PDE Controls in Battery Management and Oil Production

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ABSTRACT:

Numerous engineering systems are governed by partial differential equations (PDEs), such as energy systems, water management systems, multi-agent systems, and traffic systems. In this talk, I will present two PDE control results related to energy systems. I will first talk about improving the state-of-charge estimation accuracy in lithium-ion batteries with a thermal-electrochemical model, which is essential in ensuring the normal operation of renewable energy storage systems. Then, I will discuss how to suppress the torsional vibration of the drilling bits in deep offshore oil drilling systems subject to stick-slip instability and external disturbances, which is crucial in guaranteeing the performance of energy resource exploration and production systems. In addition to generating economic benefits, both results contribute to reducing environmental pollution and improving the safety and wellbeing of people.

BIOGRAPHY:

Shu-Xia Tang received her Ph.D. in Mechanical Engineering in 2016 from the Department of Mechanical & Aerospace Engineering, University of California, San Diego, USA. She is currently a postdoctoral research fellow at the Department of Civil and Environmental Engineering, University of California, Berkeley, USA and Inria Sophia Antipolis – Mediterranee, France. Her primary research interests are distributed parameter systems and control, with applications to battery systems, water management systems, oil drilling systems, multi-agent systems, traffic systems, and additive manufacturing systems.