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A WEBINAR PRESENTED BY
THE WATERLOO INSTITUTE FOR SUSTAINABLE ENERGY

Wednesday Oct 28, 2020
2:30 pm – 3:30 pm

How to Join the Zoom Meeting

ADVANCES IN FEEDBACK CONTROL FOR POWER GRID MODERNIZATION

John W. Simpson-Porco, Assistant Professor, Department of Electrical and Computer Engineering, University of Toronto

The ongoing deployment of distributed energy resources across all layers of the grid is changing the way power systems are operated and controlled; classical power system control architectures are presently being re-examined and revised to meet these challenges. A particular problem of interest is how hierarchical and distributed control loops, using high-bandwidth sensors and actuators, can be designed to mitigate the fast, spatially distributed disturbances arising from renewable energy integration.

Driven by these challenges, we discuss in this talk an evolving line of research focusing on the design of feedback controllers which optimize the steady-state performance of a dynamic system. We outline two constructive design frameworks for variants of this problem. The first framework begins from an optimization viewpoint, taking standard projected gradient algorithms and modifying them to accept real-time system measurements. Ideas from robust control can be leveraged to obtain closed-loop stability certificates. The second framework is instead rooted in classical tracking controller designs and relies on inserting the desired optimality conditions directly into a feedback loop. The two frameworks are illustrated with detailed applications to power system control problems, specifically to the problems of secondary frequency control and coordinated voltage control in transmission and distribution systems.

Biography

John W. Simpson-Porco is an Assistant Professor in the Edward S. Rogers Sr. Department Electrical and Computer Engineering at the University of Toronto. His research focuses on feedback control theory and applications of control and optimization in power and energy systems. John received his B.Sc. degree in Engineering Physics from Queen's University in 2010, and his PhD in Mechanical Engineering from the University of California, Santa Barbara in 2015. He was previously an Assistant Professor of Electrical and Computer Engineering at the University of Waterloo, Canada, and a visiting scientist with the Automatic Control Laboratory at ETH Zürich, Zürich, Switzerland. Prof. Simpson-Porco is a recipient of the Automatica Paper Prize, the Center for Control, Dynamical Systems and Computation Best Thesis Award, and the IEEE PES Technical Committee Working Group Recognition Award for Outstanding Technical Report. He is currently an Associate Editor for IEEE Transactions on Smart Grid.

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