Random Testing of Digital Circuits

Theory and Applications

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about the book . . .

This well-organized **reference/text** introduces a theory of random testing in digital circuits **for the first time** and offers **practical guidance** for the implementation of random pattern generators, signature analyzers, design for random testability, and testing results.

The fruit of two decades' research by the author, ***Random Testing of Digital Circuits*** calculates random test lengths for combinational and sequential circuits, memory circuits, *and* microprocessors...provides **experimental results** derived from **real circuits**, not simulations...illustrates the **efficiency** of random testing for nontarget faults...explores performance measurements *and* design for random pattern testing...profiles *both* single *and* multiple input signature analyzers...describes testing procedures for complex sequential machines...examines results from TTL circuits, LSI CMOS circuits, and the Motorola 6800 microprocessor...highlights *both* software *and* hardware generation of random test sequences...and more.

Random Testing of Digital Circuits serves as an excellent **reference** for electrical and electronics, circuit test, circuit design, communications, component, and control engineers; applied mathematicians and statisticians; and computer scientists; and as an outstanding **text** for upper-level undergraduate and graduate students in these disciplines.

about the author . . .

RENÉ DAVID is Research Director at the Centre National de la Recherche Scientifique, working at the Institut National Polytechnique de Grenoble, France. He is the author or coauthor of 140 journal articles, book chapters, and patents, and is the coauthor of *Petri Nets and Grafcet: Tools for Modelling Discrete Event Systems*. He is a member of the Association Française pour la Cybernétique Economique et Technique. Dr. David received the engineering degree in mechanics (1962) from the Ecole Nationale Supérieure d'Arts et Métiers, Paris, France, and the engineering degree in automatic control (1965) and the Ph.D. degree (1969) in automatic control from the Institut National Polytechnique de Grenoble, France.

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Foreword

The introduction of complex integrated networks and the ability to separate good networks from defective ones has consistently been a difficult problem. With the introduction of Self-Testing Techniques, for example Built-In-Logic-Block-Observation technique (BILBO), Random Patterns have played a central role in helping to solve this problem. As a result of the research in this area, a better understanding of this fundamental concept of Self-Testing has led to many designs, from large mainframe computers to the smallest of networks with utility in manufacturing and in the field. This has resulted in considerable savings in manufacturing costs and repair costs. Because of the high demand for Self-Testing, research and development in Random Patterns is absolutely required to keep pace with these ever increasing complex networks.

The author of this book has been and continues to be one of the prominent researchers in the area of random pattern testing for more than two decades. He has brought a refreshing new outlook to the field which has resulted in a number of very innovative approaches to help solve some of these fundamental problems. The key to his innovative approach is strongly based in a solid mathematics foundation. With this approach he has helped solve a number of problems in self testing applicable to structures such as BILBO. Moreover, he and his coworkers have gone further to bring some insight into an area in which few others would even have ventured, that is, random pattern testing of complex sequential machines such as µProcessors. Today this body of work has found application not only in testing of hardware but is now even being applied to the very important area of software testing. All this is accomplished with a solid mathematical base which is very easily in the reach of practicing scientists and engineers.

This book is based on the author's work in the area of random pattern testing. With the analytical tools developed in this book you will be taken through the frontier of random pattern testing from the fundamentals up to very useful concepts that can be applied in today's designs. I am pleased to have the opportunity to write this foreword for one of the researchers for whom I have always had the highest respect, and I am sure that after studying this work the reader will have similar feelings.

Professor Thomas W. Williams
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