Heuristic analysis

By Daniel Yovchev

The following three heuristics were used to test my game agent in `tournament.py` :

Heuristic 1

AB_Custom

I really like the simplicity of the AB_Improved evaluation function that's why I decided to use as my first custom function this more aggressive version, by multiplying the opponent moves by a factor of 2 `float(own_moves - (2 * opp_moves))` our game agent becomes more aggressive this improves the win rate drastically.

Heuristic 2

AB_Custom_2

In my second custom heuristic function I used the suggestion from the code reviewer and implemented board stage version to switch between different aggression level based on the level of the board moves.

Heuristic 3

AB_Custom_3

In this heuristic I tried to apply the three strategies discussed in the lectures by combining the score from my custom and AB_Custom_2 heuristic and applying the open move strategy.

Examine the results

```
Win Rate in 6 tournaments 200 matches each:

AB_Improved : 62.616%
AB_Custom   : 63.583%
AB_Custom_2 : 63.766%
AB_Custom_3 : 64.016%
```

The heuristic function I recommend is AB_Custom_3 with 1.4% on average better than AB_Improved the function combines open move strategy and the logic of playing different heuristic based on the number of moves on the board this allow to keep the heuristics simple but effective based on the current board state.

```
                    *************************
                         Playing Matches
                    *************************

 Match #     Opponent    AB_Improved    AB_Custom    AB_Custom_2    AB_Custom_3
                         Won | Lost    Won | Lost    Won | Lost    Won | Lost
    1         Random      163 |  37     166 |  34     172 |  28     170 |  30
    2         MM_Open     136 |  64     131 |  69     129 |  71     136 |  64
    3         MM_Center   146 |  54     156 |  44     150 |  50     150 |  50
    4         MM_Improved 123 |  77     126 |  74     124 |  76     128 |  72
    5         AB_Open     104 |  96     111 |  89     107 |  93     114 |  86
    6         AB_Center   123 |  77     113 |  87     105 |  95     114 |  86
    7         AB_Improved 101 |  99      93 | 107      94 | 106     100 | 100
--------------------------------------------------------------------------------
             Win Rate:      64.0%         64.0%         62.9%         65.1%


                    *************************
                         Playing Matches
                    *************************

 Match #     Opponent    AB_Improved    AB_Custom    AB_Custom_2    AB_Custom_3
                         Won | Lost    Won | Lost    Won | Lost    Won | Lost
    1         Random      154 |  46     162 |  38     173 |  27     167 |  33
    2         MM_Open     122 |  78     129 |  71     125 |  75     135 |  65
    3         MM_Center   150 |  50     152 |  48     155 |  45     156 |  44
    4         MM_Improved 112 |  88     127 |  73     131 |  69     126 |  74
    5         AB_Open     106 |  94     112 |  88     102 |  98     109 |  91
    6         AB_Center   120 |  80     117 |  83     103 |  97     118 |  82
    7         AB_Improved  96 | 104     100 | 100      96 | 104     101 |  99
--------------------------------------------------------------------------------
             Win Rate:      61.4%         64.2%         63.2%         65.1%


                    *************************
                         Playing Matches
                    *************************

 Match #     Opponent    AB_Improved    AB_Custom    AB_Custom_2    AB_Custom_3
                         Won | Lost    Won | Lost    Won | Lost    Won | Lost
    1         Random      157 |  43     168 |  32     176 |  24     167 |  33
    2         MM_Open     131 |  69     134 |  66     126 |  74     136 |  64
    3         MM_Center   152 |  48     155 |  45     148 |  52     148 |  52
    4         MM_Improved 127 |  73     133 |  67     137 |  63     118 |  82
    5         AB_Open     104 |  96     103 |  97     106 |  94     116 |  84
    6         AB_Center   113 |  87     113 |  87     110 |  90     120 |  80
    7         AB_Improved  94 | 106      98 | 102     101 |  99      90 | 110
--------------------------------------------------------------------------------
             Win Rate:      62.7%         64.6%         64.6%         63.9%
```

```
                    **************************
                         Playing Matches
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```

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	170	30	165	35	171	29	160	40
2	MM_Open	128	72	127	73	127	73	133	67
3	MM_Center	155	45	156	44	158	42	146	54
4	MM_Improved	133	67	129	71	129	71	123	77
5	AB_Open	104	96	107	93	112	88	101	99
6	AB_Center	116	84	117	83	106	94	115	85
7	AB_Improved	101	99	97	103	99	101	97	103
	Win Rate:	64.8%		64.1%		64.4%		62.5%	

```
                    **************************
                         Playing Matches
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```

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	149	51	168	32	159	41	167	33
2	MM_Open	127	73	128	72	120	80	133	67
3	MM_Center	145	55	149	51	155	45	143	57
4	MM_Improved	121	79	121	79	125	75	118	82
5	AB_Open	96	104	111	89	114	86	106	94
6	AB_Center	105	95	104	96	111	89	112	88
7	AB_Improved	103	97	99	101	96	104	104	96
	Win Rate:	60.4%		62.9%		62.9%		63.1%	

```
                    **************************
                         Playing Matches
                    **************************
```

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	163	37	157	43	170	30	169	31
2	MM_Open	129	71	127	73	126	74	133	67
3	MM_Center	150	50	149	51	150	50	150	50
4	MM_Improved	117	83	126	74	140	60	128	72
5	AB_Open	111	89	100	100	105	95	100	100
6	AB_Center	100	100	109	91	113	87	125	75
7	AB_Improved	104	96	96	104	100	100	97	103

| Win Rate: | 62.4% | 61.7% | 64.6% | 64.4% |