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Project 2

**Analyze the differences between human and machine approaches to solving problems:** Humans typically tackle problems like maze navigation using intuition, heuristics, and immediate feedback. For instance, when faced with a maze, a human might use trial and error, follow walls, or employ mental mapping to navigate toward the goal. This approach is flexible and adapts based on new information or obstacles encountered during the process. In contrast, machine approaches such as deep Q-learning rely on algorithmic methods. These methods involve systematic exploration and exploitation of paths based on mathematical models and neural networks. The machine does not have intuition but uses learned experiences and algorithmic adjustments to improve its performance over time (Sutton & Barto, 2018).

**Assess the purpose of the intelligent agent in pathfinding:** The primary purpose of the intelligent agent in pathfinding is to efficiently navigate through the maze to reach the treasure before a human player does. This requires the agent to learn and refine its navigation strategy through interaction with the environment. Reinforcement learning, specifically deep Q-learning, allows the agent to develop this strategy by balancing exploration of new actions with exploitation of known strategies. Initially, the agent explores various actions to discover effective paths. As learning progresses, it shifts focus to exploiting the most successful strategies it has learned, thereby optimizing its pathfinding capabilities and improving its chances of finding the treasure (Mnih et al., 2015).

**Evaluate the use of algorithms to solve complex problems:** Algorithms, such as deep Q-learning, are pivotal in addressing complex problems like maze navigation. Deep Q-learning combines Q-learning with neural networks to handle high-dimensional state spaces and learn from complex inputs. This approach uses experience replay and target networks to stabilize learning and improve performance. By systematically updating the agent’s policy based on past experiences and feedback, deep Q-learning effectively navigates complex environments and optimizes decision-making strategies. This demonstrates the strength of reinforcement learning algorithms in solving intricate pathfinding problems, showcasing their ability to manage and adapt to complex scenarios (Mnih et al., 2015).

**References:**

Mnih, V., et al. (2015). Human-level control through deep reinforcement learning. *Nature*, 518(7540), 529-533. https://doi.org/10.1038/nature14236

Sutton, R. S., & Barto, A. G. (2018). *Reinforcement learning: An introduction* (2nd ed.). MIT Press.

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