Lindsey DeLorenzo

12/15/24

CS370

Module 7 Project 2

Analyze the differences between human and machine approaches to solving problems.

A humans’ approach to solving a maze would be with a strategy. They would use visual cues and memorization to solve the maze. Min Zhao writes about the strategies for humans solving mazes, “Overall, strategies of maze-solving took into account available visual information, memory, confidence, the estimated cost in time for exploration, and tolerance for error.” (Understanding humans’ strategies in maze solving from eye-hand coordination. By Min Zhao).

Machines are different in their approach to learning. A machine would be given the rules and would need to learn through trial, error and rewards. The machines’ actions are purely motivated based on the rewards they can earn. Tracey Ngo explains in their paper, Can Machine Learning Solve a Maze? “It tries to get the most points possible by figuring out which actions lead to more rewards and fewer punishments. Over time, by exploring and learning from its mistakes, the computer's agent becomes more skilled at navigating the maze efficiently.”

Both humans and machines use their layout to find potential paths, use the information given to solve the maze, and use the past versions of the maze to guide how to approach the future stage.

Assess the purpose of the intelligent agent in pathfinding.

The difference between exploitation and exploration is one thoroughly explores and one finishes the path as quickly as possible. With more rewards in the individual movements an agent will explore the map to collect the largest amount of possible smaller points. However, when this is switched and the end reward for finishing is greater, the agent focuses on finishing the map quickly. When try to find a healthy balance between the two it is good to review the Epsilon greedy strategy. This strategy uses a value between 0 and 1. When 1 the agent is full explorative and when 0 exploitative. Keeping a balance between is important. If the value is in the middle, then the agent will explore a little and return to the end without fully exploring and lingering.

Evaluate the use of algorithms to solve complex problems.

I used deep Q-learning in my project with the rewards, having the agent evaluate the environment and having it learn from its experience. All are items in the code we had to write to create and guide the agent to complete its goal.

Citation

* Zhao, Min. (2014). *Understanding humans’ strategies in maze solving from eye-hand coordination*. Rutgers University Library. https://rucore.libraries.rutgers.edu/rutgers-lib/45599/#:~:text=The%20results%20challenge%20the%20previous,D.&text=RightsThe%20author%20owns%20the%20copyright%20to%20this%20work.
* Ngo, T. (2023, December 23). *Can Machine Learning Solve a Maze?* Retrieved from https://www.sciencebuddies.org/science-fair-projects/project-ideas/ArtificialIntelligence\_p008/artificial-intelligence/machine-learning-maze
* Makone, Ashutosh. (August 22, 2021) Reinforcement Learning 6: Exploration vs Exploitation. Medium. https://ashutoshmakone.medium.com/reinforcement-learning-5-exploration-vs-exploitation-c1bae5a2ea42#:~:text=Epsilon%20greedy%20strategy,more%20greedy%20over%20the%20time.
* Baeldung. (March 24, 2023) Epsilon-Greedy Q-Learning. Baelfung. https://www.baeldung.com/cs/epsilon-greedy-q-learning