Heuristic Analysis

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Definition

In computer science, artificial intelligence, and mathematical optimization, a heuristic is a technique designed for solving a problem more quickly when classic methods are too slow, or for finding an approximate solution when classic methods fail to find any exact solution. This is achieved by trading optimality, completeness, accuracy, or precision for speed. In a way, it can be considered a shortcut.A heuristic function, also called simply a heuristic, is a function that ranks alternatives in search algorithms at each branching step based on available information to decide which branch to follow. For example, it may approximate the exact solution.***[Wikipedia]***

Approach 1:

$$\#\ of\ my\ moves - \#\ of\ opponent\ moves$$

Approach 2:

$$\#\ of\ my\ moves \cdot 2 - \#\ of\ opponent\ moves$$

Approach 3:

$$\#\ of\ my\ moves + \#\ of\ opponent\ moves + move\ count$$

The **original** intention is to combine and weighting simple features such as:

- # of my moves
- # of opponent moves
- # of blank spaces
- # of moves made
- …

in a simple different ways, eg.simple linear like:

$$1 + w_1 \cdot feat_1 + w_2 \cdot feat_2 + ... + w_n \cdot feat_n$$

and then instantiate game_agents with absolutely random weights, discard clear losers and mutate a couple of winners.

Because of the insufficient time, I only ran 3 sets and unfortunately, none of them did well. The first one is chosen since it’s better than other two.

```
**************************
 Evaluating: ID_Improved
**************************

Playing Matches:
----------
  Match 1: ID_Improved vs   Random      Result: 19 to 1
  Match 2: ID_Improved vs   MM_Null     Result: 15 to 5
  Match 3: ID_Improved vs   MM_Open     Result: 10 to 10
  Match 4: ID_Improved vs MM_Improved       Result: 10 to 10
  Match 5: ID_Improved vs   AB_Null     Result: 12 to 8
  Match 6: ID_Improved vs   AB_Open     Result: 10 to 10
  Match 7: ID_Improved vs AB_Improved       Result: 14 to 6


Results:
----------
ID_Improved        64.29%

**************************
Evaluating: heuristic_function_first
**************************

Playing Matches:
----------
  Match 1: heuristic_function_first vs   Random        Result: 15 to 5
  Match 2: heuristic_function_first vs   MM_Null       Result: 11 to 9
  Match 3: heuristic_function_first vs   MM_Open       Result: 12 to 8
  Match 4: heuristic_function_first vs MM_Improved   Result: 10 to 10
  Match 5: heuristic_function_first vs   AB_Null       Result: 12 to 8
  Match 6: heuristic_function_first vs   AB_Open       Result: 12 to 8
  Match 7: heuristic_function_first vs AB_Improved   Result: 8 to 12


Results:
----------
heuristic_function_first     57.14%

**************************
Evaluating: heuristic_function_second
**************************

Playing Matches:
```

```
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  Match 1: heuristic_function_second vs   Random     Result: 13 to 7
  Match 2: heuristic_function_second vs   MM_Null    Result: 11 to 9
  Match 3: heuristic_function_second vs   MM_Open          Result: 8 to 12
  Match 4: heuristic_function_second vs MM_Improved       Result: 5 to 15
  Match 5: heuristic_function_second vs   AB_Null    Result: 11 to 9
  Match 6: heuristic_function_second vs   AB_Open    Result: 10 to 10
  Match 7: heuristic_function_second vs AB_Improved       Result: 10 to 10


Results:
----------
heuristic_function_second     48.57%

**************************
Evaluating: heuristic_function_third
**************************

Playing Matches:
----------
  Match 1: heuristic_function_third vs   Random       Result: 16 to 4
  Match 2: heuristic_function_third vs   MM_Null      Result: 10 to 10
  Match 3: heuristic_function_third vs   MM_Open      Result: 4 to 16
  Match 4: heuristic_function_third vs MM_Improved  Result: 5 to 15
  Match 5: heuristic_function_third vs   AB_Null      Result: 6 to 14
  Match 6: heuristic_function_third vs   AB_Open      Result: 5 to 15
  Match 7: heuristic_function_third vs AB_Improved   Result: 8 to 12


Results:
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heuristic_function_third     38.57%
```