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Crossroads - A Time-Sensitive Autonomous Intersection Management Technique

Background

Autonomous vehicles require intelligent autonomous intersection management for safe and efficient operation. Given the uncertainty in vehicle trajectory, intersection management techniques must consider a safety buffer among the vehicles, which must also account for the network and computational delay. However, modeling the worst-case computation and network delay as additional safety buffer degrades the throughput of the intersection. An existing query-based approach, providing simple data concerning vehicle speed and arrival time, also suffers from poor intersection throughput due to the increase of network traffic and the amount of computation on both the vehicles and the intersection. Therefore, there is a need for a time-sensitive autonomous intersection management system for self-driving vehicles.

Invention Description

Researchers at Arizona State University have developed a time-sensitive autonomous intersection management method to program the interface of a vehicle and intersection manager. Advantageously, this method does not require an additional buffer to account for the effect of network and computational delay, and further, it enables efficient intersection management.

The results based on a 1/10 scale model of an intersection using TRAXXAS RC cars demonstrate that a time-sensitive programming-based approach avoids the need for large buffers as required to accommodate for the network and computation delay. Additionally, this approach can reduce the average wait time for the vehicles at a single-lane intersection by 24%. Comparing with previous approaches, our results achieve on average 1.62X higher throughput than a simple approach with extra safety buffers and 1.36X improvement over the query-based approach.

Potential Applications

- Autonomous vehicles
- Intersection traffic management
- Traffic management

Benefits and Advantages

- Intelligent traffic and intersection management comparing traditional traffic signal systems.
- Increased efficiency and throughput over known approaches.

Dr. Aviral Shrivastava's Directory Webpage