Third International Workshop on Multi-Paradigm Modeling for Cyber-Physical Systems – MPM4CPS'21

10 – 13 October 2021 – Satellite event at MoDELS 2021 – Virtual Event
https://msdl.uantwerpen.be/conferences/MPM4CPS/

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Scope of the Workshop

Tackling the complexity involved in developing truly complex, designed systems is a topic of intense research and development. System complexity has drastically increased once software components were introduced in the form of embedded systems, controlling physical parts of the system, and has only grown in CPS, where the networking aspect of the systems and their environment are also considered. The complexity faced when engineering CPS is mostly due to the plethora of cross-disciplinary design alternatives and inter-domain interactions. To date, no unifying theory nor system design methods, techniques, or tools to design, analyze, and ultimately deploy CPS exist. Individual (physical systems, software, network) engineering disciplines offer only partial solutions and are no match for the complexity observed in CPS. Multi-Paradigm Modeling (MPM) offers a foundational framework for gluing the several disciplines together in a consistent way. The inherent complexity of CPS is broken down into different levels of abstraction and views, each expressed in appropriate modeling formalisms. MPM offers processes and tools that can combine, couple, and integrate each of the views that compose a system.

MPM encompasses many research topics - from language engineering (for DSLs, including their (visual) syntax and semantics), to processes to support multi-view and multi-abstraction modeling, simulation for system analysis, and deployment. The added complexity that CPS bring compared to embedded and software-intensive systems requires to look at these new applications and how MPM techniques can be applied or adapted to them, tying together multiple domains. Many remaining research questions require answers from researchers in different domains, as well as a unified effort from researchers that work on supporting techniques and technologies.

Topics of interest (including, but not limited to)

- **Heterogeneous models:** multi-domain and multi-physics modeling, multi-view modeling, multi-abstraction modeling;
- **Heterogeneity in modeling languages:** "blended" textual/visual modeling, modular design of modeling languages, the modeling/formal analysis/simulation/synthesis of user interfaces;
- **Multi-Paradigm Modeling techniques:** model transformation, model composition and integration, modeling cross-domain interactions, model-based detection of unanticipated interactions in heterogeneous systems, (co-)simulation of heterogeneous models, machine learning applied to the design of CPS or their languages in an MPM context;
- **Applications of and experience** with current MPM techniques, with a focus on Cyber-Physical Systems in domains such as automotive, aerospace, manufacturing, …

Contributions should clearly address the foundations of multi-paradigm modeling by demonstrating the use of models to achieve the stated objectives and discuss the benefits of explicit modeling.

Important dates

Paper submission deadline 28 July 2021
Notification of acceptance 14 August 2021
Workshop dates September 18-19 October 2021

Submission procedure

Papers should be submitted via EasyChair as a PDF document for one of the following topics. Each submission will be peer-reviewed by at least three PC members.

- **Full research papers** (10 pages max) present a novel, innovative approach;
- **Short papers** (5 pages max) present new ideas or early-stage research, extensively discuss the experiences of the researchers with an MPM approach or demonstrate a tool;
- **Extended abstracts** (1 page) for a "lightning talk" (possibly accompanied with a Poster), i.e. a short, focused talk that can spark lively debate.
- **Examplar descriptions** (10 pages max) describing a CPS Engineering practice, highlighting both the processes at play and the formalisms, languages and/or tools used to support these activities, all expressed using the language described in the Workshop's webpage.

All papers, except Extended Abstracts, will be published with the main conference's workshop proceedings; authors submitting examplars will eventually be invited to contribute to a Special Issue.