

Model Predictive Control Strategies for Post-Disturbance Corrective Action

Speaker:

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Abstract:

Critical transmission outages often cause line overloading and voltage degradation. Without corrective action, eventually overloaded lines may trip and/or voltage collapse may ensue. Importantly, these secondary effects evolve relatively slowly, allowing sufficient time for corrective controls to be enacted. This talk will present receding horizon model predictive control (MPC) strategies that capture the relevant dynamics governing the thermal behavior of overloaded transmission lines and voltage behavior of collapse processes. The controls available to MPC include generation set-points, energy storage and load regulation. MPC determines the optimal use of those resources, subject to a variety of constraints that include rate limits and resource availability. The proposed corrective control strategies will be illustrated using a system of around 100 nodes. Extension to larger, more realistic systems will require distributed MPC. The talk will discuss the suitability of various distributed forms of MPC for corrective control of large-scale systems.



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Ian A. Hiskens is the Vennema Professor of Engineering in the Department of Electrical Engineering and Computer Science at the University of Michigan in Ann Arbor. He has held prior appointments in the electricity supply industry (for ten years), and various universities in Australia and the USA. Dr Hiskens's research focuses on power system analysis, in particular modelling, optimization, dynamics and control of large-scale, networked, nonlinear systems. His recent activities have focused on systems issues arising from large-scale integration of new forms of generation, and on the development of non-disruptive load control strategies. Other research interests include nonlinear and hybrid dynamical systems. He is actively involved in various IEEE societies, and is Vice-President for Finance of the IEEE Systems Council. He is an Editor of *IEEE Transactions on Power Systems*, and has formerly served as an Associate Editor of *IEEE Transaction on Control Systems Technology* and *IEEE Transactions on Circuits and Systems*. He is a Fellow of the IEEE, a Fellow of Engineers Australia, and a Chartered Professional Engineer in Australia.