

October 16-17, 2019 14:00-16:00 Politecnico di Torino, DISMA, Aula Buzano (third floor)

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Modelling and distributed control of the power grid

Abstract

The power grid is a very complex system constituted of many interacting components. Various models have been proposed in the literature with different level of complexity and accuracy. The power flow model is widely used for control and monitoring purposes. It is a static nonlinear equilibrium model which describes the balancing of active and reactive power flows in the grid. In the first part of the course we describe this model and we provide a method that allows to determine when there exists a solution of such a model and we provide a linear approximation of this solution.

In the second part of the course we use this approximation for the synthesis of a control strategy able to control the voltages in the grid by acting on the reactive power flows. This is done by applying the gradient method to an optimization problem. We show that the gradient needs not to be computed, but instead it comes for free as an output of the power grid that can be read with a suitable choice of sensors. Moreover, the algorithm that comes out is suitable for a distributed leaderless implementation.

Biography

Sandro Zampieri received the Laurea degree in Electrical Engineering and the Ph.D. degree in System Engineering from the University of Padova, Italy, in 1988 and 1993, respectively. Since 2002 he is Full Professor in Automatic Control at the Department of Information Engineering of the University of Padova. He has been the head of the Department of Information Engineering from 2014 until 2018. In 1991-92, 1993 and 1996 he was Visiting Scholar at Laboratory for Information and Decision Systems, MIT, Cambridge. He has held visiting positions also at the Department of Mathematics of the University of Groningen and at the Department of Mechanical Engineering of the University of California at Santa Barbara.

Prof. Zampieri has published more than 150 journal and conference papers. He has delivered several invited seminars and he was member of the Technical Program Committee for several international conferences. He was general chair of the 1st IFAC Workshop on Estimation and Control of Networked Systems 2009, program chair of the 3rd IFAC Workshop on Estimation and Control of Networked Systems 2012 and publication chair of the IFAC World Congress 2011. He served as an Associate Editor of the Siam Journal on Control and Optimization on 2002-2004 and of the IEEE Transactions of Automatic Control on 2012-2014. He was the chair of the IFAC technical committee "Networked systems" on 2005-2008. He was one of the recipients of the 2016 IEEE Transactions on Control of Network Systems Best Paper Award. His research interests include networked control, control of complex systems and distributed control and estimation with applications to the smart grids.