

Editorial

Design Theory, Method, and Control of Intelligent and Safe Vehicles

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The automotive industry is undergoing a profound transformation, driven by the powerful trends of electrification, intelligence, and connectivity. This Special Issue, “Design Theory, Method, and Control of Intelligent and Safe Vehicles,” captures the cutting-edge research aimed at harnessing these technologies to create a safer, more efficient, and sustainable transportation future. The vision of intelligent, connected electric vehicles seamlessly interacting with each other and the infrastructure promises unprecedented gains in traffic flow, energy economy, and overall road safety. Ultimately, the ambitious goal is to move decisively towards a “zero casualty” reality [1–3].

However, as we embrace this promising future, we must also rigorously address its significant challenges. Current intelligent driving systems, while advanced, are not infallible. They often lack the nuanced adaptability of human drivers when confronting complex, unknown scenarios, which can potentially lead to a loss of vehicle stability and safety. Therefore, the core mission for researchers and engineers is to fortify the stability, resilience, and safety of these vehicles across all possible operating conditions. By leveraging advanced materials, artificial intelligence, and robust connectivity, intelligent vehicles are evolving to possess superior active and passive safety capabilities, intelligent decision-making, and data-driven insights that traditional vehicles cannot match [4,5].

This Special Issue presents a collection of twelve pioneering papers that collectively address these critical challenges from multiple angles. The contributions can be broadly categorized into several key research streams:

1. Perception, Security, and Risk Assessment [6,7]: Several papers focus on the foundational layer of understanding the environment and securing the system. Studies on multi-agent mapping for unknown environment exploration and LiDAR attack recognition frameworks using Gaussian processes enhance perceptual robustness. Concurrently, a critical examination of the safety risks of AI-driven solutions provides a necessary cautionary perspective, ensuring that the pursuit of intelligence is tempered with security and reliability.
2. Vehicle Dynamics and Control Optimization [8,9]: A significant number of contributions delve into the core of vehicle dynamics and control. This includes novel control strategies for semi-active suspension systems using advanced optimization algorithms like the Enhanced African Vultures Optimization Algorithm, frequency-domain fitting methods for suspension structures, and stability control for high-speed steering platoons. These works are crucial for maintaining vehicle stability and comfort under demanding conditions.
3. Motion Planning and Collision Avoidance [10,11]: The intelligent decision-making layer is addressed through research on adaptive motion planning algorithms and personalized collision avoidance systems. These studies not only improve the vehicle’s ability to navigate complex paths but also innovatively incorporate considerations



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of driver-specific behavior, bridging the gap between fully autonomous and human-centric driving styles.

4. System-Level and Conceptual Design [12–14]: Looking at the bigger picture, this issue also features multidisciplinary approaches for designing sustainable urban vehicle fleets and the conceptual design of novel platforms like an unmanned electrical amphibious vehicle. Furthermore, research on the aerodynamic impact of battery pack placement underscores the integrated nature of electric vehicle design, where energy storage and vehicle dynamics are intrinsically linked.

The diverse methodologies presented—spanning numerical simulation, optimization algorithms, incremental learning, and multidisciplinary design—highlight the vibrant and collaborative nature of this field. The papers in this collection not only provide immediate solutions but also pave the way for future research directions.

We extend our sincere gratitude to all the authors for their valuable contributions and to the reviewers for their rigorous efforts in ensuring the quality of this Special Issue. It is our hope that this compilation will serve as a valuable resource for the academic and industrial communities, inspiring further innovation and collaboration to accelerate the development of truly intelligent and safe vehicles for tomorrow's roads.

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List of Contributions

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