Center for Advanced Multimodal Mobility Solutions and Education

UTC Project Information – CAMMSE @ UNC Charlotte	
Project Title	Dynamic Coordinated Speed Control and Synergistic Performance Evaluation in Connected and Automated Vehicle Environment
University	The University of North Carolina at Charlotte
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Funding Sources and Amount Provided (by each agency or organization)	U.S. Department of Transportation: $240,000 The University of North Carolina at Charlotte: $60,000
Total Project Cost	$300,000
Agency ID or Contract Number	
Start and End Dates	08/16/2022 – 09/30/2024
Brief Description of Research Project	Due to inherent restrictions in human driving behavior and information access, freeway congestion and stop-and-go behavior are nearly unavoidable. The adverse impacts include increased safety risks, longer travel times, and excessive fuel consumption. Various techniques (e.g., Variable Speed Limit (VSL), which is also known as Dynamic Speed Harmonization (DSH)), have been proposed to dampen traffic oscillation and smooth traffic speed. However, the effectiveness of the VSL is related to the compliance rates of drivers. In addition, there are delays in the collection of information, and control strategies can only affect a small area. Fortunately, new opportunities are emerging with the development

	of Connected and Automated Vehicles (CAVs) that can completely comply with the control system. Numerous CAV applications are explored as part of the Intelligent Transportation Systems (ITS) to enhance a range of Measures of Effectiveness (MOEs), such as safety, mobility, and environmental sustainability. The objective of this study is to investigate the effects of coordinated speed control in mixed traffic flow involving Human-Driven Vehicles (HDVs) and CAVs on the freeway. Therefore, a dynamic two-phase strategy based on Deep Reinforcement learning (DRL) is developed to better understand how CAVs can improve operational performance. To evaluate and quantify the impact, a comprehensive performance framework is formulated. A series of numerical experiments will be conducted under different traffic demands and market penetration rates (MPRs) under various simulated scenarios. The overall intent of this study is to inform practitioners about the potential interactions between MOEs in implementing specific control strategies in CAV environment.
Describe Implementation of Research Outcomes (or why not implemented) *Place Any Photos Here*	
Impacts/Benefits of Implementation (actual,	

not anticipated)	
Web Links • *Reports* • *Project website*	https://cammse.uncc.edu/sites/cammse.uncc.edu/files/media/CAMMSE-UNCC-2022-UTC-Project-Information-16-Fan.pdf https://cammse.charlotte.edu/wp-content/uploads/sites/191/2024/09/CAMMSE-UNCC-2022-UTC-Project-Report-16-Fan-Final.pdf