**CS-370 Current/Emerging Trends**

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**7.3 Project Two Design Defense**

**The Approach of Solving a Treasure Hunt Game by an AI**

In this project, we attempted to teach an artificial intelligence how to solve a treasure hunt game. The game consists of a maze, structured similarly to a grid. Within the game, there is a treasure and obstacles. The objective is to navigate through the maze and reach the treasure. Players can move forward, right, left, up, and down. However, they cannot move in the direction of an obstacle.

There are significant differences between human and machine problem-solving approaches. As I mentioned in the first week's assignment, the human brain is a complex structure that grants it various abilities such as intuition and learning with minimal information. On the other hand, an intelligent agent does not possess these capabilities. Instead, it offers a data-driven approach based on the information at hand. These differences bring about a variety of distinctions in how humans and intelligent agents solve problems.

**Approach of Humans and Intelligent Agents to the Problem:**

A human first examines the grid, using intuition and prior similar experiences to choose what they see as the optimal path and attempts to follow it. In the event of failure, they use this new information to try the next most likely method. With this approach, they typically solve the problem in just a few trials.

However, when the intelligent agent starts the game, it makes random moves and records the score of these moves in a Q-function, continuing to maximize the score as it progresses and learns how to solve the problem. However, the agent requires many trials to achieve this.

**Similarities Between Humans and Intelligent Agents**

As can be seen, both humans and intelligent agents begin solving the game through trial and error. The key difference lies in that the intelligent agent tries many paths, while the human approaches the situation by leveraging analysis and intuition.

**Problem-Solving Approaches of Humans and Intelligent Agents**

**Human:**

1. Observe and analyze.
2. Based on the analysis, try the most probable path.
3. Reevaluate the analysis with new data and repeat the analysis.
4. Based on the analysis, try the most probable path.
5. Reach the treasure.

**Intelligent Agent:**

1. Create a Q-function.
2. Make random moves and record the resulting values in the Q-function.
3. Gradually reduce random moves based on the gathered data, focusing on maximizing the score.
4. Use the learned data.
5. Reach the treasure.

**What is Exploration and Exploitation**

According to Sridi (2024) definition of this two term like below.

**Exploration:** These are the moves the intelligent agent makes to explore the environment. In the context of this game, the agent tries every possible action in each square and records the actions that yield the highest score. Later, it uses this information to maximize its score.

**Exploitation:** This is when the intelligent agent uses the learned data to select the scenario that will yield the highest score. In this case, when the agent is in a square, it knows which adjacent square will give it the highest score for the next move.

The proportion of exploitation and exploration continuously changes during the game. According to Sridi (2024), this process begins randomly (exploration), and as the agent starts to understand the environment, the balance shifts toward exploitation. Even when the agent reaches the goal, the exploration rate is not reduced to zero. This is done to allow the agent to discover if a better path exists.

According to Gillis (2024), reinforcement learning roughly entails training an artificial intelligence using a reward-and-punishment model. Here, the agent makes random moves and learns which sequence of actions yields the most points. This way, the agent completes its learning. This approach provides an opportunity to create artificial intelligence that can solve any problem where a reward-and-punishment system can be applied. Furthermore, Gillis (2024) states that this method is very effective for solving complex problems, as it breaks the complex problem into smaller parts and uses inductive reasoning to solve the whole problem.

In this particular game, the problem was broken down into every possible move in each square. Neural networks formed the Q-function, and the points obtained from each move updated this Q-function during the feedback phase. This way, the agent could make better moves after each trial.

**References**

**Gillis, S. A.** (2024). What is reinforcement learning? TechTarget.

<https://www.techtarget.com/searchenterpriseai/definition/reinforcement-learning>

**Sridi, C.** (2024). Exploration strategies in reinforcement learning. Medium.

<https://medium.com/@chadhasridi60/exploration-strategies-in-reinforcement-learning-7a4ddc4ac73a>