Andrew Morrison

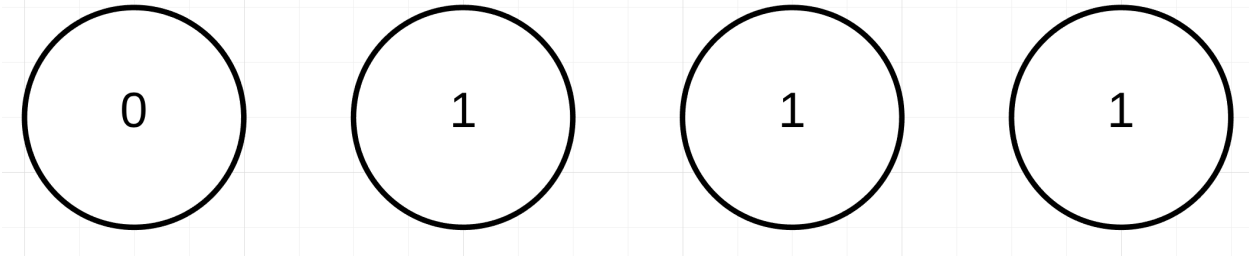
Exercise 2 HW 3

AI Design and Process

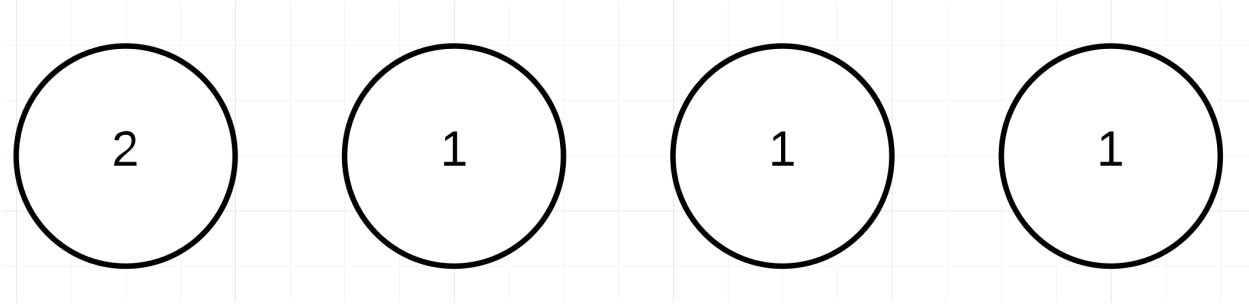
After rethinking the problem several times, I trashed my old plans for this AI. They didn't make sense in practice. I came up with two heuristics that worked much better.

Heuristic 1:

The main heuristic would calculate the amount of threats on the board. It would do this by finding n-in-a-row pieces that were not blocked.



The example above is considered a three-in-a-row threat



The example above is not a threat (the ones blocked by the 2 and vise versa)

The heuristic counted all the threats on the board and presented two values. The threats of the player and the threats of the opponent. The threat score was weighted by a function that would dramatically increase for each piece in a row. This would encourage pieces to be placed next to each other, while further encouraging multiple pieces being placed next to each other. Once all the threats were calculated, I performed this function (defense is a multiplier from 0.0 to 1.0 given by the class)

Total = threatPlayer – (threatOpponent * defense)

Heuristic 2:

This heuristic was more creative. I noticed that pieces placed near the middle of the board opened up more opportunities than ones placed near the side. I developed a table to reference based on the board size. The worth of each slot increases towards the center.

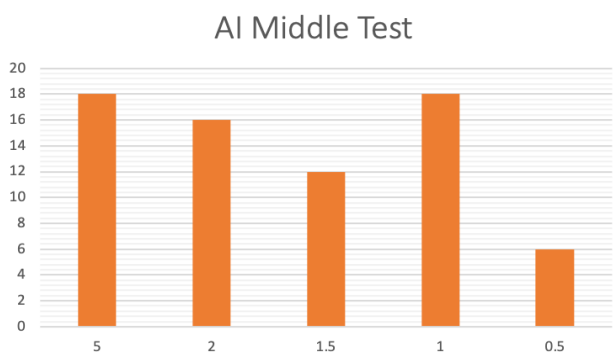
0	1	2	1	0
0	1	2	1	0
0	1	2	1	0

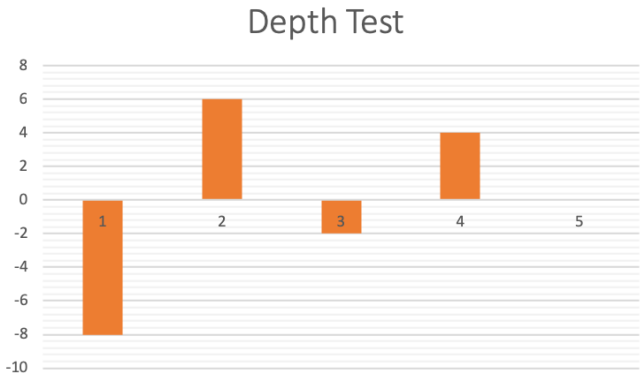
Table Example

Whenever a threat is found, I reference this table at the location of the open spaces in the threat. I then create a multiplier from this number and one from a given value in the agent class. I then use this value to weight the worth of the threat.

Testing:

To test my agents I tested them against multiple random agents and slightly altered agents of my own. Since I gave two variables to affect the AI's behavior, I was able to fine-tune them after each test. The two variables were the defensive multiplier (tendency to block the opponent) and the middle multiplier (tendency to place pieces towards the middle).





Improvement:

I wish I had more time to work on this assignment. There are a lot of things that I would have liked to try implementing, but getting the first heuristics to work was difficult. A heuristic that evaluates for win-win conditions would be the next thing I would add.