**Project 2**

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* **Analyze the differences between human and machine approaches to solving problems.**
  + Describe the steps a human being would take to solve this maze.

The manner in which Human minds approach problem solving is very reliant on a phenomenon called heuristics. Heuristics is a process or method derived from experience applied to the most readily available and apparent options. Humans primarily use three factors in their decision-making process insight, conceptualization, subgoals, and recognition of invariant features (Pizlo 1994). These processes allow people to manage to make decisions quickly without having to process all of the endless data their minds are receiving at any given moment.

* + Describe the steps your intelligent agent is taking to solve this pathfinding problem.

The steps the intelligent agent from the Treasure hunt game uses to solve the problem is rather straight forward. The agent chooses a random direction as long as that direction is a valid choice (not out of bounds or into an off-limits spot). The agent then repeats this the choice until the puzzle is solved. It then repeats that whole processes until the optimized solution is found.

* + What are the similarities and differences between these two approaches?

There is not a whole lot of overlap between these two approaches. A human will base their decisions on historical data conglomerated from past experience (even if unrelated) while the machine will choose at random and do it over and over and over again. Humans do not have the time or capacity to iterate through all of the options, so they choose what seems to be most optimal in the given moment that a decision is made.

* **Assess the purpose of the intelligent agent in pathfinding.**
  + What is the difference between exploitation and exploration? What is the ideal proportion of exploitation and exploration for this pathfinding problem? Explain your reasoning.

Exploitation comes with negative connotations but can be defined in this case as the maximal utilization of resources while exploration does not seem to concern itself, conceptually, with resources utilization. It is important to have a balance of both in that they are complimentary. Exploration allows for more resources to be discovered while exploitation determines what to do with the resource once discovered.

* + How can reinforcement learning help to determine the path to the goal (the treasure) by the agent (the pirate)?

One way to apply reinforcement learning (RL) to determine a path to a goal is to set up the environment so that the goal state is associated with a high reward, and all other states are associated with lower rewards or punishments (SALLOUM 2021). The agent then explores the environment, taking actions and receiving rewards, in order to learn the optimal sequence of actions that leads to the goal.

* **Evaluate the use of algorithms to solve complex problems.**
  + How did you implement deep Q-learning using neural networks for this game?

In order to implement a deep Q-learning when using a neural network for this game I followed some simple steps. The first step involved importing the libraries needed to perform the operations required. Next came the creation of the training environments, followed by creating a reward system. Then the learning agent was instantiated and used enhanced algorithms for learning. Finally, the agent was tested within the environment. Going through the implementation steps for deep Q-learning when using a neural network helps to find the most optimized movement sequence to navigate the map and reach the treasure cell by maximizing the reward.

Resources:

Pizlo, Z. et al. (1994). *Problem Solving in Human Beings and Computers (formerly: Heuristic Problem Solving)*. Purdue e-pubs | Purdue University Scholarship Online. Retrieved February 18, 2023, from https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2173&context=cstech

SALLOUM, Z. (2021, December 12). *Basics of reinforcement learning, the easy way*. Medium. Retrieved February 4, 2023, from https://zsalloum.medium.com/basics-of-reinforcement-learning-the-easy-way-fb3a0a44f30e