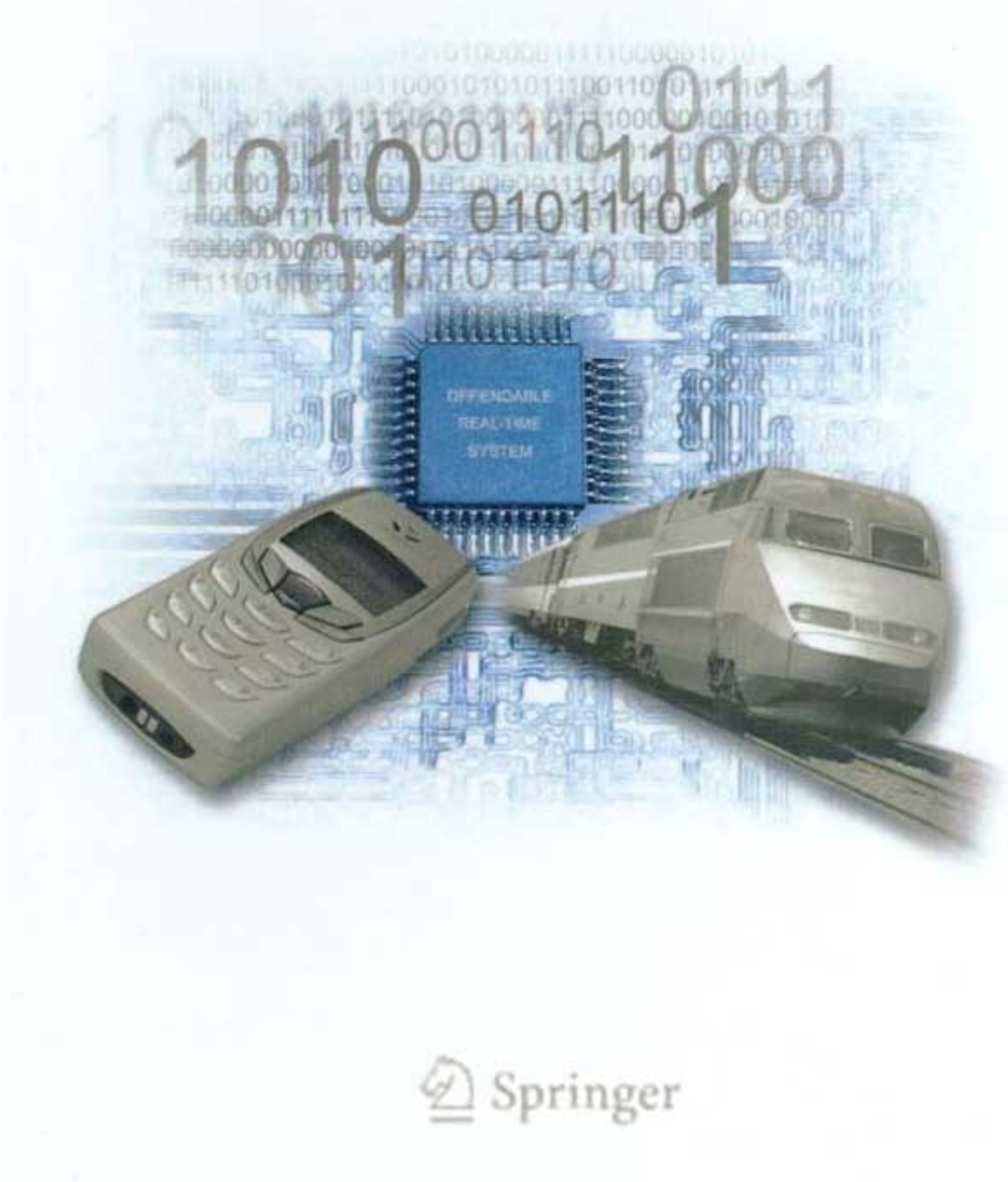


By
Peter Marwedel



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EMBEDDED SYSTEM DESIGN

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Embedded System Design

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Due to all the other constraints, this means that the code-size should be as small as possible for the intended application. This is especially true for **systems on a chip** (SoCs), systems for which all the information processing circuits are included on a single chip. If the instruction memory is to be integrated onto this chip, it should be used very efficiently.

- 3 **Run-time efficiency:** The minimum amount of resources should be used for implementing the required functionality. We should be able to meet time constraints using the least amount of hardware resources and energy. In order to reduce the energy consumption, clock frequencies and supply voltages should be as small as possible. Also, only the necessary hardware components should be present. Components which do not improve the worst case execution time (such as many caches or memory management units) can be omitted.
- 4 **Weight:** All portable systems must be of low weight. Low weight is frequently an important argument for buying a certain system.
- 5 **Cost:** For high-volume embedded systems, especially in consumer electronics, competitiveness on the market is an extremely crucial issue, and efficient use of hardware components and the software development budget are required.

- These systems are **dedicated towards a certain application**.

For example, processors running control software in a car or a train will always run that software, and there will be no attempt to run a computer game or spreadsheet program on the same processor. There are mainly two reasons for this:

- 1 Running additional programs would make those systems less dependable.
- 2 Running additional programs is only feasible if resources such as memory are unused. No unused resources should be present in an efficient system.

- Most embedded systems do not use keyboards, mice and large computer monitors for their user-interface. Instead, there is a **dedicated user-interface** consisting of push-buttons, steering wheels, pedals etc. Because of this, the user hardly recognizes that information processing is involved. Due to this, the new era of computing has also been characterized by the disappearing computer.
- Many embedded systems must meet **real-time constraints**. Not completing computations within a given time-frame can result in a serious loss of

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