

**Announcement and Calls for papers  
for the special issue of Journal Integrated Design and Process Science on:**

## **Designing cyber-physical systems for run-time self-adaptation**

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Self-adaptive cyber-physical systems represent a specific family of (systems of) systems, which are characterized by dynamic functional, structural and interoperation variability. Thus, their system and control models should consider varying operational objectives and dynamic fluctuations in the application environment and contexts. However, due to the prevalent variability, this kind of systems cannot be specified completely in the design stage and have to be managed at run-time. Consequently, designing cyber-physical systems for run-time self-adaptation raises many new design challenges, and operation control and supervision issues. As an example, the literature identifies two typical challenges of self-adaptive cyber-physical systems, namely that: (i) there are no formal proofs of reaching good functional and architectural solutions, and that (ii) the behavior (operation under application circumstances) of a system cannot be validated without deploying it in a real environment. Addressing these and the other challenges and solving the related issues need further exploratory research and both explanatory and prescriptive knowledge. This special issue intends to contribute to this by presenting cutting edge research efforts and rigorously tested results.

Methodologically, designing for self-adaptation is a complicated task. At large, two generic approaches can be distinguished. On the one hand, the design process of self-adaptive systems may follow the traditional requirements-functions-architectures-operations synthesis strategy. On the other hand, it can also focus on the affordances (operation and action possibilities) of the actors of the system, which are provided to them by: (i) their operational potentialities and offerings, (ii) existing and obtainable resources, and (iii) the conditions and circumstances created by the environment. Self-adaptive cyber-physical systems have many novel paradigmatic features and characteristics (e.g. operational resilience and dependable autonomy), and knowledge-intensive operational modes (e.g. context-based reasoning and pattern-based learning). From a computational viewpoint it has been hypothesized that designing cyber-physical systems for run-time self-adaptation needs to involve: (i) equipping the concerned systems with knowledge and capabilities needed for changing themselves, (ii) monitoring their operations and states, as well as the happenings in the environment and their effects, (iii) development of adaptation plan at run-time, (iv) acquiring the additional resources needed for the adaptation, (v)

checking the properness and the feasibility of the selected adaptation plan, (vi) operationalization of the selected adaptation plan, (vi) checking the outcome of the adaptation, and (vii) maintaining the continuity of this process under dynamic circumstances.

### **The list of topics:**

The topics considered for this special issue (identified by the acronym CPS-RTSA) include but are not limited to:

- Theoretical and methodological issues of self-adaptive cyber-physical systems
- Computational fundamentals of self-adaptive cyber-physical systems
- Run-time knowledge acquisition and engineering for self-adaptive cyber-physical systems
- Software engineering frameworks and ontologies for self-adaptive cyber-physical systems
- Operation control and supervision strategies/algorithms for self-adaptive cyber-physical systems
- Inferring adaptation needs and adaptation plan generation in short term and long term
- Run-time verification and validation of adaptation plans for self-adaptive cyber-physical systems
- Inferring, reasoning and learning strategies/mechanisms for self-adaptive cyber-physical systems
- Building awareness and dynamic context management for self-adaptive cyber-physical systems
- Human-in-the-loop and system-in-the-loop issues concerning self-adaptive cyber-physical systems
- Tools and methods for designing and self-designing self-adaptive cyber-physical systems
- State of the art reviews, future visions, research strategies, and implementation opportunities

### **Instruction for submissions:**

- All submissions are supposed to address one of the topics mentioned above, or other closely related research topic, and to provide scientifically novel, rigorously scrutinized, and useful-for practice contribution.
- All submissions will be anonymously reviewed by at least three reviewers. The selection for publication would be made on the basis of these reviews and the academic/industrial value of the contribution.
- By submitting their manuscripts to JIDPS, authors agree to the publishing principles of SDPS and to its personal data handling and privacy policy.
- Information about the format and style required for JIDPS manuscripts, as well as about submission, can be found in the manuscript template file.
- Queries and information about submissions for the CPS-RTSA special issue should be addressed to the co-guest editors, and not to the editor in chief.
- Manuscript for review and revised articles for publication should be submitted online through the journal's submission handling system at: <https://jidps.rndsphere.com>
- New users should first create a user account on the submission handling system.

### **Important dates:**

- Submission deadline for full length manuscripts (on-line system): 28 February 2021
- Decisions based on reviews and notification due: 30 April 2021
- Submission deadline for first revised manuscripts: 30 June 2021
- Decisions based on reviews and notification due: 30 August 2021
- Submission deadline for second revised papers: 15 September 2021
- Proofed final version of manuscripts due: 30 October 2021
- Special Issue published: 15 February 2022

### **Useful links:**

- <https://www.iospress.nl/journal/journal-of-integrated-design-process-science/>
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