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Methods for Selected Connected Autonomous Vehicles (CAV) Safety and Mobility Challenges

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ABSTRACT:

Autonomous vehicles promise enhanced vehicle safety and comfort. Connectivity among vehicles also provides several added safety benefits and traffic, energy, and environmental efficiencies. Most foreseeable future driving will be a mixed environment of manual, connected, and autonomous vehicles in which safety considerations are paramount. Connected Autonomous Vehicles (CAVs) provide the best that autonomy and connectivity can offer. The significant extended benefit of autonomy in traffic comes from the connectivity through communications among vehicles, vehicle and infrastructure, and vehicle and other road users (also known as V2V, V2I, and V2X.) Among many capabilities, CAVs connectivity allows augmented cooperative perception for improved safety, automated coordinated trajectory plans, coordinated speed adaptations for enhanced traffic throughput, and reduced energy consumption. Some of these also apply to Connected Vehicles (CV) without autonomy. CVs or CAVs will have more comprehensive situational awareness in the vehicle's vicinity for safety assurance. Driving tasks like lane changing, merging, navigating automated intersections, and various collision avoidance scenarios benefit significantly from the connectivity and the enhanced collective perception of the surrounding areas. Appropriate algorithms based on vehicular connectivity can also improve driving task decision-making and navigation plans within the traffic. This talk presents a few advanced methods and algorithms that demonstrate some benefits and challenges of CAVS through simulation and laboratory experiments.

BIOGRAPHY:

Dr. Azim Eskandarian is the Department Head (since 2015), and Nicholas and Rebecca Des Champs Chair/ Professor of the Mechanical Engineering Department at Virginia Tech (VT.) He established the Autonomous Systems and Intelligent Machines laboratory at VT to research intelligent and autonomous vehicles and mobile robotics. Before that, he was a Professor of Engineering and Applied Science at George Washington University (GWU) and the founding Director of the Center for Intelligent Systems Research (1996-2015), the Director of the "Transportation Safety and Security" University Area of Excellence (2002-2015), and the co-founder of the National Crash Analysis Center (1992) and its Director (1998-2002 & 5/2013-7/2015). Earlier, he was an Assistant Professor at Pennsylvania State University, York, PA (1989-92) and worked as an engineer/project manager in the industry (1983-89.) He has nearly four decades of academic and engineering experience and has conducted pioneering research in dynamics and control, intelligent systems, and applied mechanics, with applications in intelligent vehicles, vehicle dynamics and control, automotive safety, neuroengineering, and robotics. Dr. Eskandarian was awarded the Society of Automotive Engineers Vincent Bendix Automotive Electronics Engineering Award in 2021; the IEEE Intelligent Transportation (ITS) Society's Outstanding Researcher Award in 2017; and the GWU's School of Engineering Outstanding Researcher Award in 2013. He was among the highest-cited authors (top 5) and best paper awardees of IEEE Transactions on Intelligent Transportation Systems (ITS) between 2001-2010. He is the Editor-in-Chief of the IEEE Transactions on ITS, the highest impact factor journal in this field. He has served as the associate editor and editorial board member of five other journals, including ASME Journal of Dynamic Systems, Measurements, and Controls. He is the co-author and Chief Editor of "Handbook of Intelligent Vehicles" (Springer, 2012), which has been widely used (714,000 accesses to date) and was translated into Chinese in 2014 due to popular demand. Dr. Eskandarian is a fellow of ASME, a senior member of IEEE, and a member of SAE professional societies, a member of Tau Beta PI and PI Tau Sigma engineering honor societies. He also served as president of GW's Sigma Xi scientific research society chapter. He was the VP of Administration (2016-2018) and three times elected member of the Board of Governors of the IEEE Intelligent Transportation Systems Society (latest 2022-24.) He is also active in ASME Dynamic Systems and Control technical committees. He received his BS, MS, and DSC degrees in Mechanical engineering from GWU, Virginia Tech, and GWU.