**7-3 Project Two Submission**

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**Design Defense**

**Differences Between Human and Machine Approaches**

Compared to intelligent agents, humans rely more on cognitive abilities and memories, whereas machines rely on data that humans provide. When humans attempt to solve the maze, trial and error are inevitable through experience, and they must learn from their mistakes and collective feedback to solve the maze. Humans often had to change strategies due to unexpected events to reach the goal. On the other hand, when intelligent agents are challenged to solve maze problems, they rely on data inputs and algorithms to reach the end. According to Engström, “If the AI have truly learned how to make decisions based on the environment, rather than just memorizing when to do turns, a new starting position should not be a problem” (Engström, 2019, para 4).” Placing the agent into multiple areas means the AI has learned to navigate and understand the maze layout and make accurate decisions. When approaching the maze, humans and agents are determined to find the most efficient path to reach the goal. For humans, finding the most efficient path would mean fewer resources are needed to complete the problem, but for agents, finding the most efficient path leads to a higher reward. One of the essential differences between humans and machines is that humans use their past experiences or intuition to solve problems, while machines have predefined algorithms. Humans are more likely to adapt to various scenarios to overcome challenges. At the same time, machines do not have total capacity and will take longer to adjust due to a lack of data storage. Although humans have different approaches to solving the maze when compared to intelligent agents, both parties will have effective methods for solving the maze. Humans are more flexible and creative when finding solutions to adapt to problems, but intelligent agents can discover solutions faster with data analysis.

**Intelligent Agent in Pathfinding**

Exploitation can be defined as the best path to choose when reaching the goal, whereas exploration can be defined as surveying unknown domains to find new information about potential paths. (Salloum, 2019). Finding a balance between exploitation and exploration would depend on the pathfinding problem scenario. Exploitation focuses on what are the known paths and what is the most effective route to obtain the best results. One of the issues with using too much exploitation is risking better solutions to solve the problem. Exploration focuses on identifying all possible solutions by using all given resources to find the best path in the long run. However, because exploration searches through every possible path, one of the most significant issues is wasting resources to discover paths that are not the most efficient solution. The ideal proportion of exploitation and exploration for the pathfinding problem is to focus on exploration rather than exploitation. However, the intelligent agent would only use exploitation to find the solution.

Reinforcement learning can help determine the path to the goal by the agent because using trial and error would help the pirate to maximize the reward when the more efficient path is identified. At the start, the pirate will not know the path and rely heavily on exploration to uncover the best path. As the pirate prioritizes the high Q-values, the pirate will shift into exploitation to maximize the rewards when finding the most efficient path. Applying reinforcement learning will help the pirates handle complex environments because after the training it complete, all optimal actions for each state is known.

**Algorithms for Complex Problems**

The first step in implementing deep Q-learning using neural networks was to convert the maze into an image pixel, which was an 8x8 matrix. Once the visual representation of the maze object was converted, the next step was defining the reward function for the positive reinforcement when the pirate won the game. An algorithm trains the agent with neural networks to ensure the agent understands the restrictions used in the environment. Once the q-value was calculated, the agent could understand each current state, action, and reward and predict the following steps to identify the most efficient path to win the game.

**References**

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