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# Third International Workshop on Executable Modeling (EXE 2017)

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**Abstract**—The Third Edition of the International Workshop on Executable Modeling (EXE) was held on September 18, 2017 in Austin, Texas, as part of the satellite events of the ACM/IEEE 20th International Conference on Model Driven Engineering Languages and Systems (MODELS 2017). It brought together over 40 researchers and practitioners to discuss recent advances and current challenges in executable modeling. The workshop program comprised a keynote on open-source MDE tooling for the Internet of Things by Juergen Dingel from Queen’s University, presentations of five research papers, one tool demonstration, as well as a panel discussion on executable modeling for hardware, software, and cyber-physical systems.

**Index Terms**—Executable Models; Executable Modeling Languages; Model Execution; Model Simulation; Execution Semantics

## I. OBJECTIVES AND SCOPE

The complexity of modern software-intensive systems, time-to-market pressures, and the need for high quality systems are current challenges faced by the software and systems engineering industry. To address these challenges, model-driven engineering (MDE) moves models into the center of the development process. Models provide abstractions over the system to be developed, while also providing enough detail to automate the development of implementation artifacts and perform early analysis.

In this context, executable models become increasingly important. They provide abstractions of complex system behaviors and constitute the basis for performing early analyses of that behavior. The ability to analyze a system’s behavior early in its development has the potential to turn executable models into important assets of model-driven software development processes, thus reducing effort and cost in the development process and increasing the quality of the developed system.

Despite the potential benefits of executable models, there are still many challenges to solve, such as the lack of maturity in the definition of and tooling for executable modeling languages, and the limited experience with executable modeling in much of the software and systems development industry.

The International Workshop on Executable Modeling (EXE) was founded as a forum for researchers and practitioners to

discuss challenges of executable modeling, propose potential solutions, and assess and advance the state of the art in executable modeling. For this third edition, submissions of research papers, experience reports, position papers, and tool demonstrations on various topics of executable modeling were invited.

## II. PROGRAM

The Third International Workshop on Executable Modeling was held as a full-day workshop of the ACM/IEEE 20th International Conference on Model Driven Engineering Languages and Systems (MODELS 2017) Satellite Events on September 18, 2017 in Austin, Texas. Out of eight submissions, six were accepted after a rigorous review process in which each paper was reviewed by at least three members of the program committee. Five of the accepted submissions are research papers presenting novel and innovative approaches in executable modeling and one is a demonstration of a model execution tool. The following papers were accepted for EXE 2017:

- 1) “Create and Play your Pac-Man Game with the GEMOC Studio (Tool Demonstration)” by Dorian Leroy, Erwan Bousse, Manuel Wimmer, Benoit Combemale and Wieland Schwinger
- 2) “Executing Models: Enhancing Validation by Filmstrip Templates and Transformation Alternatives” by Nisha Desai, Martin Gogolla and Hilken Frank
- 3) “Executing Robot Task Models in Dynamic Environments” by Kai Adam, Arvid Butting, Oliver Kautz, Bernhard Rumpe and Andreas Wortmann
- 4) “Towards one Model Interpreter for Both Design and Deployment” by Valentin Besnard, Matthias Brun, Philippe Dhaussy, Frédéric Jouault, David Olivier and Ciprian Teodorov
- 5) “Simulation Framework for Executing Component and Connector Models of Self-Driving Vehicles” by Filippo Grazioli, Evgeny Kusmenko, Alexander Roth, Bernhard Rumpe and Michael von Wenckstern

- 6) “Consistency Recovery in Interactive Modeling” by Juri Di Rocco, Davide Di Ruscio, Marcel Heinz, Ludovico Iovino, Ralf Lämmel and Alfonso Pierantonio

The accepted papers cover many different aspects of executable modeling including the following:

- Approaches for implementing operational semantics and interpreters for executable modeling languages (paper 1, paper 4)
- Model validation and verification through model execution (paper 2, paper 4)
- Model simulation (paper 5)
- Executable models@runtime (paper 3)
- Execution semantics of consistency-preserving model management operations (paper 6)
- Applications of executable modeling for service robotics (paper 3) and the development of self-driving vehicles (paper 5)

The workshop started out with a keynote by Juergen Dingel, professor at Queen’s University, with the title “Towards an Open-Source MDE Tooling Infrastructure for the Internet of Things”. In his keynote, Juergen gave an introduction to UML-RT, a standardized UML profile for modeling real-time embedded systems, and its implementation in the open source tool Papyrus-RT. Thereafter, he discussed mechanisms for connecting UML-RT models with external tools and components, the new model debugging capabilities of Papyrus-RT, support for modifying models at runtime, as well as the Papyrus-RT PolarSys Rover demonstrator.

