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Book reviews

COMPUTATIONAL GEOMETRY IN C, SECOND EDITION, by Joseph O'Rourke, CUP, Cambridge, UK, 1998, 376 pages, inc. References and Index (Pb, £55)

This is a very expensive book, but it is also a very good book. It is not a book about computer graphics; it is a book about *algorithms for geometry* done on computer (of course, it could be used in graphics, but that is not the primary aim).

The book covers basic topics such as polygon triangulation, convex hulls, Voronoi diagrams, motion planning, arrangements and geometric search. The more advanced topics include: 3D convex hulls, intersection algorithms for ray-segment, ray-triangle and point in polyhedra. The book is self-contained in the sense that it contains all relevant background material. The book, however, does assume that the reader has a basic knowledge of algebra and of C programming.

The treatment is lucid and draws the reader into the material. The algorithms are clear, as is the code.

There are two issues which I find problematic: the price of this, admittedly excellent book, and the source code availability.

It seems that the price of £55 will act as an extremely effective deterrent to students for whom this would be required reading. It will make many academics think twice also. This implies that the book will be purchased by libraries (which is becoming less likely, given their decreasing budgets) or by departments. In any case, this is a pity.

The second is that the machine-readable form of the source code for all the examples can only be obtained via Web. It would have been preferable for a CD to be included with the book (other publishers do this; however, CUP could argue that other publishers will have greater sales). I still find it unfortunate that there is no machine-readable copy included with the text.

Iain Craig
VLTec
66 Lower Baggot Street,
Dublin 2,
(Ireland)

DIGITAL SYSTEMS ENGINEERING, by William J. Day and John W. Poulton, CUP, Cambridge, UK, 1999, 663 pages, inc. References and Index (Hb, £40)

This is an exellent book. The abstract begins thus:

> "What makes some computers fast and others slow? What makes some digital systems operate reliably for years while others fail mysteriously every few hours? Why do some systems dissipate kilowatts whereas others operate from batteries? The answers to these questions of speed, reliability, and power are all determined by the system-level electrical design of a digital system: issues of power distribution, noise management, signaling, timing and synchronization"

This is a precise summary of the book.

The book is organised as follows:

1. Introduction. This includes signaling, timing and synchronization, power distribution and noice. Wires and their scaling are considered.
2. Packaging. Integrated Circuits, PCBs, chassis, backplanes and motherboards, connectors, optical and radio communication.
3. Modeling and Analysis of Wires. The Ideal Wire, transmission lines.
4. Circuits. MOS Devices, basic circuit forms, circuit analysis.
5. Power Distribution.
6. Noise. Power supply noise, cross talk, intersymbol interference and other souces of noise.
7. Signaling Conventions.
8. Advanced Signaling Techniques.
9. Timing Conventions. Includes open- and closed-loop timing and clock distribution.
10. Synchronisation. Synchronous and Asynchronous design.
11. Signaling Circuits.
12. Timing Circuits. Include delay lines, phase comparators, clock aligners and voltage-controlled oscillators.

The book has uses in an undergraduate Digital Systems Engineering course at MIT. Materials from this course (including lecture notes, simulations and laboratory assignments) are to be made available via the Web.

The book is relatively deep in mathematics, the reader should be aware!

My problem with this book is that it is so expensive. Students will not buy books that cost as much as this. This means that lecturers of Digital Systems Engineering will be the main audience for this book, as will be professional engineers. Many lecturers might consider the cost too high, however.

Iain Craig,
VLTec,
66 Lower Baggot Street,
Dublin 2 (Ireland)

INTRODUCTION TO DIGITAL SYSTEMS, by Milós Ercegovac, Tomás Lang and Jaime H. Moreno, Wiley, Chichester, UK, 1999, 498 pages, inc. CD and Index (Hb; £29.50)

This book is a tutorial on the construction of digital circuits and systems. It starts at the beginning with combinational system specification and works through combinational circuits, gate networks, two-level gate networks, multilevel gate networks and then moves to sequential systems and networks. Thereafter, sequential modules, programmable entities (such as PSA, ROMS and gate arrays) are examined, register transfer systems, data and control (as in a microprogrammed controller). The finale is a chapter on the specification and implementation of a microcomputer.

The book starts in what I (as a software engineer) would consider to be a traditional way and explains such things as NAND and NOR gates and how they are connected to form circuits.After these preliminaries are out of the way, the authors use μVHDL (a subset of VHDL) as their primary specification mechanism.

The book is accompanied by supplementary material which can be obtained from the authors' Web site. This material consists of an Instructor's Manual and viewgraphs for the UCLA lectures (in PostScript).

The book is also accompanied by a CD-ROM which contains a student version of a compleate CAD environment (Altera's

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MAX+PLUS II) for the design and synthesis of digital systems using Altera's devices.The CD also includes the VHDL source for the examples.

The book and associated material seems to me (an outsider, it must be admitted) to be a good package and worth considering as a text for a course. I found it useful to refresh and extend my (highly limited) knowledge of digital circuits, so it can be used by others.

The book is well written and the examples are clear. It is obvious that the material has benefitted from use in real classrooms prior to publication.

The price seems very reasonable given what else is available.

Iain Craig,
VLTec,
66 Lower Baggot Street,
Dublin 2,
(Ireland)

VHDL FOR LOGIC SYNTHESIS, by Andrew Rushton, Wiley, Chichester, UK, 1998, 375 pages, inc. Index (Hb, £29.95).
This book teachers the reader about logic design using VHDL, a high-level algorithmic language for circuit design. The book covers the following topics:

1. Register-Transfer Design
2. Combinational Logic
3. Types
4. Operators
5. Standard arithmetic operations
6. Numerical operations such as shifting
7. Sequential algorithms
8. Registers
9. Hierarchy (declarations, components, binding, parameterisation)
10. Subprograms

The book ends with a chapter on tristate logic and then chapters on testing, libraries. There are two appendices, one covering packages, the other a syntax summary.

As the reader will see, many of the topics are related to VHDL as a programming language rather than as a logic design language. The intention in defining the language is to allow the logic designer to write algorithms which can be translated into gates.Hence the chapters on sequential algorithms (which deals with issues such as iteration and selection) and the hierarchy chapter.

The Preface makes very interesting reading. The author explains that the book is required because design engineers have found it hard to come to grips with the VHDL approach to logic design. The author also says that "VHDL is a very large and clumsy language"—having looked at the examples in detail, I would agree completely (it was, it would seem, designed by committee).

The book clearly written and appears to cover essentials (I do not, personally, know VHDL but the author has had many years' experience). At the price, it would appear to be within reach of most.

Iain Craig,
VLTec,
66 Lower Baggot Street,
Dublin 2,
(Ireland)

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