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Holistic Assessment of the Co-Benefits and Tradeoffs between Safety, Mobility and the Environment for Automated and Connected Vehicles

Safety, mobility and environmental sustainability represent the three cornerstones when evaluating the effectiveness of connected and automated vehicles (CAV). Most CAV applications are typically developed with the major goal of improving one of these key elements. As examples, 1) Crash avoidance systems on vehicles are being developed specifically for improving safety; 2) Connected adaptive signal control systems are being put into place to improve mobility; and 3) Eco-approach and departure systems at signalized intersections are now being contemplated to reduce vehicle energy and emissions. However, very few CAV studies have been conducted that provide a holistic assessment of all three of these elements. Many CAV applications may have co-benefits in the sense that they can improve a combination (usually two) of safety, mobility and environmental sustainability. On the other hand, some CAV applications may actually have trade-offs between these different elements. In this presentation, we describe a holistic assessment and examine the co-benefits and tradeoffs between safety, mobility and the environment for a variety of CAV applications. An in-depth literature search was conducted to examine these tradeoffs and synergies, and detailed analysis is being carried out on three representative CAV applications using advanced simulation tools. The results from this program are being used to inform practitioners and policy makers of potential interactions between the safety, mobility, and environmental sustainability goals of implementing specific CAV programs.

Speaker

Matthew Barth is the Yeager Families Professor at the College of Engineering, University of California-Riverside. He is part of the intelligent systems faculty in Electrical and Computer Engineering and is also serving as the Director for the Center for Environmental Research and Technology (CE-CERT), UCR's largest multi-disciplinary research center. He received his B.S. degree in Electrical Engineering/Computer Science from the University of Colorado in 1984, and M.S. (1985) and Ph.D. (1990) degrees in Electrical and Computer Engineering from the University of California, Santa Barbara. Dr. Barth joined the University of California-Riverside in 1991, conducting research in Intelligent Systems.

Dr. Barth's research focuses on applying engineering system concepts and automation technology to Transportation Systems, and in particular how it relates to energy and air quality issues.His current research interests include ITS and the Environment, Transportation/Emissions Modeling, Vehicle Activity Analysis, Advanced Navigation Techniques, Electric Vehicle Technology, and Advanced Sensing and Control.

Dr. Barth is active with the U.S. Transportation Research Board serving in a variety of roles in several committees, including the Committee on ITS and the Committee on Transportation Air Quality. He was awarded the TRB Pyke Johnson Award for TRB outstanding paper in 2007. In 2011, he was one of the winners of the Connected Vehicle Technology Challenge sponsored by U.S. Department of Transportation's Research and Innovative Technology Administration (RITA).

He has also served on a number of National Research Council (NRC) Committees. Dr. Barth has also been active in IEEE Intelligent Transportation System Society for many years, participating in conferences as a presenter, invited session organizer, session moderator, reviewer, associate editor of the Transactions of ITS, and member of the IEEE ITSS Board of Governors.

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