Tic Tac Toe

FFR135 Artificial Neural Networks

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Solution proposal

The task was to teach a computer to play Tic Tac Toe optimally using Q learning. My Code works but is extremely slow (multiple hours) since the check function has to check if a sequence is contained in a very large matrix. I realize now that using a hash method would be much faster. I'm not do more now because this has already taken way too much time and I need to focus on the exam.

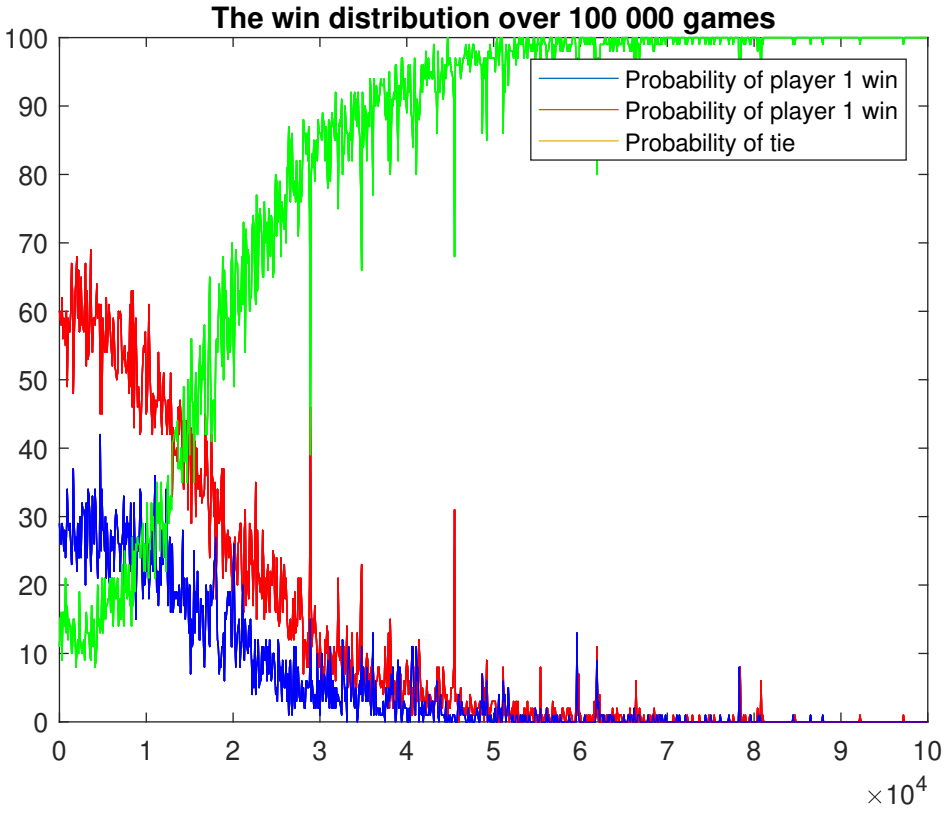

Figure 1: *Figure of the probability distribution for a win or a tie.*

A MATLAB-kod

A.1 Main

```
%% TicTacToe
clc, clear
% Settings
nGames = 100000;
epsFactor = 0.99;

% Initialize
epsilon = 1;
gamma = 1;
alpha = 0.1;
Q1 = zeros(1,18);
Q2 = [];
score = zeros(1,3);
totalScore = [];

for games = 1:nGames
    winner = false;
    boardState = zeros(1,9);
    [boardState, newP1Pos] = MakeMove(epsilon, boardState, Q1, 1);
    Q2 = AddState(boardState, Q2);

    [boardState, newP2Pos] = MakeMove(epsilon, boardState, Q2, 2);
    Q1 = AddState(boardState, Q1);
    Q1 = UpdateQ(Q1,boardState,alpha,newP1Pos);

    while ~winner
        [boardState, newP1Pos] = MakeMove(epsilon, boardState, Q1, 1);
        [winner, scoreP1, scoreP2] = CheckWinner(boardState, scoreP1, scoreP2);

        if ~winner;break;   end

        Q2 = AddState(boardState, Q2);
        Q2 = UpdateQ(Q2,boardState,alpha,newP1Pos);

        [boardState, newP2Pos] = MakeMove(epsilon, boardState, Q2, 2);
        [winner, scoreP1, scoreP2] = CheckWinner(boardState, scoreP1, scoreP2);

        if ~winner;break;   end

        Q1 = AddState(boardState, Q1);
        Q1 = UpdateQ(Q1,boardState,alpha,newP1Pos);
    end
    if mod(games,100) == 0
    epsilon = epsilon*epsFactor;
    totalScore(games/100,:) = score;
    score=zeros(1,3);
    end
end

% Plot
x = 1:100:100000;
plot(x,totalScore(:,1).','r')
hold on
plot(x,totalScore(:,2).','b')
plot(x,totalScore(:,3).','g')
legend('Probability of player 1 win', 'Probability of player 1 win', 'Probability of tie')
title('The win distribution over 100 000 games')
```