Eric Bryant

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Southern New Hampshire University

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**Design Defense – Project Two**

**Analyze the differences between human and machine approaches to solving problems.**

There are multiple steps that a human would have to take to solve this maze. The first would be to visually analyze the maze, memorizing various paths and changes of direction. Next, a human would have to plan their route and start navigating through the maze. A human would have to make decisions at each junction or intersection based on their planned route. Avoiding obstacles and making choices of the next direction of their route based off their perception of their surroundings. Humans would have to constantly update their path and strategy to reach the end goal of the maze. On the other hand, an intelligent agent would take a different approach. An intelligent agent would have to initialize the environment by constructing the maze from a given array. From here the agent would need to experience replay object to store and recall past episodes and initialize variables for win history, win rate, and other parameters. Lastly, the agent will need to print the epoch number, loss, episode count, win count, win rate, and time for each epoch and if the win rate and completion condition are met, training is considered successful, and the process terminates. Some similarities include them both being goal oriented. A human and intelligent agent have end goals that need to be met, such as reaching the end of the maze. Both the human and intelligent agent learn from experience, making mistakes and decisions based off previous attempts.

**Assess the purpose of the intelligent agent in pathfinding.**

The purpose of the intelligent agent in pathfinding is to navigate a maze or a complex environment to find the optimal or near-optimal path from a starting point to a goal which is the end of the maze. The agent then makes decisions at each step, considering the current state of the environment and using learned knowledge to maximize the chances of reaching the goal efficiently. Exploitation selects actions that are known to be the most optimal based on the current knowledge. It involves exploiting the learned information to maximize the expected reward. Exploration on the other hand takes actions that are not the most optimal or promising but are aimed at gathering new information and discovering potentially better actions or paths. For proportion purposes, exploration helps the agent gather information about the environment and learn about the structure of the maze. From here, the agent then can use exploitation to make decisions based off the learning from exploration. The reinforcement learning process allows the agent to navigate the maze based on learned knowledge rather than relying on predefined rules. By optimizing the Q-values through trial and error, the agent can determine the most effective path to the goal, even in complex and dynamic environments where traditional algorithms may struggle.

**Evaluate the use of algorithms to solve complex problems.**

**To**  implement deep Q-learning using neural networks for this game I used the following steps:

1. Take the current state of the environment as input and output Q-values.
2. Create and experience replay to store and recall past episodes.
3. Use exploration and exploitation to find the best possible path efficiently.
4. Train the neural network through epochs and update.
5. Evaluate win rate and a completion check.

**References**

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