E-Pico Master's Thesis

Research on the collaboration and collision avoidance of multiple automated vehicles

Goals

Multiple vehicle cooperation and collision avoidance in automated vehicles is a crucial area of research within autonomous driving technology. This survey article likely explores existing approaches, challenges, and potential solutions in enhancing collaboration among multiple automated vehicles to prevent collisions.

The proposed AI-enabled conceptual framework is likely aimed at leveraging artificial intelligence algorithms to facilitate communication, coordination, and decision-making among automated vehicles to ensure safe and efficient operation in dynamic environments. This framework may incorporate various AI techniques such as machine learning, reinforcement learning, and computer vision to enable vehicles to perceive their surroundings, predict the intentions of other vehicles, and take appropriate actions to avoid collisions.

Key aspects that the survey and conceptual framework may address include:

1. **Communication Protocols**: Investigating how vehicles can exchange information such as position, speed, and trajectory predictions to coordinate their actions effectively.
2. **Decision-Making Algorithms**: Developing AI algorithms that enable vehicles to make real-time decisions considering factors like traffic conditions, road infrastructure, and safety constraints.
3. **Collision Avoidance Strategies**: Exploring different collision avoidance strategies, including trajectory planning, braking, and lane changing, to prevent accidents in complex traffic scenarios.
4. **Cooperative Maneuvers**: Studying how vehicles can cooperate to perform maneuvers such as merging onto highways, navigating intersections, and overtaking other vehicles safely.
5. **Integration with Traffic Management Systems**: Considering how automated vehicles can interact with existing traffic management infrastructure, such as traffic lights and signage, to optimize traffic flow and enhance safety.
6. **Robustness and Scalability**: Ensuring that the proposed framework is robust to uncertainties and variations in traffic conditions and can scale to accommodate a large number of vehicles operating simultaneously.

7. **Regulatory and Ethical Considerations**: Addressing regulatory challenges and ethical dilemmas associated with implementing AI-enabled collision avoidance systems, such as liability issues and prioritization of safety over other objectives.

Overall, the survey and conceptual framework aim to provide insights into the state-of-the-art techniques and propose novel approaches to enhance the cooperation and collision avoidance capabilities of automated vehicles, ultimately contributing to the advancement of autonomous driving technology and improving road safety

Requirements

You should understand *Automatic control, Machine Learning, Automotive*.

Bibliography

[1] Muzahid, A.J.M., Kamarulzaman, S.F., Rahman, M.A. et al. Multiple vehicle cooperation and collision avoidance in automated vehicles: survey and an AI-enabled conceptual framework. Sci Rep 13, 603 (2023). https://doi.org/10.1038/s41598-022-27026-9

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