SOHOMA'26 Special Session

Self-Adaptive Cyber-Physical Production Systems: Reconfiguration Loops across Physical, Digital and Cyber Spaces

Organisers

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Topic overview

The advent of Cyber-Physical Production Systems (CPPS) marks a fundamental shift in the design of manufacturing systems. Beyond the mere digitalisation of equipment, a CPPS establishes an operational continuum between a physical space — machines, resources, material flows — and a cyber space — models, data, decision-making intelligence — within which a permanent feedback loop is maintained. It is precisely this loop that endows the system with its adaptive capacity: perceiving a deviation, modelling it, deciding on a response and reconfiguring the system accordingly, either autonomously or in an assisted manner.

Adaptability in a CPPS therefore cannot be reduced to the physical flexibility of equipment alone, nor to the sophistication of control algorithms in isolation. It emerges from the interaction between these two spaces and from the quality of the loop connecting them. This reconfiguration loop can operate across different time scales — from real time for reacting to operational disturbances, to the medium term for structural reorganisation — and at different levels of granularity, from the individual resource to the shop floor as a whole, or even to the extended value chain.

On the physical side, this vision encompasses structural reconfigurability paradigms such as Reconfigurable Manufacturing Systems (RMS), modular architectures, mobile and autonomous resources, and additive manufacturing as a vector for rapid substitution. On the cyber side, it draws on distributed and self-organising control architectures — holonic systems, multi-agent systems, service-oriented architectures — as well as modelling and simulation tools such as digital twins, which play a key role as mediators between the two spaces: they represent the current state of the physical system, enable reconfiguration scenarios to be evaluated before real deployment, and actively participate in the decision-making process.

This special session invites contributions that address the adaptability of CPPS from this integrative perspective, explicitly articulating the physical–cyber–decision loop. Theoretical works, architectural developments, methodological approaches and industrial applications are all

welcome, provided they shed light on the mechanisms by which a CPPS detects, models and resolves a situation requiring reconfiguration.

Topics of Interest (non-exhaustive list)

- CPPS architectures for autonomous and assisted reconfiguration
- Physical reconfigurability: RMS, modular systems, mobile and autonomous resources
- Distributed control and self-organisation: holons, agents, services
- Digital twins as mediators of the reconfiguration loop
- Anomaly detection and reconfiguration triggering
- Artificial intelligence and machine learning for real-time adaptation
- Evaluation and metrics of adaptability within a CPPS framework
- Industrial deployments and feedback on adaptive CPPS

Keywords
Cyber-Physical Production Systems; Reconfigurable Manufacturing Systems; Self-organising Control Architectures; Digital Twins

Important dates
Full paper submission: 5 April 2026
Notification of decision: 4 May 2026
Early registration and fee payment: 1 June 2026
Final camera-ready paper submission: 13 July 2026

(Please consult the SOHOMA'26 website for updates and further information)