

## **Special Issue on The Working Formal Methods Symposium (FROM 2018)**

### **Preface**

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“Software engineers want to be real engineers. Real engineers use mathematics. Formal methods are the mathematics of software engineering. Therefore, software engineers should use formal methods.” Mike Holloway

The Working Formal Methods Symposium (FROM) aims to bring together researchers and practitioners who work on formal methods by contributing new theoretical results, methods, techniques, and frameworks, and/or make the formal methods to work by creating or using software tools that apply theoretical contributions.

FROM 2018 (<https://fmse.info.uaic.ro/event/from-2018/>) was organized by the Faculty of Computer Science at Alexandru Ioan Cuza University of Iași, the Research Institute of the University of Bucharest (ICUB), and the Faculty of Mathematics and Computer Science at the University of Bucharest. FROM 2018 was the second event in a yearly workshop series, the first edition being held in 2017 in Bucharest.

This special issue includes extended versions of three papers selected from the eleven papers accepted as regular submissions and extended versions of two invited talks. The conference program was diverse, covering almost all areas of the field of formal methods.

Viorica Sofronie-Stokkermans uses techniques combining hierarchical reasoning, symbol elimination, and model generation to verify properties of reactive, real-time and hybrid systems. The focus of the paper is on checking whether safety properties are invariants and on a dual problem, of deriving constraints between parameters which guarantee that a certain safety property is an invariant.

A very interesting model based on the concept of virtual organisms is introduced by Gheorghe Ștefănescu and Ciprian Ionuț Păduraru, in order to bridge at the intermediary level the rigid, but slightly reconfigurable, hardware agents and abstract, intelligent, adaptive software agents. The model is compositional in both dimensions, space and time. An implementation of the model is described.

Denisa Diaconescu investigates the properties of bisimulation in context of many-valued modal logics with many valued accessibility relations. Bisimulation is a central notion used to describe the dynamics of systems by capturing worlds with the same behaviour. The main result of her paper states a Hennessy-Milner property for the class of image-finite models.

Ioana Leuştean, Natalia Moangă, and Traian Florin Şerbănuţă introduce a many-sorted polyadic modal logic as a first step of an ambitious program that intends to deepen the connection between modal logic and program verification. A completeness theorem for the introduced logic is proven, the semantics of a IMP-like language is formalized in the new logic and then it is shown how this formalization is used for program verification.

Georgiana Caltais, Mohammad Reza Mousavi, and Hargurbir Singh investigate counterfactual causal reasoning in the context of Labelled Transition Systems, modelling the real-life system, and Hennessy Milner Logic, describing the system hazard or undesired effects. The notion of causality is refined to accommodate better the conditions under which an event can be considered causal for an effect. An encoding of causality in terms of modal mu-calculus with data, together with an implementation of this encoding is described.

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