

Heuristic Analysis By Ng Fang Kiang

Udacity – Artificial Intelligence Nanodegree (Class of 2017)

Heuristic 1:

```
def custom_score(game, player):  
    """  
    . . .  
    """  
    if game.is_loser(player):  
        return float("-inf")  
    if game.is_winner(player):  
        return float("inf")  
    own_moves = len(game.get_legal_moves(player))  
    opp_moves = len(game.get_legal_moves(game.get_opponent(player)))  
    return float((own_moves-2) - opp_moves)
```

Result 1:

***** Playing Matches *****									
Match #	Opponent	AB_Custom		AB_Custom		AB_Custom		AB_Custom	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	8	2	10	0	9	1	8	2
2	MM_Open	5	5	5	5	7	3	8	2
3	MM_Center	9	1	7	3	10	0	7	3
4	MM_Improved	4	6	6	4	6	4	8	2
5	AB_Open	4	6	6	4	7	3	5	5
6	AB_Center	5	5	5	5	4	6	4	6
7	AB_Improved	5	5	4	6	5	5	4	6

Win Rate:		57.1%		61.4%		68.6%		62.9%	

Heuristic 2:

```
def custom_score_2(game, player):  
    if game.is_loser(player):  
        return float("-inf")  
    if game.is_winner(player):  
        return float("inf")  
    own_moves = len(game.get_legal_moves(player))  
    opp_moves = len(game.get_legal_moves(game.get_opponent(player)))  
    return float((own_moves + opp_moves)/2)
```

Result 2:

***** Playing Matches *****									
Match #	Opponent	AB_Custom_2		AB_Custom_2		AB_Custom_2		AB_Custom_2	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	8	2	7	3	8	2	7	3
2	MM_Open	8	2	4	6	6	4	5	5
3	MM_Center	7	3	5	5	7	3	6	4
4	MM_Improved	5	5	5	5	4	6	5	5
5	AB_Open	4	6	4	6	4	6	5	5
6	AB_Center	7	3	5	5	5	5	4	6
7	AB_Improved	5	5	4	6	5	5	5	5

Win Rate:		62.9%		48.6%		55.7%		52.9%	

Heuristic 3:

```
def custom_score_3(game, player):
    if game.is_loser(player):
        return float("-inf")
    if game.is_winner(player):
        return float("inf")
    w, h = game.width / 2., game.height / 2.
    y, x = game.get_player_location(player)
    yl, xl = game.get_player_location(game.get_opponent(player))
    return float(((h - y)**2 + (w - x)**2) + ((h - yl)**2 + (w - xl)**2)) / 2)
```

Result 3:

Playing Matches									

Match #	Opponent	AB_Custom_3		AB_Custom_3		AB_Custom_3		AB_Custom_3	
		Won	Lost	Won	Lost	Won	Lost	Won	Lost
1	Random	8	2	9	1	8	2	6	4
2	MM_Open	6	4	5	5	7	3	8	2
3	MM_Center	10	0	8	2	8	2	8	2
4	MM_Improved	4	6	6	4	5	5	7	3
5	AB_Open	3	7	6	4	4	6	4	6
6	AB_Center	6	4	8	2	4	6	5	5
7	AB_Improved	4	6	4	6	5	5	6	4

Win Rate:		58.6%		65.7%		58.6%		62.9%	