Q Learning Implemantation

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1 Introduction

Reinforcement learning is a methodology focusing on training algorithms using a system of reward and punishment. And Q-Learning is an algorithm which produces a Q table that an agent uses to find the best action to take given a state. Our project was to develop a game which uses Q-Learning methods to win the game.

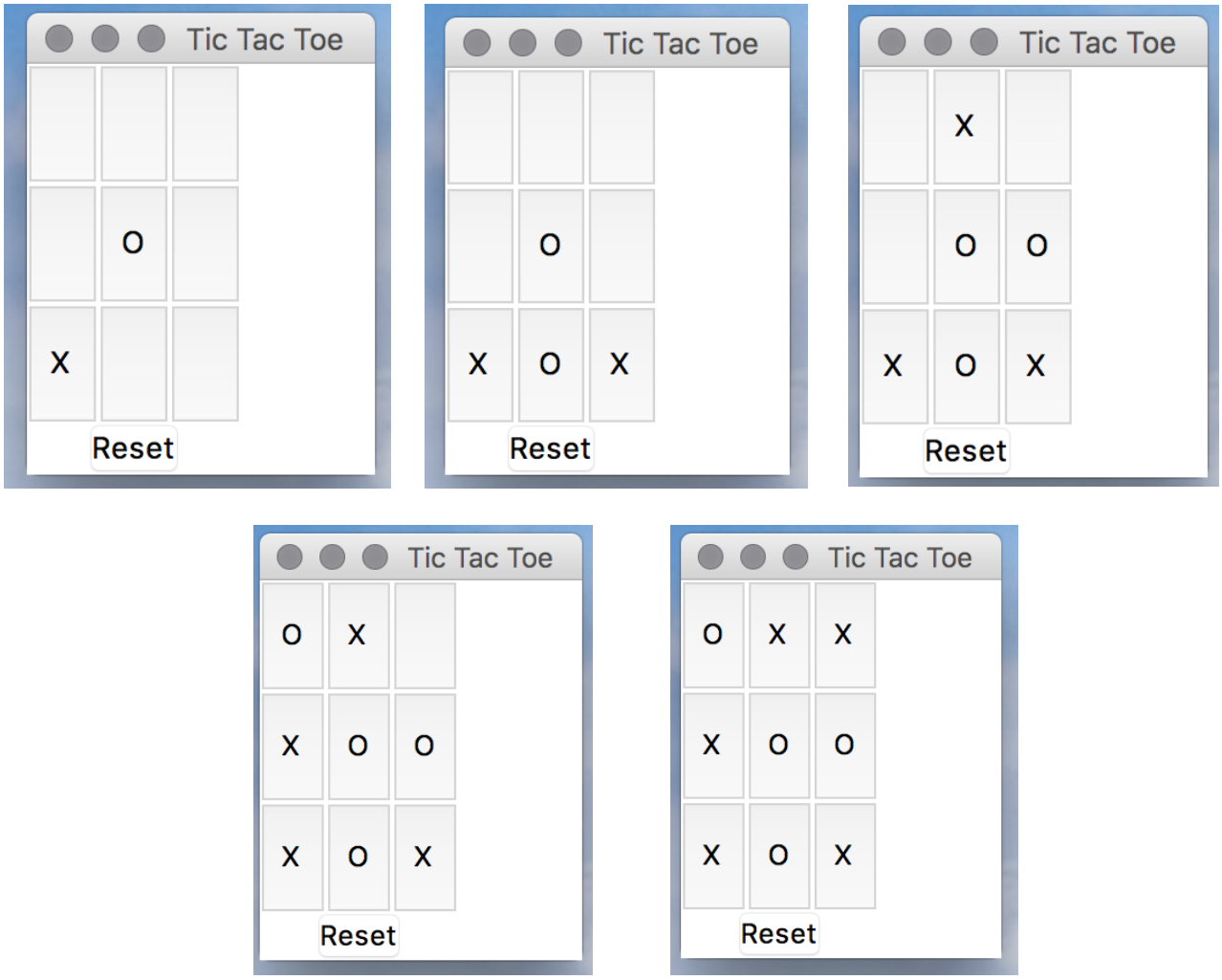
2 Game

All examples and codes that I saw in internet were about either deep reinforcement learning or using basic methods. At the beginning of the project, I wanted to make a backgammon game which has both dice and place variables. So I decided to make a Tic Tac Toe game.

2.1 Tic Tac Toe

In our game, Tic Tac Toe, at each discrete time step t, the state s of the system is defined by the sings X and O at the board and which player's turn it is, and the possible actions a by the empty places at the board. It is important finding a policy that states belong to action which tells us which action to take in which state to maximize our chance of winning.

At any given time each state has a specific value V to the pi, which is the expected reward from following policy for all future time: where rt = rt(st,at) is the reward at time step t and Gamma represents Gamma, discount factor.



In the implementation of Tic Tac Toe, 'sign convention' is important. For player "X" , our reward is positive -- specifically, a reinforcement of 1.0 is awarded when player "X" wins, -1.0 when player "O" wins, and 0.5 in the case of a tie. Therefore, player "X" aims to maximize the value, while player "O" aims to minimize it. The discount factor Gamma is given a value of 0.9.

References

Retrieved from https://skymind.ai/wiki/deep-reinforcement-learning

Retrieved from http://mnemstudio.org/path-finding-q-learning-tutorial.htm

Retrieved from https://medium.freecodecamp.org/an-introduction-to-reinforcement-learning-4339519de419

Retrieved from How to Cite Anything in APA Format. (2017, July 17). Retrieved from https://www.easybib.com/guides/citation-guides/apa-format/