

SUMMERSIM'19

2019 Summer Simulation Conference

2019 SUMMER COMPUTER SIMULATION (SCSC 2019)

PLENARY TALK

Title: Multi-Paradigm Modelling of Cyber-Physical Systems (MPM4CPS).

Speaker: Hans Vangheluwe

TALK SUMMARY:

The networking of multi-physics (mechanical, electrical, hydraulic, biochemical, ...) with computational systems (control systems, signal processing, logical inferencing, planning, ...) processes, interacting with often uncertain environments, with human actors, in a socio-economic context, leads to so-called Cyber-Physical Systems (CPS). The CPS that are engineered today are reaching a hitherto unseen complexity. To date, no unifying theory nor systematic design methods, techniques and tools exist for such systems. Individual (mechanical, electrical, network or software) engineering disciplines only offer partial solutions. Multi-paradigm Modelling (MPM) proposes to model every part and aspect/view of such complex systems explicitly, at the most appropriate level(s) of abstraction, using the most appropriate modelling formalism(s). This includes the explicit modelling of the often-complex engineering workflows. Modular modelling language engineering, including model transformation, and the study of modelling language semantics, are used to realize MPM. MPM is seen as an effective answer to the challenges of designing CPS. This presentation introduces a vision of complex CPS, in particular in the context of Industry 4.0. The causes of complexity of such systems and some of the challenges of their collaborative development are introduced, as well as possible multi-paradigm modelling solutions such as (in-) consistency management and co-simulation. Open discussion with the audience will be encouraged.

SHORT BIO:

Hans Vangheluwe is a Professor in the Antwerp Systems and Software Modelling (AnSyMo) group within the Department of Mathematics and Computer Science at the University of Antwerp in Belgium, where he is a founding member of the NEXOR Consortium on Cyber-Physical Systems (CPS). He was a Professor in the School of Computer Science at McGill University, Montreal, Canada with which he keeps close research ties. AnSyMo is a Core Research Lab of Flanders Make, the strategic research centre for the Flemish manufacturing industry. He heads the Modelling, Simulation and Design Lab (MSDL). In a variety of projects, often with industrial partners, he develops and applies the model-based theory and techniques of Multi-Paradigm Modelling (MPM) in application domains as diverse as bio-activated sludge waste-water treatment plant design and optimization and safe automotive software. He is the chair of the EU COST Action IC1404 "Multi-Paradigm Modelling for Cyber-Physical Systems" (MPM4CPS).