COMP5313 Artificial Intelligence
Department of Computer Science
Lakehead University

Exercise 1: OpenAI GYM RL: Controlling a Mountain Car

Instructions to run the code:

The two python files:

- SiddhiJariwala_Ex1(RandomApproach).py

- SiddhiJariwala_Ex1(QueryLearning).py

➤ **These two files can be run on Python IDE PyCharm platform.**

➤ **Certain libraries need to be installed before running these files for proper execution of the code such as numpy, gym, pygame, matplotlib.**

Random Approach:

In the first technique, the agent is assigned random values for 10,000 times. The motion of the vehicle is warped in this case because the agent is randomly travelling through the state space. Additionally, because this strategic approach is dependent on observation and experimentation, it cannot assure that the aim of achieving the peak of the mountaintop will be met.

Because the methodology provides random numbers to the vehicle and attempts to simply propel it back and forth between varying degrees of acceleration, it eventually generates an inarticulate plan and the entity does not educate or constantly evolve in any fashion.

Q-Learning Algorithm Approach:

For learning and development, the second technique employs the Q-Learn Algorithm. This strategy lets the entity to keep a record of its activities and rewards, along with values that enhance the vehicle's performance with every successive step.

In this case, the goal is reached within a specific time period and it requires at least 5000 occurrences to adequately educate and conquer the mountain in a way that meets the conditions of the problem statement.

Eventually, this technique adds each episode to the Q-table, allowing the entity to be taught and controlled to drift back and forth while maintaining proper flow rates.

Conclusion of the problem statement:

After comparing the two strategies, we can conclude that the reinforcement learning approach is more precise and dependable for training the entity step by step within every episode. With an aim to improve the learning behavior, the Q-Learning algorithm constructs a Q-table and records all of the values of the actions taken by the entity for each event. The prior values are then used to produce new quantities for the agent, and it strives to achieve the intended goal by altering the composition in the Qtable.

In contrast, the random approach, is a simplistic concept that just provides a new collection of truly random numbers from a specific range in order to guide the entity in various ways to accomplish the objective. This arbitrary technique often fails because there is no certainty that the entity will achieve the pinnacle of the slope at the culmination of occurrences.