

Preface

This book is an edited collection of contributions in selected topics related to embedded systems modeling, analysis, and synthesis. Most contributions are extended versions of papers that were originally presented at several workshops organized in the context of the Embedded Systems Week and Real-Time Systems Symposium in the last months of 2011. The workshops targeted topics and challenges related to the use of models for the design, analysis, and synthesis of Embedded Systems. These workshops were the WSS, *Workshop on Software Synthesis*, the TiMoBD, *Time Analysis and Model-Based Design*, and the SOMRES, *Workshop on Synthesis and Optimization Methods for Real-Time Embedded Systems*. Problems and solutions were discussed for different stages in the development process and applied to the system-level view, as well as to the design, analysis, and synthesis of components and subsystems and the behaviors therein.

As workshop organizers and editors of this book, we believe that recent years have brought renewed interest for the study and development of embedded and cyber-physical systems by researchers and developers. The opportunity for the development of new languages, methods, and tools comes from the emergence of feature-rich, complex, distributed systems, and the need to tame their complexity in new ways, is leading to the adoption of model-based development, new analysis methods and design synthesis techniques, and true component-based development, in which functional and platform assemblies are composable, analyzable, and, possibly in the future, demonstrably correct-by-construction.

This book collects contributions on different topics, including system and software models, innovative architectures (including OS and resource managers), formal methods, model checking and analysis techniques, software synthesis, system optimization and real-time networks, with the ambitious objective of providing useful insights and innovative ideas on how to solve very complex problems throughout the entire (model-based) development cycle. Contrary to other books on the subject, we attempt at reconciling the two communities of Model-Based Design and Model-Driven Engineering, which often operate in independent ways, with only a few fortunate exceptions.

Regardless of the workshop organization, the selected papers have been reorganized according to their topics and divided into parts that better fit the stages in the development process rather than an abstract classification based, for example,

on languages, algorithmic solutions, or analysis and synthesis methods. The intended audience includes of course the general community of embedded systems researchers, but we believe several topics should be also of interest for developers, tool vendors, and development process experts. Several contributions are provided by industry developers and researchers, referring to upcoming commercial products, methods, and tools. The applicability of most other results is demonstrated by use cases and/or project experiences.

We would like to acknowledge all authors for their hard work, the reviewers and workshop audiences for their constructive feedback and interesting discussion, which eventually paved the way for improved and new content, and the assistant editors at Springer. We hope that this book will serve as an interesting source of inspiration for new researches and applications, and help many readers to enter the domain of model-based design of embedded systems.

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Embedded Systems Development

From Functional Models to Implementations

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