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Welcome to the proceedings of the ACM/IEEE 16th International Conference on Model Driven Engineering Languages and Systems (MODELS 2013). This year’s MODELS edition took place in the “Magic City” of Miami, a renowned region for education and research. As the MODELS community celebrated its 16th birthday, this major hub for culture, entertainment, arts, and fashion offered a unique stage for hosting the international diversity of participants who attended MODELS.

Since its beginnings, the use of models has always been a core principle in computer science. Recently, model-based engineering has gained rapid popularity across various engineering disciplines. The pervasive use of models as the core artifacts of the development process, and model-driven development of complex systems, has been strengthened by a focus on executable models and automatic transformations supporting the generation of more refined models and implementations. Software models have become industrially accepted best practices in many application areas. Domains like automotive systems and avionics, interactive systems, business engineering, games, and Web-based applications commonly apply a tool-supported, model-based, or model-driven approach toward software development. The potential for early validation and verification, coupled with the generation of production code, has been shown to cover a large percentage of implemented functionality with improved productivity and reliability.

This increased success of using models in software and systems engineering also opens up new challenges, requiring collaborative research across multiple disciplines, ranging from offering suitable domain-specific modeling concepts to supporting legacy needs through models. The MODELS conference is devoted to model-based development for software and systems engineering, covering all types of modeling languages, methods, tools, and their applications. MODELS 2013 offered an opportunity for researchers, practitioners, educators, and students to come together, to reflect on and discuss our progress as a community, and to identify the important challenges still to be overcome.

The MODELS community was challenged to demonstrate the maturity and effectiveness of model-based and model-driven engineering, and to explore their limits by investigating new application areas and combinations with other emerging technologies. This challenge resulted in papers submitted to the MODELS 2013 Foundations and Applications Tracks.

The program of MODELS 2013 had a strong mix of research and application papers that demonstrate the advances in this thriving field, anchored by three keynote sessions. Our first keynote speaker was Charles Simonyi from Intentional Software, who talked about “The Magic of Software.” Charles is a well-known high-tech pioneer, philanthropist, and space traveler. He was the chief architect
of Microsoft Word, Excel and other widely-used application programs. He left Microsoft to found Intentional Software, which aims to develop and market computer software for knowledge processing. His passion for science and for space has led him to travel into space twice aboard the Soyuz spacecraft, becoming the fifth space tourist and the first ever to fly twice. Despite this, we found that his opinions are practical and down to earth!

Our second keynote speaker was Constance Heitmeyer, who leads the Software Engineering Section of the Naval Research Laboratory’s (NRL’s) Center for High Assurance Computer Systems. She talked about “Model-Based Development of Software Systems: A Panacea or Academic Poppycock?” Her talk was an interesting view of software modeling from the perspective of transitioning research results to software practice. Among other things, she is the chief designer of NRL’s SCR (Software Cost Reduction) toolset, a set of tools for modeling, validating, and verifying complex software systems, which has been transferred to over 200 industry, government, and university groups.

We were also honored with a keynote presentation by Professor Bernd Brügge, a renowned expert and well-known speaker from the Technische Universität München and Carnegie Mellon University. He discussed a challenging topic in his talk “Creativity vs. Rigor: Informal Modeling Is OK,” showing how it is possible to include informal modeling techniques in project courses with real customers involving a large number of students at the sophomore and even freshmen level, without compromising the ideas of model-driven software development.

The Foundations Track papers provide significant contributions to the core software modeling body of knowledge in the form of new ideas and results that advance the state of the art. Two categories of Foundations Track papers are included in these proceedings: Technical Papers, describing original scientifically rigorous solutions to challenging model-driven development problems, and Exploratory Papers, describing new, non-conventional modeling research positions or approaches that challenge the status quo and describe solutions that are based on new ways of looking at software modeling problems.

The Applications Track papers demonstrate the relevance and effectiveness of the model-based paradigm of engineering. They include two categories of papers: Application Papers, providing a realistic and verifiable picture of the current state of the practice in model-based engineering and explore the problems encountered by the industrial adoption of model-based techniques, and Empirical Evaluation Papers, evaluating existing problem cases or scientifically validated proposed solutions through empirical studies, experiments, case studies, or simulations.

Following the successful format initiated in 2012, we used a Foundations Program Committee and an Applications Program Committee to evaluate all the papers. A separate Program Board (PB) also convened to help ensure that all reviews received by the authors provided constructive feedback, and to check that the selection process was as rigorous and fair as possible. In the 2013 review process each paper was reviewed by at least three members of the Program Committees; the reviews were monitored by a PB member assigned to the paper.
Each paper was extensively discussed at the online Program Committee (PC) meeting, giving due consideration to author responses. A physical PB meeting was held as a satellite event of ICSE 2013, in San Francisco, during May 24–25, 2013, to finalize the selection of papers by making acceptance decisions on those papers for which online PC discussions did not converge on a clear decision.

For MODELS 2013, we received a total of 180 full papers from the 236 abstracts submitted. From these, 130 papers were submitted to the Foundations Track and 50 to the Applications Track. Out of the 130 papers, the PC and PB accepted 30 papers and invited four for resubmission. Of the 50 Applications Track papers, 12 were accepted and one was invited to be improved and resubmitted. All five papers invited for resubmission were accepted after a second round of evaluations. This results in a total number of 47 papers accepted, with a 26% acceptance rate.

The PC chairs also conducted an author survey to obtain feedback on the quality of reviews. We received 112 responses from authors of Foundations Track papers and 44 responses from Applications Track authors. Authors were asked to evaluate the usefulness of the reviews. Over 76% of the respondents indicated that their reviews were either useful or very useful. Feedback like this helps us determine the effectiveness of the MODELS review process and we greatly appreciate the effort of the authors who submitted completed survey forms.

