IEEE SMC Distinguished Lectures

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Lecture 1

Title: Dynamic Event-Triggered Distributed Coordination Control

Abstract: Distributed coordination control is the current trend in networked systems and finds prosperous applications across a variety of fields, such as smart grids and intelligent transportation systems. One fundamental issue in coordinating and controlling a large group of distributed and networked agents is the influence of intermittent inter-agent interactions caused by constrained communication resources. Event-triggered communication scheduling stands out as a promising enabler to strike a balance between the desired control performance and the satisfactory resource efficiency. What distinguishes dynamic event-triggered scheduling from traditional static event-triggered scheduling is that the triggering mechanism can be dynamically adjusted over time in accordance with both available system information and additional dynamic variables. This talk provides an up-to-date overview of dynamic event-triggered distributed coordination control. The motivation of dynamic event-triggered scheduling is first introduced in the context of distributed coordination control. Then some techniques of dynamic event-triggered distributed coordination control are discussed in detail. Implementation and design issues are well addressed. Furthermore, this talk exemplifies two applications of dynamic event-triggered distributed coordination control in the fields of microgrids and automated vehicles. Several challenges are suggested to direct the future research.

Lecture 2

Title: Multi-Agent Systems Based Distributed Control and Optimization in Smart Grids

Abstract: With the widespread integration of renewable distributed energy sources such as wind generation, photovoltaic and solar panels, a traditional electrical network has been experiencing a huge revolution towards a smart grid in various terms of generation, transmission, distribution and usage, and so on. Such a revolution poses new theoretical and technical challenges in operation and management of smart grids. To address these challenges, a multi-agent system-based strategy is developed to address control and optimization issues in smart grids, showcasing its strong ability in improving efficiency, reliability and scalability. In this keynote talk, some backgrounds on smart grids from the perspective of multi-agent systems are introduced. Second, a distributed secondary control scheme with an event-triggered communication mechanism is presented to ensure frequency regulation and active power sharing of AC islanded microgrids while significantly reducing the utilization of communication resources. Third, a multi-objective distributed optimization method is provided to address current sharing and voltage regulation in DC microgrids. Finally, some challenging issues are discussed for future investigation.