

# Preface

For more than four decades the complexity of circuits and systems has grown according to Moore's Law resulting in chips of several billion components. While already the synthesis on the different levels from the initial specification down to the layout is a challenging task, for all the individual steps the correctness has to be considered.

In the past, classical approaches based on simulation or emulation have been used. But these techniques do not scale well and reach their limits. Correctness can only be ensured by the use of formal methods. These techniques were proposed more than 30 years ago in the context of circuit and system design, and in the meantime exist very powerful tools that are used in industry for specific tasks, like the equivalence check of netlists on the Register Transfer Level (RTL).

But with increasing complexity of the systems there is a high demand for tools that are better scalable and also consider modeling beyond plain digital circuits. In this context analog and mixed signal circuits have to be included on the lower level, but also hardware-dependent software towards the higher levels of abstraction.

In this book, these advanced topics of using formal verification along the design flow with a special focus on the system level are addressed. World's leading researchers have contributed chapters, where they describe the underlying problems, possible solutions, and directions for future work.

The chapters in the order as they appear in this book are:

- *Formal Techniques for Verification and Coverage Analysis of Analog Systems* by Andreas Fürtig and Lars Hedrich
- *Verification of Incomplete Designs* by Bernd Becker, Christoph Scholl and Ralf Wimmer
- *Probabilistic Model Checking: Advances and Applications* by Marta Kwiatkowska, Gethin Norman and David Parker
- *Software in a Hardware View: New Models for HW-dependent Software in SoC Verification* by Carlos Villarraga, Dominik Stoffel and Wolfgang Kunz
- *Formal Verification—The Industrial Perspective* by Raik Brinkmann and David Kelf

On the different abstraction layers it is shown in which way formal methods can assist today to ensure functional correctness. The contributed chapters cover not only the latest results in academia but also descriptions of industrial tools and perspectives.

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