Embedded systems take over complex control and data processing tasks in diverse application fields such as automotive, avionics, consumer products, and telecommunications. They are the primary driver for improving overall system safety, efficiency, and comfort. The demand for further improvement in these aspects can only be satisfied by designing embedded systems of increasing complexity, which in turn necessitates the development of new system design methodologies based on specification, design, and verification languages.

The objective of the book at hand is to provide researchers and designers with an overview of current research trends, results, and application experiences in computer languages for embedded systems. The book builds upon the most relevant contributions to the 2008 conference *Forum on Design Languages* (FDL), the premier international conference specializing in this field. These contributions have been selected based on the results of reviews provided by leading experts from research and industry. In many cases, the authors have improved their original work by adding breadth, depth, or explanation.

System development includes the tasks of defining an initial, high-level specification, designing system architecture and functional blocks, and verifying that architecture and functionality meet the specified properties and requirements. The designers working on these tasks, and the electronic design automation tools deployed in the design process, have to take into account software, digital logic, and analog system components and their complex interactions in heterogeneous, mixed discrete/continuous systems. This book therefore addresses related issues in four parts, dedicated to specification, heterogeneity, design, and verification.

Part I, Model-Based System Specification Languages, focuses on two high-level specification languages which are emerging as standards for embedded systems: the *Architecture Analysis and Design Language* (AADL), and the *Modeling and Analysis of Real-Time and Embedded Systems* (MARTE) profile for the Unified Modeling Language (UML). Beyond their syntax and semantics, the methods built upon these languages, and initial applications are presented in three chapters. Two further chapters are dedicated to competing approaches using an abstract state machine based language and Matlab/Simulink driven modeling, respectively.

Part II, Languages for Heterogeneous System Design, is devoted to two promising languages that provide the means to describe heterogeneous systems. The discrete-time and continuous-time worlds are brought together by SystemC-AMS on system level, whereas VHDL-AMS provides all it takes to describe mixed analog and digital circuits.

Part III, Digital Systems Design Methodologies Based on C++, is the largest part of this book, based on the substantial impact that the SystemC library and its methodology-specific additions continue to be making in the digital (hardware/software) design community. This part comprises eight chapters devoted to
the subjects of transaction-level modeling and its applications, architecture and
performance evaluation, design and scheduling of functional blocks, as well as
programming and modeling approaches for (run-time) reconfigurable FPGA archi-
tectures.

Part IV, Verification and Requirements Evaluation, features contributions ad-
dressing both functional and beyond-functional properties. Functional aspects in-
clude the verification of circuitry implementing arithmetic operations and the
debugging of contradictory functional constraints specified with the SystemC Ver-
ification Library (SCV). Analysis of beyond-functional properties such as timing
behavior, performance, area cost, and power dissipation, is covered for Multi
Processor Systems-on-Chip (MPSoC) as well as on-chip interconnection networks.

The selection of the contributions to the before-mentioned parts has been guided
by the reviews provided by FDL reviewers and programme committee members.
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