

Open Track Session Proposal – INCOM 2024 Vienna

Large-Scale Complex Networked Systems within the Manufacturing Industry: Control and Resilience

Organisers

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Abstract

In recent years, with the development of economic globalization and information technology, production network, energy management network, supply chain, logistics network and other manufacturing systems are faced with large-scale, high complexity and strong dynamic. Factors such as the volatile international environment, unpredictable events, and various types of potential attacks can significantly disrupt system operations and result in substantial losses. In this context, the research of control and resilience in large-scale systems become critically important. This session will discuss fundamental aspects of control and resilience in large-scale systems within the manufacturing industry, including modeling of manufacturing systems under physical or social constraints, analysis system features such as controllability and observability, optimal control and real-time economic optimization, designing adaptive control and resilience strategies to cope with uncertain environments and researching large-scale system security under attack. This will help improve the resilience of manufacturing systems, enabling them to better adapt and remain efficient in a changing global economic environment. It is of great significance for maintaining the stability and sustainable development of manufacturing industry.

This session aims to facilitate connections and sharing of knowledge between researchers and practitioners. It covers large-scale network systems in manufacturing at different stages, including scheduling systems, energy management systems, supply chains, production networks, transportation systems, inventory networks and so on. We welcome research papers, case studies and theoretical perspectives that explore how large-scale network systems approaches can be used to improve the operational efficiency and resilience of manufacturing systems, contributing to practical engineering applications. Through interdisciplinary discussions, we hope to gain a comprehensive understanding of the opportunities, challenges, and best practices for enabling information sharing for large-scale systems control and resilience in manufacturing.

The topics of interest include, but are not limited to:

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- **Modeling:** To construct mathematical models for large-scale systems in manufacturing industry to better comprehend the statistical characteristics and underlying reasons.
- **Analysis:** To identify intrinsic characteristics of large-scale network, investigate controllability and observability and develop methodologies and techniques for describing and predicting system dynamic behavior.
- **Optimization:** To modify and enhance the properties and performance of networks for achieving optimal control and real-time economic optimization in large-scale systems.
- **Adaptive control:** To construct manufacturing system adaptive control strategies for adapting to uncertainties and external perturbations, ensuring the high performance and stability in a variety of situations of the system.
- **Resilience:** To design resilient systems and strategies in uncertain manufacturing environments, constructing metrics to evaluate system resilience.
- **Security:** To consider various types of attacks, devising defense strategies and investigating the game between attack and defense in large-scale manufacturing system.

Keywords

Large-Scale Systems, Manufacturing Systems, Optimization , Adaptive Control, Resilience