In addition to the invited talks and technical sessions, MODELS 2013 featured the traditional set of satellite events which this year included 18 workshops, ten tutorials, two sessions dedicated to tool demonstrations, one panel on “Abstraction Challenges,” and one evening session devoted to posters of emergent ideas. The Educators and Doctoral Symposia also occurred again at MODELS 2013, providing the premier venue for both educators and doctoral students working on topics related to model-driven engineering. For the first time in its history, MODELS hosted the ACM Student Research Competition (SRC), sponsored by Microsoft Research. The ACM SRC is a forum for undergraduate and graduate students to showcase their research, exchange ideas, and improve their communication skills while competing for prizes at MODELS 2013.

Organizing MODELS 2013 involved the considerable effort of over 100 hard-working members of the Organizing Committee and the various selection committees. A list of the Organizing Committee and selection committees for the satellite events can be found on the MODELS 2013 website (http://www.modelsconference.org/). We thank them all for their expertise, time, and commitment across several years of planning and coordination.

We are particularly grateful to the Foundations PC, the Applications PC and the PB for their continued observance in maintaining the quality of the MODELS program. We also thank the additional reviewers who contributed to the MODELS 2013 review process. We extend special thanks to Gregor Engels (MODELS Steering Committee Chair) and all the other members of the Steering Committee for their support during the planning and execution of MODELS 2013. We appreciate the helpful assistance from Geri Georg, who served as the
MODELS Steering Committee Chair during the early phases of the MODELS 2013 formation.

Our special gratitude goes to the local Miami team at Florida International University, including the excellent group of student volunteers, for their hard work behind the scenes to make this conference happen. Organizing a conference represents almost two years of hard work and complete dedication.

We thank all the authors who submitted papers to MODELS, and we congratulate those authors whose papers appear in these proceedings. These papers reflect the quality of the current state of the art in software modeling research and practice.

A special word of gratitude is due to Richard van de Stadt for his CyberChair support. He went far beyond the call of duty in providing innovative responses to the many challenges presented him and was a tireless collaborator and companion on this exciting journey.

No conference would be viable without sponsors. We sincerely thank all of our generous supporters, especially our gold sponsors CEA-List and Microsoft Research, silver sponsors Intentional Software, Tata Consulting Services and Siemens, and the rest of the contributing and supporting companies and organizations including the OMG, Springer, CEUR, Greater Miami Convention and Visitors Bureau, and society sponsors IEEE, IEEE Computer Society, ACM and ACM SIGSOFT.

We are convinced that everyone had both an exciting and stimulating time in Miami, and left with new ideas and enthusiasm to broaden the MODELS community and strengthen the application of models in the engineering of software systems.

August 2013

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Keynote Abstracts
The Magic of Software

Charles Simonyi

Intentional Software, USA

Abstract. Software allows for many models of computation. We create models to understand and reason about these computations (e.g., did the aircraft change its course because there was a hill in front of it or because a model indicated the presence of a hill?). As computers and software become more and more ubiquitous, the tangible world and computer models of the world are merging. We are re-designing our basic systems from networks, cars and aircrafts, to financial and health systems to reduce their costs and increase their effectiveness using software that, by necessity, must incorporate a model of the environment and its characteristics. Models can also take us outside of this reality and let us explore alternative timelines — what we call simulation. Today, programming languages are the primary way to communicate our intentions of these systems in software. Notation, syntax and semantics make the mental programming language models concrete for us as humans. But the computer does not really need the notation, syntax and semantics models of the software in the same way as we humans do. In this talk, we will trace the magic of software that enabled this progression from Moore’s law, through computer languages, to the Digital Artifacts of today. We will investigate it carefully and come to some surprising conclusions that question the mainstream thinking around software models. What if we let go of some of our learned beliefs about software models and think differently about models of instructing computers?
Model-Based Development of Software: 
A Panacea or Academic Poppycock

Constance Heitmeyer

Center for High Assurance Computer Systems
Naval Research Laboratory, USA

Abstract. In recent years, the use of models in developing complex software systems has been steadily increasing. Advocates of model-based development argue that models can help reduce the time, cost, and effort needed to build software systems which satisfy their requirements and that model-based approaches are effective not only in system development but throughout a system’s life-time. Thus the problem addressed by researchers in software and system modeling encompasses not only the original construction of a complex system but its complete life-cycle. This talk will address significant issues in model-based system and software development, including: What is the current and future role of models in software system development? What benefits can we obtain from the use of models not only in development but throughout the system life-cycle? What are the barriers to using models in software system development and evolution? What are the major challenges for system and software modeling researchers during the next decade?
Abstract. Single large project courses with clients from industry have been established as capstone courses in many software engineering curricula. They are considered a good way of teaching industry relevant software engineering practices, in particular model-based software development.

One particular challenge is how to balance between modeling and timely delivery. If we focus too much on modeling, the students do not have enough time to deliver the system ("analysis paralysis"). If we focus too much on the delivery of the system, the quality of the models usually goes down the drain. Another challenge is the balance between informal models intended for human communication and specification models intended for CASE tools. I argue that teachers often put too much weight on the rigor of the models, and less on the creative and iterative aspects of modeling. Modeling should be allowed to be informal, incomplete and inconsistent, especially during the early phases of software development. I have been teaching capstone courses for almost 25 years, initially at the senior and junior level. During this time excellent automatic build and release management tools have been developed. They reduce the need for heroic delivery efforts at the end of a course, especially if they are coupled with agile methods, allowing the teacher to spend more time on the creative aspects of modeling. I will use several examples from my courses to demonstrate how it is possible to include informal modeling techniques in project courses with real customers involving a large number of students at the sophomore and even freshmen level without compromising the ideas of model-driven software development.
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