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PHYSICS-AWARE SCHEDULING ALGORITHM FOR AUTONOMOUS VEHICLES

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ABSTRACT

The rapid advancements in autonomous vehicle technology have necessitated the development of intelligent systems for optimal resource allocation and task scheduling. This paper proposes a Physics-aware Scheduling Algorithm (PASA) to enhance the operational efficiency of autonomous vehicles (AVs) by integrating physics-based principles into the scheduling process. Traditional scheduling algorithms often overlook the dynamics and physical constraints inherent in AV operations, leading to suboptimal task performance. PASA, in contrast, incorporates real-time data such as velocity, acceleration, and energy consumption to dynamically allocate tasks, ensuring that the vehicle's physical capabilities are efficiently utilized.

The proposed algorithm operates by considering both the physical state of the vehicle and the environmental factors it encounters, including road conditions and traffic patterns. By leveraging these data points, PASA can predict the optimal scheduling sequence that minimizes energy consumption while maximizing task completion efficiency. The algorithm uses a hybrid approach that combines heuristic optimization techniques with real-time feedback to adapt to the changing conditions of AVs during their operation.

Through simulations and real-world case studies, the effectiveness of PASA is evaluated in comparison to conventional scheduling algorithms. The results demonstrate significant improvements in energy efficiency, task execution time, and overall system performance. PASA's ability to account for physical constraints and real-time conditions presents a promising avenue for the development of more intelligent and resource-efficient autonomous vehicle systems, pushing the boundaries of autonomous transportation and facilitating the transition to fully optimized self-driving technologies.

KEYWORDS: *Physics-Aware Scheduling, Autonomous Vehicles, Task Allocation, Resource Optimization, Energy Efficiency, Real-Time Data, Vehicle Dynamics, Hybrid Optimization, Task Execution, Self-Driving Technology*

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