VEHICLE-IN-THE-LOOP EXPERIMENTS OF OPTIMAL AUTOMATED DRIVING IN MIXED TRAFFIC

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Connected and automated vehicles (CAVs) are marketed for their increased safety, driving comfort, and time saving capabilities. Coupled with easier access to information via connected technologies, they also offer unprecedented opportunities for energy efficient driving by better anticipation and planning of upcoming traffic events – leading to reduced braking. Additionally, the interaction between automation and human drivers plays a key role in the efficiency of emergent scenarios in mixed traffic. Via traffic motion harmonization, further secondary traffic improvements can be observed that contribute to boosted road utilization and improved energy efficiency of nearby human drivers. This talk will highlight the energy and traffic efficiency potentials of connected and automated vehicles based on optimal control theory and explores the impact of anticipative vehicle guidance on energy and traffic efficiency of CAVs and surrounding human-driven vehicles. The benefits are shown in a novel vehicle-in-the-loop experiment of an emergent highway scenario with virtual traffic surrounding a real-vehicle on a test track in real-time. Energy results are shown for both a gasoline engine and an electric motor vehicle.

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