Integrated Power Systems for Electrified Ships: Control and Optimization

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As the key enabler of ship electrification, shipboard integrated power systems (IPS) incorporate heterogeneous power sources and energy storage systems to achieve improved energy efficiency and reliability. One unique characteristic of IPS is the highly interactive and dynamic nature due to tight physical couplings of the multiple components involved. To achieve high efficiency, the IPS relies on an effective power management system to exploit its operating profiles and push the system to operate at its optimal conditions. In this presentation, we will explore the special characteristics of the all-electric ships and their IPS and discuss the challenges and solutions associated with IPS control and optimization. Through several examples that involve all-electric ship technology development, we will demonstrate the important roles of control and real-time optimization in the era of electrified ships and highlight the demands for more effective design and analysis methodologies and tools.

Speaker's Short 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 to 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 44 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.