# Heuristic for L shaped isolation

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I defined various heuristics however first two are the ones which are present in code in uncommented format; I choose the ***second heuristic as the final one*** for the project, based on test results. For experiments, I ran each tournament 5 times and present my result with each of three heuristics across those 5 tournaments later in the document. In effect I ran 100 \*5 = 500 games per heuristic for student player vs improved player. In summary I did see a better score than improved player. Below I first present each of the heuristic with its result on the tournament.

*If reader of this document have time then you can read through the entire document to see the misery I have been going through to create better heurisitcs. If not then feel free to skip after Choosing as final heuristic.*

## Improved\_improved\_heuristic:

This one is slight improvement over already provided improved\_heuristic. This one is based on "go after" opponent philosophy by giving extra weight to opponent moves for e.g this becomes #my\_moves – 2\*#opponent\_moves. I.e. multiplying opponent moves by 2.

I did not see any significant improvements than improved however score was on par.

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| --- | --- | --- |
| **Tournament #** | **Improved** | **Student - improved\_improved** |
| 1 | 57.14% | 58.86% |
| 2 | 60.00% | 61.00% |
| 3 | 57.00% | 59.00% |
| 4 | 57.86% | 59.86% |
| 5 | 62.00% | 61.00% |

## Score\_extra:

After trying with tons of heurisitcs as mentioned below and some I choose not to include; I realized that maybe searching is a better option. So my heuristic function returns score of not first level of legal\_moves but for next level. This has shown consistent improvement with improved score. Basis of selecting this heuristic was that I imagine opponent is not moving then what are high legal moves in next level.

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| --- | --- | --- |
| **Tournament #** | **Improved** | **Student - search\_extra** |
| 1 | 60.00% | 74.00% |
| 2 | 63.00% | 65.00% |
| 3 | 55.30% | 68.00% |
| 4 | 55.00% | 66% |
| 5 | 59.00% | 65% |

## *Choosing above as final heuristic*

Its pretty obvious from table that this heuristic performs better if not worse than improved across 500 games. More notably it performs better on MM\_Open and MM\_improved than ID\_Improved. Probably because its better than greedy for current level

## Extra heurisitcs which scores poor than improved

## Heuristic\_priority:

As we see that its beneficial for a player to move towards center of the board as opposed to rims and corners. This became the basis of my first heuristic. I assumed that even if center pieces or good positions have less score that would still be better than corners or rims. Result of this heuristic is not that bad in comparison; given that we don’t take opponent moves into account at all.

Please see code for more details in function heuristic\_priority. I came up with random weight(score) if move is in eights etc. and -ve score if move is in bad position like rims or corner.

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| --- | --- | --- |
| **Tournament #** | **Improved** | **Student - heuristic priority** |
| 1 | 57.14% | 52.86% |
| 2 | 60.00% | 55.00% |
| 3 | 57.00% | 51.14% |
| 4 | 57.86% | 57.14% |
| 5 | 62.00% | 53.00% |

## Heuristic\_penalty:

This heuristic was slight improvement over our first heuristic in theory. For e.g. for a given proposed move if it has any further legal moves(its 2 level deep from get move function) which are in opponent legal moves then we penalize those moves. Amount of penalty based on the move is higher for a better move because that move is what we expect the opponent to take as it is a good move.

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| --- | --- | --- |
| **Tournament #** | **Improved** | **Student - heuristic penalty( priority + penalty)** |
| 1 | 60.00% | 52.86% |
| 2 | 65.00% | 55.71% |
| 3 | 61.43% | 47.00% |
| 4 | 60.71% | 48% |
| 5 | 57.00% | 54% |

Unfortunately above heuristic didn’t work out better than improved score.

# Heuristic\_final

This is the heuristic which combines above two heuristics with slight modification to second one; in that it uses improved score with penalty. While choosing one of the heuristics it uses first for initial part of game when there were sufficient blank moves and second for the later part.

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| --- | --- | --- |
| **Tournament #** | **Improved** | **Student - heuristic improved + penalty/ priority** |
| 1 | 60.00% | 58.00% |
| 2 | 61.00% | 63.00% |
| 3 | 59.00% | 61.00% |
| 4 | 56.00% | 53% |
| 5 | 59.00% | 63% |