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CS370

Project 2 Design Defense

The differences between human and machine approaches to solving problems.

In the game we generated our code for, a human competes with an AI enabled Pirate to see who can reach the end of the maze first, human or AI. There is a treasure at the end of the maze and obstacles in the way.

The steps I could see a human making would be to evaluate where they are starting from and randomly choose a direction to move. With out knowledge of the maze the human would continue this process of random moves until the player guesses the correct route and reaches the end or the Pirate wins first.

The steps my intelligent agent would take to solve this pathfinding problem would be to evaluate where they are starting from and choose a random directions. Post this random direction the action would be evaluated with a value system and feed back into the evaluation process for the next move. Correct/ good moves rewarded with positive values, incorrect/ bad moves punished with negatives values feed back into the evaluation process.

Similarities and Differences between these two approaches would include both start in the same spot and choose the first move at random. Both evaluate how the their move went and use that data to make their next move. Some of the differences between how the intelligent agent and the human user are, how they evaluate if it was a good move or not, and what to do with the analysis.

A human could leverage emotions or guesses when choosing their next move. The intelligent agent would follow the best move algorithm and always choose based on the math. As the math adds up, the intelligent agent will begin to win more and more of the episodes until the human user no longer is able to win any.

The Purpose of the intelligent agent in pathfinding:

What is the difference between Exploitation and Exploration?

According to Yang (2023) in “What is Exploration vs. Exploitation in Reinforcement Learning?”

The author describes exploitation as a “greedy” approach where the intelligent agent leverages existing data to attempt to get the highest rewards, where exploration is an attempt to “obtain more knowledge about actions instead of getting the most rewards”.

The ideal approach in pathfinding problems from my experiences is a low value set for exploration. 0 value is bad, but too high a value is worse. A low value, i.e. 0.001 is value added and improves the algorithm by learning new paths with out factoring in reward, but too much lowers the score.

Reinforcement learning helps to determine the path to the goal by the agent by teaching the agent what a good action is. With out the reinforcement learning the agent could get lost in the maze, or through random movement “maybe” finish.

The use of algorithms to solve Complex problems:

I implemented deep Q-learning using neural networks for this game by allowing the agent to get feedback in a value-based approach from evaluation of previous actions.

Boesch, G. (2023). In the work “Deep Reinforcement Learning: How It Works and Real World Examples.” Stated “Reinforcement Learning is able to solve more complicated tasks with lower prior knowledge because of its ability to learn different levels of abstractions from data.”

Because of this ability I leveraged deep Q-Learning instead of coding the agent to randomly choose a direction for the next move I assigned a value system to evaluate the last move, discounted rewards, and fed it back into the evaluation for the next move.

References:

Boesch, G. (2023). Deep Reinforcement Learning: How It Works and Real World Examples. *viso.ai*. <https://viso.ai/deep-learning/deep-reinforcement-learning/#:~:text=The%20use%20of%20deep%20learning,levels%20of%20abstractions%20from%20data>.

Yang, A. (2023, March 17). What is Exploration vs. Exploitation in Reinforcement Learning? *Medium*. https://angelina-yang.medium.com/what-is-exploration-vs-exploitation-in-reinforcement-learning-a3b96dcc9503#:~:text=The%20exploration%2Dexploitation%20trade%2Doff,more%20('exploration').