Design Defense

CS370

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Analyze the differences between human and machine approaches to solving problems: Human problem-solving typically involves three stages: input, processing, and output. Humans gather sensory data from their environment, process it through their central nervous system, and make decisions based on the information. This process includes stages of knowledge/memory, inference/decision-making, and learning. In contrast, machine problem-solving, such as that of an intelligent agent, relies on receiving input data, selecting an algorithm, and generating an output based on the algorithm's decision-making process.

Outline the Steps of Human Maze Solving: Humans navigate mazes by utilizing sensory input to perceive their surroundings, drawing on past experiences and knowledge to make decisions, and adjusting their actions accordingly. For instance, they might visually observe the maze layout, recall similar situations, and choose a path based on past successful strategies, continuously iterating until they reach the goal.

Explain the Intelligent Agent's Pathfinding Process: The intelligent agent receives input data relevant to the maze, selects an algorithm—such as depth-first search or shortest path algorithm—based on predefined criteria (e.g., efficiency), and generates an output representing the optimal path through the maze. It iterates this process until it finds a solution.

Compare Human and Intelligent Agent Approaches: Both human and intelligent agent approaches rely on input data and decision-making processes. However, humans have the ability to gather and process information autonomously, drawing on memory, inference, and learning, while intelligent agents require predefined algorithms and training to generate solutions.

Assess the Purpose of the Intelligent Agent in Pathfinding: The purpose of the intelligent agent in pathfinding is to efficiently navigate complex environments by selecting the most optimal path from a given set of possibilities. This allows for automation and optimization of tasks that would be time-consuming or impractical for humans to perform manually.

Distinguish Between Exploitation and Exploration: Exploitation involves utilizing known information or strategies to exploit existing knowledge, while exploration involves seeking new information or strategies to expand knowledge. The ideal proportion of exploitation and exploration for pathfinding depends on the complexity of the maze and the need to balance between exploiting known paths and exploring new possibilities to find the optimal route.

Explain How Reinforcement Learning Facilitates Pathfinding: Reinforcement learning enables the intelligent agent to learn through trial and error, gradually refining its understanding of the maze environment and selecting actions that lead to desirable outcomes (e.g., reaching the goal). By iteratively exploring and exploiting different paths, the agent learns to navigate the maze more effectively over time.

Evaluate the Use of Algorithms in Solving Complex Problems: Algorithms play a crucial role in solving complex problems by providing systematic procedures for decision-making and optimization. Implementing deep Q-learning using neural networks involves importing necessary libraries, building the environment for training, creating the learning agent, finding optimal strategies, and testing the agent's performance.