

SPECIAL SECTION/ISSUE

Title

Methods for Modelling, Control, and Verification of Industrial Cyber-Physical Systems

Editors

Dr. Friederike Bruns

Carl von Ossietzky University of Oldenburg, Germany

e-mail: friederike.brun@uni-oldenburg.de

profile: uol.de/en/computingscience/dcis/team/dr-ing-friederike-bruns

Prof. Andreas Rauh

Carl von Ossietzky University of Oldenburg, Germany

e-mail: andreas.rauh@uni-oldenburg.de

profile: www.interval-methods.de

About

Industrial cyber-physical systems (CPSs) are at the core of modern automation, where the integration of distributed physical processes with networked computing allows for highly dynamic, decentralized, and intelligent systems. These are composed of an interconnection of sensors, actuators, and processing units that continuously exchange information creating a deeply entangled architecture. Ensuring the reliability and efficiency of such systems is crucial to address the novel challenges and trade-offs across several areas. These can be modelling and design of industrial CPSs, robust and efficient control strategies, as well as validation and verification approaches. As far as implementation aspects are concerned, the IEC 61499 standard, with its focus on distributed control and reconfigurable architectures, offers an essential foundation for tackling these challenges. This special publication seeks to bring together cutting-edge research and innovative approaches in the development of industrial CPSs. We invite contributions that explore novel methods for system modelling, advanced control strategies, and rigorous verification techniques that ensure the reliability and efficiency of CPSs in real-world industrial settings.

Scope

Topics of interest include but are not limited to:

- Modelling and simulation of industrial CPSs, for example, using the IEC 61499 standard.
- Development of advanced control algorithms for distributed and decentralized systems.
- Formal verification and validation techniques for ensuring system safety, reliability, and performance.
- Approaches to fault detection, fault tolerance, and system resilience in industrial environments.
- Applications of mathematical methods to optimize control and verification processes.
- Integration of uncertainty models for enhanced robustness within IEC 61499-based systems.
- Real-time performance considerations for distributed CPSs, including timing constraints and synchronization.
- Case studies showcasing the practical application of IEC 61499 in industrial automation, smart manufacturing, or IoT systems.

This special publication is to provide a platform for researchers, practitioners, and industry experts to share insights and breakthroughs that advance the state-of-the-art in industrial CPSs. Submissions that offer both theoretical advancements and practical applications are highly encouraged.

We look forward to your contributions to this critical and rapidly evolving field!

Important dates

Submission deadline: **1 May 2025**

Notification of acceptance: **15 September 2025**

Possible publication: **late 2025**

Information for authors

- The papers should meet high quality journal manuscript guidelines, in terms of research results, editorial quality, and language. Poorly written manuscripts will not be considered for review.
- The submission must be done online at www.amcs.uz.zgora.pl/?action=submission.
- **Important!** In your paper file, please put as the first keyword capitalized and asterisked ***I-CYBER***.
- The papers should be prepared with the journal LaTeX template, following strictly the guide for authors available at www.amcs.uz.zgora.pl/?action=guide.
- The submissions will undergo a review process, following the journal rules.
- The final decision will be made by the journal's Editor-in-Chief and Guest Editors.
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Technical assistance

amcs@uz.zgora.pl