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CSCI 2114: Data Structures

Homework 5

Est genus in totidem tenui ratione redactum
scriptula, quot menses lubricus annus habet;
Parua tabella capit ternos utrimque lapillos,
in qua uicisse est continuasse suos.

There is another game divided into as many parts
as there are months in the year;
A small board has three pieces on either side,
the winner must get all the pieces in a straight line.
—Ovid (Ars Amatoria III, lines 365-369)

Question 1. Implement the Minimax algorithm for adversarial search in the Tic-tac-toe game tree.

Start by downloading and reading the starter code. You need to only edit the `Minimax.java` by implementing the unfinished Java methods. Upon successfully implementing all of the API, you may run `javac Game.java` and `java Game`. You'll be presented to make the first move. Click at the appropriate place to start the game.

FIGURE 1. Gameplay in the state of the art graphics by Tashfeen Studios™.

Question 2. Once your game is functional[1] and your `Minimax.java` class contains a game tree. You should start another Java class like this,

```
public class Investigate {
    public static void main(String[] args) {
        Minimax model = new Minimax(3);
        System.out.println(model.root);
    }
}
```

Write appropriate code in this file to answer the following questions,

1) How many tree-leaves result in a draw? 46080
2) How many of these leaves win for the first (max) player? 131184
3) How many of these leaves win for the second (min) player? 77904

Question 3. Ask two other professors to play your implementation on your computer. At least one of the professors has to be not from computer science. Ask them if they think they can win and how do they think the "AI" maybe picking its moves. State which professors (and their department) you interviewed and summarise their responses.

The first professor I asked is Connor Knudsen, the esports director. I believe he is technically under the Mass Communication department. He has definitely been asked to play against minimax before, as he knew of minimax and that the game is solved.

The second professor I asked is Jian Song, my Microeconomics professor. She is in the business school. She correctly guessed that since tic-tac-toe is played on a 3*3 grid, I can compute the best move. She believed that if the board was much larger I would be unable to compute the best move.

SUBMISSION INSTRUCTIONS

1) Turn in a PDF containing any plots, figures and/or answers from the homework.
2) Turn in your,
   i) `Minimax.java`
   ii) `Investigate.java`

[1] Run `Test.java` and see if all the tests pass.