_Improved Result: 239 to 161
Match 5: Student 3 vs AB_Null Result: 315 to 85
Match 6: Student 3 vs AB_Open Result: 260 to 140
Match 7: Student 3 vs AB_Improved Result: 236 to 164

Results:

Student 3 70.07%

****
Evaluating: ID_Improved
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Playing Matches:

Match 1: ID_Improved vs Random Result: 339 to 61
Match 2: ID_Improved vs MM_Null Result: 291 to 109
Match 3: ID_Improved vs MM_Open Result: 249 to 151
Match 4: ID_Improved vs MM_Improved Result: 246 to 154
Match 5: ID_Improved vs AB_Null Result: 303 to 97
Match 6: ID_Improved vs AB_Open Result: 250 to 150
Match 7: ID_Improved vs AB_Improved Result: 230 to 170

Results:

ID_Improved 68.14%