Prediction, Estimation, and Control of Connected and Autonomous Vehicles

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ABSTRACT:

Connected and Automated Vehicles (CAV) have been heralded as a transformative technology, leading to the new era of transportation with unprecedented safety and mobility benefits. They also push the energy efficiency of the transportation systems at both the macro (traffic flow) and micro (vehicle) levels to the next height with abundant new opportunities for communication and optimization. This talk will discuss some fundamental technical challenges for prediction, estimation, and control at the core of the CAV technology. Using the integrated power and thermal management for CAV as an example, we will show how model-based design, complemented by data-driven approaches, can lead to control and optimization solutions with a significant impact on energy efficiency and operational reliability, in addition to safety and accessibility. Several unique problem characteristics, such as multi-timescale, the highly interactive nature of subsystems involved, and the dynamic and uncertain environment that CAVs are operating within, will be explained and explored. Those features call for innovative use of existing tools and the development of new solutions and tools for prediction, estimation, and control.

BIOGRAPHY:

Jing Sun received her Ph. D degree from the University of Southern California in 1989 and her master's and bachelor's degrees from the University of Science and Technology of China in 1984 and 1982, respectively. From 1989-1993, she was an assistant professor in the Electrical and Computer Engineering Department at Wayne State University. She joined Ford Research Laboratory in 1993, where she worked on advanced powertrain system controls. After spending almost ten years in the industry, she returned to academia in 2003. She joined the University of Michigan, where she is the Michael G. Parsons Collegiate Professor in the Naval Architecture and Marine Engineering Department, with joint appointments in the Electrical Engineering and Computer Science Department and Mechanical Engineering Department at the same university. She holds 43 U.S. patents and has published over 300 archived journal and conference papers. She is a Fellow of NAI (the National Academy of Inventors), IEEE (Institute of Electrical and Electronics Engineers), IFAC (International Federation of Automatic Control), and SNAME (the Society of Naval Architecture and Marine Engineering). She is a recipient of the 2003 IEEE Control System Technology Award.