IMPOSSIBLE TIC-TAC-TOE

Jerome Santos, Gaudwin Timoteo
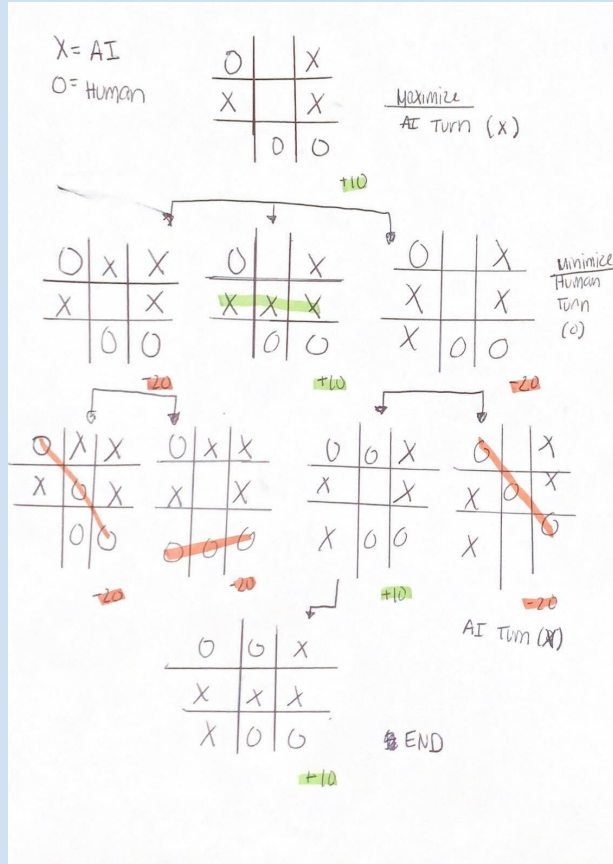
WHAT IS IMPOSSIBLE TIC TAC TOE

Impossible TIC-TAC-TOE utilizes the MINIMAX algorithm in order to have the AI either win the game and/or tie the game. Human players should never be able to win.

WHAT IS MINIMAX

Minimax is defined as a decision rule typically utilized in artificial intelligence for minimizing the possible loss for a worst case (maximum loss) scenario. When dealing with gains, it is referred to as "maximin"—to maximize the minimum gain.

PROCESS

X = AI
O = Human

Maximize
AI Turn (X)

+10

Minimize
Human
Turn
(0)

+20   +10   -20

-20   -20   +10   -20

AI Turn (X)

END

+10

```javascript
function minimax(newBoard, player) {
    var availSpots = emptySquares(newBoard);

    if(checkWin(newBoard, Human)) {
        return {score: 10};
    } else if(checkWin(newBoard, Ai)) {
        return {score: -20};
    }
    else if(availSpots.length === 0) {
        return {score: 0};
    }
```

```javascript
var moves = [];
for (var i = 0; i < availSpots.length; i++) {
    var move = {};
    move.index = newBoard[availSpots[i]];
    newBoard[availSpots[i]] = player;

    if(player == Ai) {
        var result = minimax(newBoard, Human);
        move.score = result.score;
    } else {
        var result = minimax(newBoard, Ai);
        move.score = result.score;
    }

    newBoard[availSpots[i]] = move.index;

    moves.push(move);
}

var bestMove;
if(player == Human) {
        var bestScore = -10000;
        for (var i = 0; i < moves.length; i++) {
            if (moves[i].score > bestScore) {
                bestScore = moves[i].score;
                bestMove = i;
            }
        }
    } else {
        var bestScore = 10000;
        for(var i = 0; i < moves.length; i++) {
            if(moves[i].score <= bestScore) {
                bestScore = moves[i].score;
                bestMove = i;
            }
        }
    }

    return moves[bestMove];
}
```
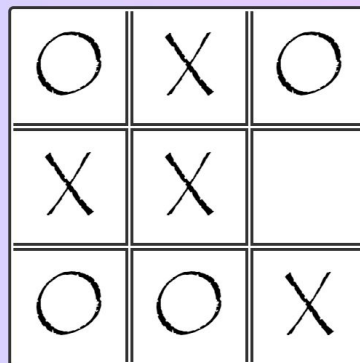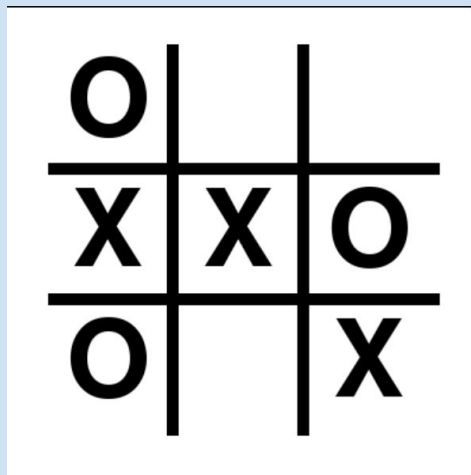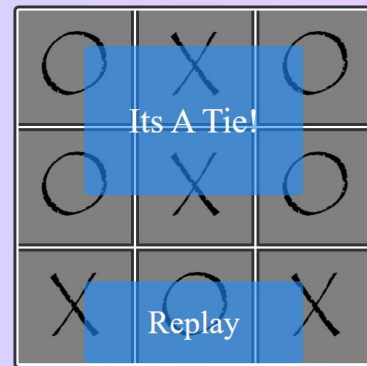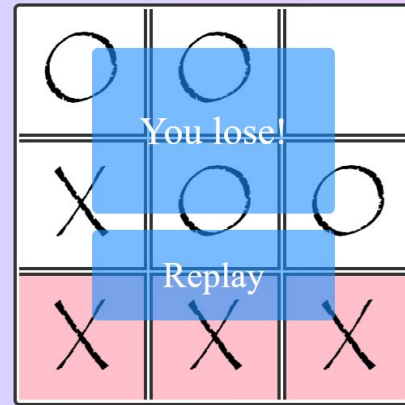
PROCESS CONTINUED

FEATURES

HUMAN vs AI

- A human player against the AI
- Human player starts as the "O" and AI as the "X"
- Human player should not win the game
  - Results should be loss or tie

AI vs AI

- AI against the AI
- AI player1 starts as the "O" and AI player2 as the "X"
- Player1 should not win the game
  - Results should be only tie

DEMO

We used VSCODE as our main IDE

GIT REPOSITORY : https://github.com/msantos1597/TTT

DEMO ON REPL.IT

THINGS TO ADD IN THE FUTURE

- Human vs Human Mode
  - Finish the test tab
- Score Counter
  - Counts Player 1 wins, Player 2 wins, and ties
- Next Move Button for AI vs AI
  - Allows move by move playthrough
- Better Randomization for AI vs AI
- Aesthetics
- If we have time, we want to add other games like mancala

THANK YOU