MECHANICAL ENGINEERING SEMINAR

Control Topology Design in Complex Dynamical Networks

Dr. Tyler Summers

Assistant Professor, Mechanical Engineering
The University of Texas at Dallas

Friday, September 7, 2018
11:00 am, ECSS 2.415

Abstract

Emerging cyber-physical networks, including critical infrastructure such as electric power grids, water distribution networks, and transportation systems, are becoming increasingly difficult to operate and control efficiently and resiliently. On the other hand, the recent spectacular advances in computation, communication, sensing, and actuation technologies are providing opportunities to fundamentally reimagine the control and information architectures and algorithms for these networks. In this talk, I will discuss structure and algorithms for control architecture design problems, which involve simultaneous design of the control topology -- i.e., locations of sensors, actuators, and communication links -- and the corresponding feedback control and estimation laws. I will show that several important classes of control performance and robustness metrics have strong structural properties that allow for either efficient global optimization or an approximation guarantee by using a simple greedy heuristic. The results are illustrated on problems of sensor and actuator placement and selection in power grids.

Biography

Tyler Summers is an Assistant Professor in the Department of Mechanical Engineering at UT Dallas, where he directs the Control, Optimization, and Networks Laboratory. Prior to joining UT Dallas, he was an ETH Postdoctoral Fellow in the Automatic Control Laboratory at ETH Zürich from 2011 to 2015. He received a B.S. degree in Mechanical Engineering from Texas Christian University in 2004 and an M.S. and PhD degree in Aerospace Engineering with emphasis on feedback control theory at the University of Texas at Austin in 2007 and 2010, respectively. He was a Fulbright Postgraduate Scholar at the Australian National University in Canberra, Australia in 2007-2008. He is the recipient of a CISE Research Initiation Initiative (CRII) award from the National Science Foundation in 2016 and a Young Investigator Program award from the Army Research Office in 2017. His research interests are in distributed feedback control, optimization, and learning in complex dynamical networks, emphasizing theoretical tools and computational methods and driven by applications to distributed robotic networks and electric power networks.