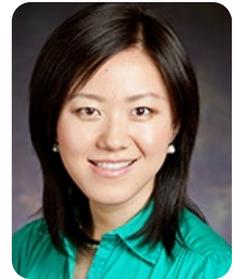


Seminar Announcement

Dr. Hao Zhu
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Electrical and Computer Engineering
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Friday, April 22, 2016
Green Hall, Room 0120
1:30 PM

Decentralized Dynamic Optimization for Power Network Voltage Control

Abstract: One crucial objective of the smart grid vision is to revitalize power distribution systems by improving network architecture. Significant effort and investment has been made to resolve the issue of loss of voltage regulation along distribution feeders due to increasing penetration of distributed energy resources (DERs). In this talk we will focus on the fast voltage control problem using the reactive power support capability of DER inverters. A decentralized voltage control strategy can be designed by minimizing a quadratic voltage mismatch error objective using the gradient-projection (GP) updates. Coupled by the power network flow, the local voltage measurement can directly provide the instantaneous gradient information. We will analyze the performance of this decentralized GP-based voltage control design under two dynamic scenarios: i) the nodes perform the updates in an asynchronous fashion; and ii) the network operating condition is time-varying. For the asynchronous voltage control, we can improve the existing convergence condition significantly by recognizing that the voltage based gradient information is always up-to-date. To address the dynamic operating condition, we will provide an error bound in tracking the instantaneous optimal solution to the quadratic error objective. This result can be extended to general constrained dynamic optimization problems with smooth strongly convex objective functions under stochastic inputs that have bounded iterative changes.

Bio: Hao Zhu is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC). She received a Bachelor's of Engineering degree from Tsinghua University, China, in 2006, and Master of Science and Ph.D. degrees from the University of Minnesota, Twin Cities, in 2009 and 2012, all in electrical engineering. After graduation, she was a postdoctoral research associate working on power grid modeling and validation at the UIUC Information Trust Institute before joining the ECE faculty in January 2014. Her current research interests include power grid monitoring, power system operations and control, and energy data analytics.