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A Reinforcement Learning based Algorithm for Developing Stacking games

Artificial Intelligence (AI) and machine learning have been instrumental in designing intelligent programs to enhance humans' understanding of games, and players' experiences by generating responsive, and adaptive behaviors in a computer program. In 2016, Google utilized a sophisticated Reinforcement Learning(RL) algorithm to develop a program called AlphaGo to defeat the World's best human Go player, an achievement thought to be impossible. The challenge lies in the complexity of these board games, with Go having approximately 2.1 x 10170 possible moves. Even the most powerful supercomputers lack the processing power to analyze all the moves in any reasonable amount of time.

In Reinforcement Learning, an agent collects information about its current environment and performs an action accordingly. The environment either rewards or punish the agent based on the action. Over time, the agent learns what actions are best to maximize the reward.

Inspired by the AlphaGo project, this research aims to develop an AI that is capable ofplaying a set of board games called stacking games. Stacking games are computational interesting due to the "stacking" operation that requires the game to be played on multiple boards, and the moves dictate which board the next move will be played on. Due to this reason, our agents will need to collect more information, be capable of adapting to multiple environments, and performs actions accordingly. In order to achieve this task, we developed and implemented an epsilon-greedy algorithm into Q-RL and a Monte Carlo Tree Search algorithm into Q-RL to help expedite the learning process.

In this research, we examine the results of a Monte Carlo Tree Search algorithm-based AI playing the game Ultimate Tic-Tac-Toe. In the future, we would like to explore how other computational techniques perform for other stacking games and deploy these games and AI to the general audience.

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