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Now This Is Pod Racing

Pod racing, a thrilling and high-speed sport featured in *Star Wars*, features pilots racing through dangerous tracks at extreme velocities, dodging obstacles and making split-second decisions. Due to its perilous nature, it is vital that all pilots make the most optimal decisions quickly, which creates a perfect environment to utilize artificial intelligence— an extremely effective optimization tool when specific, specialized strategies are used. This essay will explore how artificial intelligence techniques such as heuristic search, Bayes networks, and deep learning, can be applied to the sport of pod racing in *Star Wars*, optimizing decision-making, enhancing risk management, and improving overall race performance in the dynamic and high-stakes environment of the game.

Heuristic search, particularly through the use of algorithms such as A\*, plays a critical role in optimizing decision-making under high-speed conditions. In a pod racing situation, the state space would include variables such as the pod’s position, velocity, orientation, proximity of obstacles, and the current danger level. Actions, such as maintaining speed, braking, or using boosts, should be chosen based on a heuristic function that balances speed with risk. For instance, the heuristic function can consider both the time to reach a goal, distance to reach the goal, and the potential danger of a certain path, with the danger being factored in as a penalty. Furthermore, in order to prevent the AI from crashing into, i.e. the walls or specific obstacles on the course, due to it attempting to go through the shortest path, we can give a penalty, and reward the AI’s behaviour when it is not hitting anything. This ensures that while the AI strives to find the fastest route, it also avoids crashing and high-risk actions, such as taking sharp turns at high speed, which might lead to accidents or loss of control. A\* search will use a cost function f(n) + h(n) where g(n) is the cost from the start to node n and h(n) is the heuristic estimate of the cost of node n to the goal. As stated previously, with the danger level in the state space being such an important factor, we can incorporate this into our heuristic by making h(n) = estimated time + danger penalty by taking into account the other state space information for the estimated time and adding the danger penalty to the heuristic. By combining the actual path cost with heuristic estimates of danger, A\* search essentially allows the pod to make efficient decisions that maximize safety and speed.

However, a Heuristic search alone will not be enough, as due to the uncertainty that is inherent in the nature of podracing— which is where Bayesian networks come in. These networks are ideal for representing various random variables, such as track conditions, engine temperature, crash risk, and opponent proximity. By using conditional probabilities, a Bayes network can predict the likelihood of a crash or mechanical failure based on the current state of the race. For instance, the crash risk could be dependent on variables like speed, terrain smoothness, and turn sharpness, whereas the damage level could be directly influenced by the likelihood of a crash, and other factors such as the positions of the other pod racers relative to the AI’s pod. As a result, this probabilistic model would be able to enable the AI to assess the most likely outcomes at any given moment and adapt its strategy accordingly. By continuously updating the network’s constraints with real-time data, the AI can thus make informed decisions that minimize risk and greatly improve the performance of its race.

Notwithstanding, the current AI would be useless in a real pod race as it currently lacks the means to retrieve and parse the specific data that it needs for its algorithms, requiring the addition of deep learning to do the job. This AI technique offers powerful capabilities for processing visual and sensory data in real-time, which makes it a perfect strategy to use for pod racing, as decisions need to be made based on rapidly changing environments that the AI needs to distinguish. Through the use of convolutional neural networks (CNNs), the AI can use that to process visual data from the pod’s surroundings to detect obstacles, opponents, and changes in track conditions. In addition, recurrent neural networks (RNNs) can be employed to process the pod’s internal data, such as speed, engine temperature, and boost levels, learning the best actions to take under various scenarios. As the AI learns from this historical race data, it can thus optimize its decision-making, predict the best paths, and know how to handle specific dangerous maneuvers through its past experiences. This allows for continuous improvement, as the deep learning model adjusts its strategies over time in order to provide the pod with an edge over competitors.

In conclusion, the application of artificial intelligence to the sport of pod racing in *Star Wars* opens up significant opportunities for enhanced decision-making, risk management, and improved race performance. Through the use of strategies such as heuristic search, the AI can optimize its path while effectively balancing speed, safety, and ensuring the racer avoids high-risk actions. On the other hand, Bayesian networks can further refine this decision-making process by accounting for the inherent uncertainty that is present in every Pod race environment, allowing the AI to constantly adapt in order to reduce the likelihood of failure. However, it is deep learning that truly enables the AI to function effectively in the high-speed, dynamic environment of pod racing, as it allows the AI to process real-time sensory and visual data in order to detect obstacles, anticipate opponent behavior, and learn from past experiences. By combining these three powerful and specific AI techniques, pod racing can be transformed into a more strategic and optimized sport, where each decision is based on careful analysis of real-time data and previous experiences; now this is pod racing!