Dominick Hernandez

Binyam Heyi

CS 370

5/29/24

Module One Assignment

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

A human would understand that they can't go through a wall, and that they are in some type of place they want to get out of.

They might then come up with a plan to reach an exit.

Some might systematically eliminate different paths till they make it out, and some might make marks while traversing through the maze, and some might simply walk along one wall until they make it out.

Either way if the person is smart enough to understand the situation they are in, they will be able to use their intuition, life experiences, context clues and reasoning, to traverse and exit the maze.

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

My AI agent is starting by taking in its environment and moving randomly around the maze.

Then after a few movements it looks through its experiences.

Checking to see what those experiences led to, and how they affected its outcome.

It uses that experience to change its Q-values and its policy towards a better outcome.

Eventually the agent will stop randomly going about the maze, and through experience it will understand which paths and movements lead it to the ending, and which lead it faster to the exit.

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

While the AI might not know what it is supposed to do, not understanding why running into a wall gives it a bad reward, or why moving around too much is bad, it just understands that it IS. A human on the other hand can understand these important contextual clues that can help it learn how to traverse the maze without as much trial and error. They are both similar in that they gather information from their environment and experiences, to understand how to leave the maze the fastest, or in the case of the agent, how to get the best score.

* **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.

Exploration is akin to a person moving around the maze testing what paths may lead to. Neither knows if the path is good or bad, but they both access their experience and learn from it. In my experience, a good balance between exploration and exploitation is around 90% exploration in the beginning and slowly petering off to around 10% exploration near the end.

This all helps ensure that even as the agent starts understanding of their environment, they don’t get caught in a local maxima.

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

The agent is designed to try and string together the best actions based on its environment, experiences, and predicted q values, to reach the best ending. It does not know what ending is best unless it has a reward system behind those endings that tells it how to best maneuver its environment. For example, if we never set up a -.4 reward for each step, the agent would not care whether it takes 20 or 200 steps to get to the end of the maze, as long as it makes it there to get the reward from finishing.

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

We implemented deep Q- learning using neural networks for this agent by developing a neural network-based policy. The neural network calculates the Q- values for each possible move the agent can take based on its environment and current position. These Q- values represent the expected future rewards for taking each action, helping the agent choose the optimal move. This approach helps the agent learn and improve its strategy over time through trial and error, gradually developing an efficient pathfinding policy.