# Comprehensive Review of Autonomous Vehicles: Sensing, Mapping, Planning, and Human-Machine Interaction

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## Abstract:

This literature review provides a comprehensive analysis of recent advancements in autonomous vehicles, focusing on four critical aspects: Sensing and Perception Systems, Localization and Mapping, Motion Planning and Control, and Human-Machine Interaction. Autonomous vehicles rely on sophisticated sensing and perception systems, including LIDAR, cameras, and RADAR, to interpret their environment accurately. This review explores the integration of these sensors and emerging sensor fusion techniques that enhance environmental perception. Localization and Mapping are crucial for precise navigation, and this review discusses state-of-the-art methodologies, such as Simultaneous Localization and Mapping (SLAM) and high-definition map integration. Motion Planning and Control algorithms ensure safe and efficient vehicle maneuvering by addressing challenges related to dynamic environments, collision avoidance, and real-time decision-making. Human-Machine Interaction is examined to understand user experience, safety, and ethical considerations, highlighting the importance of intuitive interfaces and driver monitoring systems. This literature review synthesizes findings from 50 research papers, providing a holistic understanding of the technological landscape and identifying future research directions to advance autonomous vehicle technology.