After the keynote, two sessions were dedicated to the presentation and discussion of the papers accepted for the workshop.

In the last session, EXE hosted for the first time a panel discussion with four researchers and practitioners renowned for their contributions to the field of executable modeling on the topic of “Executable Modeling for Hardware, Software and Cyber-Physical Systems”. The panelists were Benoit Combemale from the University of Toulouse, Taylor Riché from National Instruments, Cortland Starrett from One Fact Inc, and Hans Vangheluwe from the University of Antwerp. The panelists and the workshop participants discussed applications of executable modeling, executable modeling solutions, and open research challenges in executable modeling and the broader field of MDE.

All the materials presented at EXE 2017 can be found on the workshop Website <http://modelexecution.org/exe2017>. This includes the slides of all presentations given at the workshop, as well as the opening statements of the panelists.

### III. PROGRAM COMMITTEE AND EXTERNAL REVIEWERS

The program committee of EXE 2017 comprised 25 experts in the domain of executable modeling from twelve different countries. We thank the program committee members and external reviewers very much for their services in reviewing and discussing the submitted papers.

### Program Committee Members

- Francis Bordeleau, CMind, Canada
- Tony Clark, Sheffield Hallam University, UK
- Peter Clarke, Florida International University, USA
- Benoit Combemale, University of Toulouse, France
- Jonathan Corley, University West Georgia, USA
- Juan de Lara, University of Madrid, Spain
- Julien Deantoni, Université Côte d’Azur, CNRS, I3S, Inria, France
- Thomas Dague, CWI, The Netherlands
- Juergen Dingel, Queen’s University, Canada
- Martin Gogolla, University of Bremen, Germany
- Dimitris Kolovos, University of York, UK
- Nicholas Matragkas, University of Hull, UK
- Marjan Mernik, University of Maribor, Slovenia
- Zoltan Micskei, Budapest University of Technology and Economics, Hungary
- Richard Paige, University of York, UK
- Alessandro Romero, Brazilian National Institute for Space Research, Brazil
- Jesús Sánchez Cuadrado, Universidad de Murcia, Spain
- Markus Scheidgen, Humboldt University Berlin, Germany
- Bran Selic, Malina Software Corporation, Canada
- Cortland Starrett, One Fact Inc, USA
- Eugene Syriani, University of Montreal, Canada
- Jérémie Tatibouët, CEA, France
- Massimo Tisi, Ecole des Mines de Nantes, France
- Simon Van Mierlo, University of Antwerp, Belgium
- Andreas Wortmann, RWTH Aachen University, Germany

### External Reviewers

- Nisha Desai, University of Bremen, Germany
- Dorian Leroy, TU Wien, Austria
- Jean-Marie Mottu, University of Nantes, France

### IV. ACKNOWLEDGEMENTS

We thank the organizers of MODELS 2017 very much for hosting EXE 2017 and for their support in the workshop organization. Our special thanks go to the general chair of MODELS 2017, Don Batory, as well as to the workshop chairs Michalis Famelis and Sahar Kokaly, whose support was extraordinary. Furthermore, we thank all the presenters and the participants of EXE 2017, who contributed to the open discussions and made the workshop a lively and successful event. We also want to express our sincere gratitude to Juergen Dingel for kicking off the workshop with his inspiring keynote. Furthermore, we thank our panelists, Benoit Combemale, Taylor Riché, Cortland Starrett, and Hans Vangheluwe for discussing approaches, experiences, applications and challenges of executable modeling. Lastly, we thank the reviewers and the members of the program committee for their timely and high-quality reviews, as well as for their inputs to the workshop program.