

HEURISMIC ANALYS

Build a Game-Playing Agent

Antonio Rincon

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1.Base Heuristics

In the starting code provided with the isolation project there are several heuristics provided:

- **open_move_score**
score equal to the number of moves open for your computer player on the board.
- **null_score**
This heuristic presumes no knowledge for non-terminal states, and returns the same uninformative value for all other states
- **center_score**
Outputs a score equal to square of the distance from the center of the board to the position of the player
- **improved_score**
outputs a score equal to the difference in the number of moves available to the two players.

2.Custom Heuristics

As part to beat the improved score, new score heuristic have been tested:

- **improved_score_weight**

outputs a score equal to the difference in the number of moves available to the two players, weighting the opponent moves

```
return float(own_moves - w*opp_moves)
```

- **in_wall**

score the presence of move in the wall borders

```

for m in own_moves:
    if m in walls:
        own_score -= w
    else:
        own_score += w
for m in opp_moves:
    if m in walls:
        opp_score -= w
    else:
        opp_score +=w
return own_score-opp_score

```

- in_border

score the presence of moves in the 4 corners:

```

for m in own_moves:
    if m in corners:
        own_score -= w
    else:
        own_score += w
for m in opp_moves:
    if m in corners:
        opp_score -= w
    else:
        opp_score +=w
return own_score-opp_score

```

3.Evaluation

While testing the tournament application, some warning related to timeouts and forfeit raised. Initialization of best move was changed to selected any available move instead of (-1,-1) to avoid the forfeit warnings. The timeout warning was related to the sleeping mode of the computer.

There was a big variability on the results in different executions, the number of matches per player was increased to 100 to have more homogeneous results in different executions.

custom_score where configured to weight 0.80, .90, 1, 1.10, 1.20 the opponent moves.

Also custom score were tuned add to add a penalty to moves positioned in the walls or corners by .025 and 0.5

Combining a weight 1.1 to opponent moves and weight 0.25 to positions in corner or border it was possible to get 2% improvement.

 Playing Matches

| Match # | Opponent | AB_Improved | | AB_Custom | | AB_Custom_2 | | AB_Custom_3 | |
|-----------|-------------|-------------|------|-----------|------|-------------|------|-------------|------|
| | | Won | Lost | Won | Lost | Won | Lost | Won | Lost |
| 1 | Random | 191 | 9 | 190 | 10 | 189 | 11 | 194 | 6 |
| 2 | MM_Open | 144 | 56 | 144 | 56 | 155 | 45 | 137 | 63 |
| 3 | MM_Center | 169 | 31 | 180 | 20 | 176 | 24 | 176 | 24 |
| 4 | MM_Improved | 133 | 67 | 139 | 61 | 139 | 61 | 136 | 64 |
| 5 | AB_Open | 100 | 100 | 105 | 95 | 101 | 99 | 111 | 89 |
| 6 | AB_Center | 124 | 76 | 131 | 69 | 132 | 68 | 120 | 80 |
| 7 | AB_Improved | 91 | 109 | 95 | 105 | 100 | 100 | 104 | 96 |
| Win Rate: | | 68.0% | | 70.3% | | 70.9% | | 69.9% | |