

System-Scenario-based Design Principles and Applications

Francky Catthoor • Twan Basten
Nikolaos Zompakis • Marc Geilen
Per Gunnar Kjeldsberg

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 Springer

Francky Catthoor
IMEC and KU Leuven
Leuven, Belgium

Nikolaos Zompakis
MicroLab-ECE-NTUA
Athens, Greece

Per Gunnar Kjeldsberg
Norwegian University of Science
and Technology
Trondheim, Norway

Twan Basten
Eindhoven University of Technology
and ESI, TNO
Eindhoven, The Netherlands

Marc Geilen
Eindhoven University of Technology
Eindhoven, The Netherlands

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Preface

In the past decades, embedded systems have become much more complex due to the introduction of a substantial amount of conditionally executed functionality in a single application and due to running of several applications or parts of applications concurrently. This substantially increases the dynamic nature of today's applications and systems, and it complicates dealing with their typically tight constraints in terms of, e.g., task deadlines, throughput, and battery lifetime. Also, optimizing for their cost functions like energy consumption and overall fabrication cost is much harder under such dynamic operating conditions. State-of-the-art design methods usually try to cope with these dynamic issues either by taking the corner cases, ending up in the true worst-case design paradigm, or by identifying several most used cases (use-case scenario paradigm) and dealing with them separately. Both of these approaches clearly reduce the complexity introduced by the dynamism, at the cost of adding large margins though.

In contrast, the material in this book encompasses a generic and systematic design-time/run-time methodology for handling the dynamic nature of modern embedded systems without adding such margins. It can be utilized in combination with most existing statically oriented realization methods to effectively deal with dynamism and to drastically increase their performance and efficiency. The presented method is based on the concept of system scenarios, which group system behaviors that are similar from a multidimensional cost perspective, such as resource requirements, delay, and energy consumption. This enables optimization per system scenario. It thus takes a more global cost-oriented system perspective, which is also the main distinction from the abovementioned use-case scenarios. One of the main aims with this book is to disseminate the know-how behind this concept more broadly.

Leuven, Belgium
Eindhoven, The Netherlands
Athens, Greece
Eindhoven, The Netherlands
Trondheim, Norway

Francky Catthoor
Twan Basten
Nikolaos Zompakis
Marc Geilen
Per Gunnar Kjeldsberg

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