Workshop Speaker

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Title: Distributed Real-Time Pricing and Stabilization in Power Grids

Abstract: The contribution of electrical power systems to global climate change has become one of the more urgent problems facing the world; accordingly, a high amount of distributed generation capacity, including photovoltaic, wind power, biomass, and co-generated power, is being planned for installation into large-scale power network systems in order to reduce greenhouse gas emissions and fossil fuel reliance. However, it is well understood that many renewable resources pose risks to power system stability in terms of adverse effects on frequency and the creation of voltage fluctuations; hence, in embedding renewables into a grid, it is necessary to create an explicit plan for plant cooperation and generation optimization in order to ensure safety.

This talk deals with a game theoretic distributed real-time pricing method based on dual decomposition and its application to load frequency control of electrical power networks. The goal of this distributed real-time pricing methodology is to solve the constrained optimization problem consisting of each player's utility and social welfare under selfish players. We can show that selfish players' decision can be expressed via a kind of a Nash equilibrium solution considering their own cost functions and it can lead selfish players' decision to social welfare maximization via real-time pricing method. Finally the proposed method is applied to a load frequency control problem of power networks and the effectiveness can be shown via some numerical simulations.

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