3rd IEEE International Conference on Industrial Cyber-Physical Systems (ICPS)

Special Session on

"Digital Twins in Industrial Performance Management"

organized by

Principal Organizer 1: Kari Tammi
Affiliation: Aalto University, Finland
Email: kari.tammi@aalto.fi

Organizer 2: Heikki Mesiä
Affiliation: Konecranes, Ltd, Finland
Email: heikki.mesia@konecranes.com

Organizer 3: Raine Viitala
Affiliation: Aalto University, Finland
Email: raine.viitala@aalto.fi

Call for Papers

Scope of the Special Session

Digital Twin (DT) is recognized as a concept opening new business potential in product design, performance and life cycle management (IEEE Top Technology Trends 2019). The topic is relevant for ICPS because Digital Twins namely concern cyber parts of cyber-physical systems. We merge industrial and academic perspectives in the special session proposed. Both perspectives are ensured by a series of collaborative projects between industry and academia. Tools and technologies required for the method development include The Digital Twin context enables also the usage of machine learning techniques applied in the field of traditional engineering and rotating machinery. Although numerical and simulation models are widely available and they are computationally feasible, there is a need to provide real measurement data for data analysis in the Digital Twin & machine learning context. The simulation models are mostly human-created and trying to imitate the physical world - Digital Twin & machine learning techniques applied may expose something which is completely omitted by a human writing simulation software.

The Digital Twin denotes an integrated set of all the available data from a rotating machine. The Digital Twin represents the latest available information of a physical product and stores the analyses produced by data-analysis techniques, which are not available by measurements only. This suggests that Digital Twin in this particular use case can be seen as a cyber-part of a cyber-physical product. Machine learning and other modern data analysis technologies are used as a tool to analyze the massive amount of real measurement and usage data, enriched with the simulation model produced virtual sensor data, all of which are stored in the Digital Twin. Machine learning and data-analysis can reveal critical features and occurrences that are otherwise difficult or practically impossible to study.

Topics of interest for this special session include

- Digital Twin realizations
- Performance management of smart rotating machines
- Interfaces to enable data flow between Digital Twin subsystems
- Digital twin security, portability, transferability
- Data transfer between DT's, and between DT and physical twin

Submissions Procedure: All the instructions for paper submission are included in the conference website https://events.tuni.fi/icps2020/authors/

Deadlines: The same as the general conference deadlines

CVs of the proposers

Prof. Kari Tammi was born in 1974. He received an M.Sc., Lic.Sc., and D.Sc. degrees from the Helsinki University of Technology in 1999, 2003, and 2007, respectively. He received a Teacher's pedagogical qualification at the Häme University of Applied Sciences in 2017. He was a Researcher with CERN, the European Organization for Nuclear Research, from 1997 to 2000, and a Post-Doctoral Researcher with North Carolina State University, USA, from 2007 to 2008. From 2000 to 2015, he was a Research Professor, a Research Manager, the Team Leader, and other positions at the VTT Technical Research Centre of Finland. He has been an Associate Professor with Aalto University since 2015. He currently serves in the Finnish Administrative Supreme Court as a Chief Engineer Counselor. He has authored over 60 peer-reviewed publications cited in over 1500 other publications. He is a member of IEEE and the Finnish Academy of Technology. He serves as the Deputy Chair for IFTOMM Finland.

Heikki Mesiä is with Konecranes Research and Innovation as Senior Research Specialist for Crane Intelligence. He has participated in several collaborative research programs.

Raine Viitala received his M.Sc. and D.Sc. degrees in mechanical engineering from Aalto University in 2017 and 2018. He has a solid background in experimental large rotor research, including vibration analysis and subcritical vibration, bearing excitations, roundness measurements, and manufacturing for operating conditions. Viitala is also involved in developing an AI and simulation enhanced Digital Twin of a rotor system