Platooning System and Methods

Tech ID: 34195 / UC Case 2022-810-0

BACKGROUND

Vehicle platooning technology is an evolving segment within the broader movement towards more intelligent transportation, specifically relating to autonomous vehicles. Some early concepts dates back to the 1970s with projects like Electronic Route Guidance System developed by the U.S. Federal Highway Administration, which used a destination-oriented approach with roadside units to decode vehicle inputs and provide routing instructions. Subsequent initiatives such as the California Partners for Advanced Transportation Technology program demonstrated vehicles traveling in close formation guided by magnets embedded in roadways. The landscape has since evolved from individual vehicle automation concepts to more sophisticated vehicle-to-vehicle (V2V) communication schemes to enable coordinated movements. More recent industry developments have been driven by advancements in 5G technology, V2V communication protocols, and enhanced safety requirements. Current systems face control stability challenges, particularly as platoon size increases, with research showing that system stabilizability degrades and can lose stability entirely in infinite vehicle formations. Moreover, issues with V2V communication reliability persist, including frequent intermittent connectivity problems and wireless interference, limiting wider adoption. Additional challenges include the fundamental trade-off between fuel efficiency and safety margins, where shorter inter-vehicle distances improve aerodynamic benefits but increase collision risk.

TECHNOLOGY DESCRIPTION

To help address the complexity of mixed-autonomy scenarios where both controlled and uncontrolled vehicles must coexist safely, researchers at UC Santa Cruz (UCSC) have introduced an approach to autonomously maneuvering vehicle nodes in a platoon with a focus on critical control challenges through time-based parameter monitoring and dynamic speed adjustment. UCSC's Adaptive Decentralized Emergent-behavior PlaTooning's (ADEPT) centers on receiving positional data at different time increments from multiple vehicle nodes and determining control parameters based on temporal analysis to enable more responsive and stable platoon formation. Unlike existing systems that rely primarily on distance-based control or simple predecessor-following algorithms, ADEPT potentially offers improved real-time adaptation by incorporating multi-temporal data analysis for enhanced decision-making accuracy. The system and methods integrate advanced parameter comparison mechanisms with threshold-based control logic, potentially offering more robust responses to dynamic traffic conditions compared to current state-of-the-art platooning technologies.

APPLICATIONS

- commercial freight/trucking
- autonomous ride-sharing/robotaxi
- autonomous/semi-autonomous non-commercial automotive

FEATURES/BENEFITS

- Real-time adaptation through incorporation of multi-temporal data analysis for enhanced decision-making accuracy.
- Resilience to various driving conditions and traffic scenarios by integrating advanced parameter comparison mechanisms with threshold-based control logic.
- Time-increment-based controls suggest superior precision in inter-vehicle spacing and overall string-stability.

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230343223	10/16/2023	2022-810

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OTHER INFORMATION

KEYWORDS

platoon, platooning, vehicle, automotive, autonomous, vehicle platooning, automotive platooning, decentralized, V2V, truck platooning, connected vehicles, vehicle-to-vehicle, DSRC

CATEGORIZED AS

- **Communications**
  - Other
- **Computer**
  - Software
- **Sensors & Instrumentation**
  - Position sensors
  - Process Control
- **Transportation**
  - Automotive

RELATED CASES

2022-810-0

RELATED MATERIALS

- Multi-Vehicle Merge in Adaptive Decentralized Emergent Behavior PlaTooning - 06/14/2023

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- A Novel Iot Protocol Architecture; Efficiency Through Data And Functionality Sharing Across Layers
- Cross-Layer Device Fingerprinting System and Methods
- Smart Deployment of Nodes in a Network

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