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System Analysis and Modeling

Languages, Methods,
and Tools for Industry 4.0

11th International Conference, SAM 2019
Munich, Germany, September 16–17, 2019
Proceedings

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Preface

This book constitutes the refereed proceedings of the 11th International Conference on System Analysis and Modeling (SAM 2019), held during September 16–17, 2019, in Munich, Germany.

This year's edition of SAM was under the theme “Languages, Methods, and Tools for Industry 4.0.”

In 1784, industry was characterized by the combined use of three elements, the steam engine, the use of coal as a fuel, and the use of iron. From 1870, major changes to industry were driven by new sources of energy – gas, oil, and electricity – along with new materials, new systems of transportation, and the rise of telephone and radio use. Since 1969, industry has been characterized by greater utilization of the renewable energy sources, development of rechargeable batteries, of hydrogen batteries, and of other new energy storage technologies, such as the intelligent grid or electric power distribution network “smart” (smart Grid). Increased use of transport based on electric vehicles (all-electric vehicles, as well as fuel cells), using renewable electricity as a propulsion power, has also played a major role. But remarkably, and related to the context of this conference, during this period we see the rise of electronics, telecommunications, and computers, raising in the programmable logic controllers (PLCs) and robots.

Now Industry 4.0 represents a qualitative leap in the organization and control of the entire value chain throughout the life cycle of the manufacture and delivery of the product. The exponential expansion of this fourth revolution is mainly caused by the possibility of merging the technology, breaking the limits between the physical and the digital worlds. This produces a paradigm shift in society. There are plenty of different technologies that individually have a great impact on the production processes, but more interestingly, when those technologies act together, they create an increased force that accelerates the generation of news processes on the industrial frame. The mainstream adoption of technologies and processes that will soon lead the upcoming production methods will change the face of the industry in a broad spectrum.

Several consulting firms with the goal to establish a clear definition of what is Industry 4.0 agree that there is a set of technologies that will lead this revolution, like Simulation, Cloud computing, 3D printers, among others. The key concept of the digital twin, a copy of the system that defines the main elements that drive the behavior of the system along with the system evolution, is to serve as the glue between all the elements that exist on this system.

A digital twin is a model, and by definition a model uses formal languages and tools that supports description and the adoption of the model vision in all spheres of the industry to achieve a holistic approach. In this sense, conferences like SAM 2019 provide an excellent opportunity to depict the main concerns and solutions regarding the modeling process that will lead the upcoming industrial (r)evolution.

The 12 regular papers (maximum 20 pages) and the 2 work-in-progress papers (maximum 12 pages), were carefully reviewed and selected from 28 submissions. Each submission was reviewed by at least 2, and on average 2.9, Program Committee members.

We had two keynote presentations, from two strong researchers and practitioners of the area: Antoni Guasch i Petit from the InLab FIB, a research institution of the Universitat Politècnica de Catalunya, who presented interesting examples and experiences learned from the use of conceptual modeling in critical projects; and Thomas Weigert, Chief Technology Officer and Vice President at UniqueSoft. This second keynote presentation contextualized the current trends in model-driven engineering and was also included in this volume.

As is the usual at SAM conferences, the papers describe innovations, new trends, and interesting experiences in modeling and analysis of complex systems mainly focused on ITU-T's Specification and Description Language (SDL-2010) and Message Sequence Chart (MSC) notations, but also including system design languages like UML, ASN.1, TTCN, SysML and the User Requirements Notation (URN). This edition includes software engineering technologies related to Industry 4.0, such as distributed applications, interoperability, social and environmental modeling, concurrency, data integrity, software verification and validation, and automated code generation.

SDL Forum Society

The SDL Forum Society is a not-for-profit organization that, in addition to running the System Analysis and Modelling (SAM) conference series of events, also:

- Runs the System Design Languages Forum (SDL Forum) series
- Is a body recognized by ITU-T as co-developing system design languages in the Z.100 series (SDL), Z.120 series (MSC), Z.150 series (URN), and other language standards
- Promotes the ITU-T System Design Languages

For more information on the SDL Forum Society, see <http://www.sdl-forum.org>.

July 2019

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