Ronald W. Sudol III

SNHU CS370

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**Design Defense**

Although they are similar in many ways, Human and machine approaches to solving problems also differ in many aspects. A human would conceptualize the beginning and end of the maze and choose a strategy for approaching it, such as always going left first at a juncture. If one were to reach a dead end or a loop, one could backtrack to the previous junction and try another path. If the human has reached the end point, they have solved the maze. If not, repeat they would backtrack and repeat until they find a solution or give up. A machine is given a representation of the maze as a matrix with 1’s representing open spaces and 0’s representing the walls of the maze. The machine follows a predetermined algorithmic procedure to path find. The machine then stored information about its current place in the maze and the path that it took to get there and uses that and information from previous trials to choose a next move by either exploiting this information or trying a new direction at random. It repeats this process until it has determined the optimal path through the maze. Both approaches aim to find a path from the start to the end of the maze, and both approaches use some kind of representation, search strategy, evaluation criteria, and learning ability to solve the problem. These approaches are still different, however, because the human approach is more flexible, intuitive, subjective, and adaptive, while the machine approach is more precise, systematic, objective, and algorithmic.

The difference between exploitation and exploration is a trade-off in random action versus reinforced action. Exploitation involves choosing the best-known option based on past experiences, while exploration involves trying out new options that may lead to better outcomes in the future. Finding the ideal proportion between these two strategies is crucial in many decision-making problems but it is particularly important in finding an efficient and effective training algorithm in the treasure maze problem. Reinforcement learning can help to determine the path to the goal by learning a policy that maps each state of the environment to a probability distribution over the possible actions. The agent can use both exploration and exploitation strategies to balance between learning new paths and building off of paths that have been effective in the past.

For the purpose of training my intelligent agent, I tried to develop an algorithm that initially focused on exploration and looked for many different possible successful paths. I used a decay rate to reduce the effect of epsilon, the exploration value, over time and a conditional statement that caused the algorithm to utilize exploitation or learned data more and more over time. This gave the agent a robust set of experiences to learn from as it began to rely more and more on past experience. The final outcome was an agent that learned to traverse the maze with a 100% win rate after only 235 epochs.

**CITATIONS:**

Gulli, A., & Pal, S. (2017c). *Deep Learning with Keras*.

Beysolow, T., II. (2019c). Applied Reinforcement Learning with Python: With OpenAI Gym, Tensorflow, and Keras. Apress.