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Design defense

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

When a Human solves for a maze the first question would be where would the human be? In the maze or above the maze. First If the Human were above the Maze, He would be able to see where the walls or obstacles were and conduct a series of guesses as to the quickest way through the maze. This would be done by checking the maze against a key, or map. The Artificial intelligence could do the exact same thing. If there were no key to check against it, it would be a series of guesses. The Agent would take the data of the starting point and end point, as well as other important points, and make a series of guesses as to which path is the best path. Either way the human and the machine would have no advantage over the other. The agent would need a series of implanted rewards and penalties to assess where to go next, and to make sure it does not go outside the maze. I would suggest that humans are like that as well, but it has not put mathematically as it would be for the AI.

If the Human were in the maze how far could they see could they see an obstacle several squares away from themselves. In this case they could go along the wall until an opening appears. However, the artificial agent could do the same thing as well and would contain no upper hand. As more complex mazes would arise the Agent would have an advantage if it were allowed to trace a map and create its own key. This could the use the A2C actor to critic method in learning the mazes. Just as humans could do the same.

Both can learn the same ways in either of the cases, in no matter which scenario they are placed. The difference between the two is how much data can the Human and the agent pull from. The AI might take longer to go through the data, but is also more likely to remember, and store, the data accurately. The Human would already come in with a bias and cross off obvious paths where the agent would need to explore the paths several times to eliminate them from its series of choices.

Exploration is the pursuit of testing any and every way imaginable the experiment we are conducting through the maze. Whereas Exploitation would take already thought of Ideas and work within that framework to produce the best solution. Again, if no map exists, we will need to do exploration and run through many guesses. But if we had a map, we could use exploitation of that data and seek to working on faster ways to get through the map. It is in this case I believe that exploitation would be a better route in reinforcement learning. But if there is no map, it would have to be trial and error, based on rewards and penalties.

There are many different algorithms that could be used. Tremaux pathfinding search algorithms could be an example of this. It creates a line thought the maze to follow, the problem with this is that it does not guarantee the shortest route. In the use of Algorithms, it would have to be able to update the rewards and penalties as needed. This would be able to help speed up the finding the shortest route.

References

1. 1. i8 Ventures (Feb 2021) Exploitation versus Exploration: Know the difference and master both types of innovation, https://i8.ventures/exploitation-versus-exploration-know-the-difference-and-master-both-types-of-innovation/#:~:text=Exploitation%3A%20Innovation%20that%20emerges%20from%20existing%20assets%20of,most%20managers%20of%20organizations%20feel%20comfortable%20with%20it.
2. 2. Becker, Kory (May 2013) Solving Mazes with AI Pathfinding Techniques: A\* vs Tremaux, http://www.primaryobjects.com/2013/05/13/solving-mazes-with-ai-pathfinding-techniques-a-vs\_tremaux/#:~:text=Assuming%20the%20robot%20has%20an%20aerial%20layout%20of,will%20provide%20a%20successful%20path%20through%20the%20maze.