MECHENGINEERING SEMINAR

Advances in Vehicle Safety and Mobility Leading to Autonomous Driving

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Abstract

While autonomous or driverless driving has received a lot of public attention recently, the majority of the driving for the foreseeable future remains without automation, or with a mixed environment of no and partial automation, and full automation only for a small percentage of vehicles. In all of these mixed modes of traffic, the persisting significant challenge is the safety of driving and traffic crashes, which cause about 35,000 fatalities and 2.2 million injuries annually in the United States, resulting in an estimated economic loss of over $230 billion. Integrated vehicle passive and active safety systems are required to mitigate crashes or avoid collisions. This talk reviews some timely areas of research in vehicle control systems and signal processing to address the pervasive vehicle safety problem.

Advanced methods in vehicle mechanics/dynamics, controls, communications, man-machine interface, human factors, AI and machine learning, as well as cognitive science are utilized to design and develop active safety and advanced driver assistance systems (ADAS). Based on sensory feedback and situational awareness, these systems can warn/alert the driver to take action, partially support the driver's control tasks, or intervene by full control to automatically avoid collisions. In this talk, first, a holistic approach to vehicular safety and its advanced research challenges is discussed. Advances in vehicular systems, ranging from partial to full automation and their collision avoidance implications are reviewed. Next, a critical perspective on personal mobility and the implications of current directions in automotive industry is briefly discussed. A view on the future that ensures both practical mobility, safety, and congestion mitigation while minimizing energy consumption is presented with the hope of creating awareness for a persisting traffic congestion and safety challenge.

Biography

Dr. Azim Eskandarian has been a Professor and Head of the Mechanical Engineering Department at Virginia Tech (VT) since August 2015. He became the Nicholas and Rebecca Des Champs chaired Professor in April 2018. He established the autonomous systems and intelligent machines laboratory at VT to conduct research in intelligent and autonomous vehicles, and mobile robotics. Prior to that, he was a Professor of Engineering and Applied Science at The 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 industry (1983-89.) He has over 33 years 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 IEEE Intelligent Transportation (ITS) Society's Outstanding Researcher Award in 2017 and the GWU's School of Engineering Outstanding Researcher Award in 2013. He is the Editor-in-Chief of the IEEE Transactions on ITS and 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 and due to popular demand was translated into Chinese in 2014. He was among the highest cited authors (top 5) of IEEE Transactions on Intelligent Transportation Systems (ITS) between 2001-2010.

Dr. Eskandarian is a fellow of ASME, senior member of IEEE, and member of SAE professional societies; a member of Tau Beta PI, PI Tau Sigma engineering honor societies; and previously served as president of GW's chapter of the Sigma Xi scientific research society. He has been the VP of Administration of IEEE Intelligent Transportation Systems Society (since 2016) and two terms elected board member of the society. 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, respectively.