Project Proposal – Foundations of Artificial Intelligence

Problem description

My goal is to create an Artificial Intelligence (AI) solution that will play BlackJack. Furthermore, with the help of reinforcement learning, it will learn to play BlackJack in a manner that maximizes its chances of winning.

Blackjack has a set goal: to reach 21, or get as close to it as possible, without going.[1] Therefore, there is a clearly defined goal. The game has 2 agents, the player and the dealer. Each agent starts with a fixed balance of money. Whoever runs out of money first, loses.

Inputs would be the decisions the AI makes based on the initial state (the initial hand) and subsequent cards drawn from a fair 52 card deck randomly. It will get positive reinforcements from actions that put it in a better position than it's opposite.

Outputs would be the card valuations as a result of the decisions taken by the player to either hit, double-down or withdraw. Based on the decisions the AI makes, it can gain or lose money. When either the dealer or the player runs out of money, the game is finished.

Algorithms

The Q-learning algorithm will be used to create an optimal blackjack strategy. This Algorithm is ideal because it "allows learning to take place during play."[i] Blackjack is an episodic game, where an episode can be the end of a hand, allowing for multiple hands can be played during a session.

Furthermore, Blackjack has a finite Markov Decision Processes (MDP), allowing for Q-learning to find an optimal path. By learning to play better as you play, Q-learning will allow us to optimize our plays in order to maximize the amount of money we take from the dealer.

Results

Through this project, I am expecting to implement the Q-learning algorithm to device a Python 2.7 based solution to winning a game of Blackjack by maximizing the probability of winning the game, not necessarily just the given hand.

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[1] http://cs.ou.edu/~granville/paper.pdf

Notes

2-9 are worth their values

10 - jack, queens, kings

Ace can be 1 or 11

Pays 3 to 2 (has 500, gets 750)

You can split pairs.

hit you take another card

You can double down (bet more money)

Goal is to get to 21 (or close to) without going over

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i http://cs.ou.edu/~granville/paper.pdf