CISC 856 Reinforcement Learning

Final Project Proposal

Task:7

Play Chrome Dino Game Using “gym-chrome-dino” Environment

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Project Description

The project is centered around instructing an RL agent to participate in the "Dino Run" game built into Google Chrome, using reinforcement learning strategies. This training is made possible through a custom-made reinforcement learning setup known as gym-chrome-dino. The objective is to increase the score by ensuring the dino runs the longest distance possible, while effectively dodging hurdles on its path.

State Space

The state space in the gym-chrome-dino setup corresponds to the present game frame, essentially acting as a pixel grid that represents the game's visual display. This grid takes the form of a 3D array, with dimensions that match the screen's height, width, and color channels (RGB). Hence, every state can be interpreted as a snapshot of the game screen at a particular moment, providing data on the dino's position and any approaching hurdles.

Action Space

The action space in this game involves three potential moves the dino can make:

- Do nothing: The dino maintains its forward movement.
- Jump: The dino performs a jump, enabling it to dodge obstacles on the ground.
- Duck: The dino lowers its stance, which assists in avoiding obstacles in the air.

The action space is characterized by a discrete set of three actions, and the agent must make a choice between these actions at each stage in the game.

Proposed Solution

The suggested approach involves using deep reinforcement learning, particularly Deep Q-Learning (DQN), to train the RL agent.

In the DQN method, we utilize a neural network as a function estimator to predict the Q-values, which are the anticipated returns for taking a specific action in a particular state. The state, represented by the game screen, serves as the network's input, while the Q-values for each possible action constitute the output. The agent's action selection is based on these Q-values.

To handle the state space's complexity due to its high dimensionality, we can apply preprocessing methods to the game screens, such as downsizing them and changing them to grayscale. Alternatively, techniques like frame-stacking could be used, which involves layering consecutive frames to provide the network with information regarding the game objects' movement.