The 10th Triennial IFAC Conference on Manufacturing Modelling for Management and Control(MIM 2022) in Nantes, France, June 22 – 24, 2022

Special Session:

Implementing Digital-Twin in Manufacturing and Logistics Systems: new trends and challenges

Organized by:

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Digitalization in Manufacturing and Logistics (M&L) systems represents a crucial driver able to lead companies in achieving higher levels of productivity and flexibility. Digital technologies, such as Internet of Things, Cloud Computing, Artificial Intelligence, Virtual Reality, Augmented Reality or the new generation of Information Technologies, allow an intelligent integration and interconnection among all actors involved in the M&L processes. Moreover, digital technologies enable a real-time monitoring, control and data collection, as well as the development of Cyber-Physical systems that are able to combine the physical and virtual environment. In such a context, Digital-Twin (DT) concept represents an emerging research topic in M&L systems. DT is defined in several ways according to the application field. However, in M&L systems, the DT consists in creating a virtual representation of the system aiming to evaluate, predict and optimize their states and future behaviour. Moreover, the data flows between physical and virtual entities are integrated in both directions. It implies that a change in the physical entity could lead to a change in the virtual one and vice versa. In such a way, DT is designed to continuously elaborate data from the past, monitor the present in real-time and, finally, support future operations decision-making by combining past data with the real-time ones. According to the scientific literature, DT is applied in several M&L phases such as production planning and control, workpieces quality prediction, machine and human-robot collaboration, real-time M&L systems monitoring, product traceability, performance prediction. However, some critical issues in implementing DT exist. For example, there are difficulties in sharing DT in multiple application systems involving several stakeholders, difficulties in ensuring efficient storage, processing and analysis of a large amount of data. Moreover, there is the necessity to ensuring reliability and robustness of the DT. Furthermore, due to the high degree of heterogeneity in digital technologies, there are some difficulties in making suitable decisions and investments in DT from a company perspective. Finally, some lacks are still present related, for example, to complex manufacturing systems, and external and internal factors which can affect machine or workers' skills degradation.

For this reason, this session aims to investigate new trends and challenges in implementing DT concepts in M&L systems. Due to the different scientific research domains (e.g., statistics, Artificial Intelligence, computer science, operations, etc.) involved in implementing DT the evaluation of benefits and criticalities from a multi-disciplinary perspective represents another aim of the proposed session.

Topics may include, but are not limited to:

- Using new emerging technologies for the DT implementation in M&L systems
- Conceptual frameworks to support DT development in M&L systems
- DT architectures in M&L systems
- Real-time based models and algorithms for assembly line design, balancing and re-balancing techniques
- Simulation and optimization models based on real-time data for production planning and control in flexible manufacturing systems
- Real-time job scheduling and sequencing for complex M&L systems
- DT models for improving M&L systems layout
- DT models for analysing the Machine-to-Machine interaction and Human-Robot collaboration DT methods and models to improve human factors in M&L systems
- Using DT concepts to improve M&L systems reliability, availability and efficiency
- DT as a tool to improve M&L systems resilience
- Quantitative and qualitative analysis concerning the DT implementation in M&L systems
- DT applications from real M&L systems

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Theoretical, applied research contributions and real application feedbacks are welcome.

Submission

For author guidelines, please refer to www.ifac-control.org. All papers must be submitted electronically using https://ifac.papercept.net/ and must follow the two-column format in accordance with the IFAC manuscript style. Please use the official IFAC instructions and template to prepare your contribution as full-length draft paper. Submission details are available on the symposium website. All submissions must be written in English. All papers that conform to submission guidelines will be peer-reviewed by IPC members. The corresponding author submits the paper online (pdf format) as an open invited session paper. Submission as an invited paper requires the invited session code: xxxx. Several international journals are associated with the conference for publication of special issues.

IMPORTANT DATES:

Draft paper submission deadline:	25/12/2021
Notification of acceptance:	15/02/2022
Final papers submission deadline:	15/03/2022
Early registration deadline:	30/04/2022
Conference date:	22-24/06/2022

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