

Poster: Adaptive Safety Measures: A Concept to Optimize Safety in Automated Driving Systems

Anil Ranjithbhai Patel, Peter Liggesmeyer

Chair of Software Engineering: Dependability, RPTU Kaiserslautern, Germany

Abstract *This poster introduces an approach in the field of Autonomous Driving Systems (ADS), focusing on enhancing safety in complex and rapidly changing driving conditions. Central to this research is the development of a dynamic risk rating system. Leveraging runtime data from On-board sensors (OBS), this system continuously evaluates and responds to risk levels based on key parameters, such as relative velocity, distance to the lead vehicle, and driving environment conditions. By incorporating Machine Learning techniques, it adapts its risk management algorithms to be more proactive and less reactive.*

The research then integrates this risk level prediction with a system service monitor to translate risk assessments into actionable safety measures. This integration identifies safety rules that could prevent hazardous situations during operation, marking a key step in operational safety. Subsequently, a reconfiguration strategy is employed, involving a configuration manager that includes a system service monitor, a set of safety rules, and various configurations. It works with the risk assessment module to select and activate configurations that mitigate identified risks while maintaining functionality. Each safety rule correlates specific vehicle risk levels with restorative measures, ensuring operational safety.

The poster details a comprehensive simulation study in a highway lane-following scenario with an adaptive cruise control system. This environment replicates various failure conditions, such as sensor malfunctions, unexpected behaviours of the lead vehicle, and adverse weather conditions. The results demonstrate the model's ability to dynamically adapt to unsafe situations, offering a granular understanding of evolving risks and enabling the ADS to make safer, more risk-informed decisions.

The advanced transportation field of ADS necessitates a shift from traditional static risk assessment methods to dynamic, adaptable models. This research contributes to this field by providing a conceptual framework for dynamic risk management. The adaptive risk rating system not only improves the ability of ADS to navigate complex environments but also sets a new way forward for runtime risk perception and management. It is a step toward more intelligent, adaptive, and safe autonomous driving technologies, capable of handling the unpredictability and diversity of real-world driving scenarios.

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