book from almost 25 years ago has not resulted in a text that is representative of today's philosophy and technology for the numerical solution of partial differential equations. In view of the rapid and fundamental development of this field during the last decades it would, in fact, have been very difficult to achieve such a goal.

V. T.

8[35–06, 35J60, 65–06, 65K10, 65L05, 65N06].—RANDOLPH E. BANK (Editor), *Computational Aspects of VLSI Design with an Emphasis on Semiconductor Device Simulation*, Lectures in Applied Mathematics, vol. 25, Amer. Math. Soc., Providence, RI, 1990, xiii+190 pp., $23\frac{1}{2}$ cm. Price $56.00.

These are the proceedings of the eighteenth AMS-SIAM Summer Seminar on Applied Mathematics, held at the Institute for Mathematics and Its Applications from 30 April to 7 May 1987.

The primary focus of the book is on process or device simulation in the design of VLSI (Very Large Scale Integrated circuits, such as the computer chips that make up a personal computer, workstation, or even supercomputer). Topics related to circuit-level simulations are also presented.

The so-called drift-diffusion model used in device simulations is a system of nonlinear partial differential equations. Several papers are devoted to an asymptotic analysis of the singular limit of these systems as one of the physical parameters (which is usually small in typical applications) tends to zero. There is also some work on existence theory for such systems.

The numerical treatment of the drift-diffusion models is not extensive in the book, although substantial examples are presented in the papers dealing with the asymptotic behavior of the singular limit. These models exhibit internal layers (and possibly boundary layers), and the asymptotic analysis is intended to improve numerical methods for such problems as well as provide qualitative information of independent interest.

The drift-diffusion model is known to be insufficiently detailed for some VLSI designs of current interest. Two papers explore more detailed models. One is based on the Boltzmann equation and involves no less than seven independent variables: space, time, and wave numbers. The relationship between this model and the drift-diffusion model is reviewed and some numerical experiments on a simplified model problem are presented. Another paper explores the inclusion of quantum mechanical effects that are influential especially for VLSI chips made of gallium arsenide. A model consisting of a system of nonlinear partial differential equations, not unlike the drift-diffusion system, is derived and numerical experiments are described.

One paper considers block Gauss-Seidel iterative algorithms for solving the steady-state version of the drift-diffusion model. Another considers parameter-continuation methods (together with multigrid solution of the linearized equations) for solving them.

One paper is devoted to solving the basic algebraic-ODE equations that comprise the circuit-level model of VLSI. These models arise via spatial averaging of the device-level description of VLSI, reducing an entire device to discrete point values of current or voltage.

There are other significant computational problems of VLSI design not covered in the book. Among these are logic- and register-level models, which are discrete both in space and time. Logic-level models arise by quantizing the current or voltage levels in the circuit-level models into Boolean variables, as well as averaging over the time variable. Register-level models are a further abstraction in which logic elements are grouped into functional units operating on bytes or words of data. Other problems of computational VLSI design are optimization of chip layout and routing of wires, as well as testing of final designs. However, the title of the book indicates that these topics are beyond its scope.

The overall quality of the articles is high, both in terms of historical perspective and technical contribution. This monograph is essential reading for anyone interested in computational simulation of VLSI behavior.

L. R. S.

9[60–06, 65–06, 68–06, 70–06, 80–06, 82–06, 90–06, 92–06, 93–06, 94–06].— MATTI HEILIÖ (Editor), *Fifth European Conference on Mathematics in Industry*, European Consortium for Mathematics in Industry, Vol. 7, Kluwer, Dordrecht, 1991, x+400 pp., $24\frac{1}{2}$ cm. Price $139.00/Dfl.260.00.

This carefully edited volume is the fifth in a series of proceedings of European conferences on industrial mathematics. In format and organization it resembles many SIAM conference proceedings and recent publications of the University of Minnesota's Institute of Mathematics and Its Applications. It contains seven invited presentations and sixty-four contributed presentations. The invited papers average about ten pages, and the contributed about five. In addition, there is a special section, or minisymposium, focusing on problems related to the distribution of electric power.

Such a volume of necessity sacrifices depth for diversity. The diversity of subject matter, both from technological and mathematical vantage points, is far beyond the knowledge base of any given individual. Areas of application include electromagnetic field theory, fluid mechanics, materials science, chemical engineering, design, phase and shape transitions, systems analysis, process simulation, control theory, image processing, robotics, nondestructive testing, signal processing, robotics, image processing, oceanography, and technical education.

The editor emphasizes that there is no fixed body of knowledge, theory, or techniques properly forming an area called "industrial mathematics". They refer to industrial mathematics as an orientation and a process by which the science of mathematics and computation meets the world of technological application. This conference and its proceedings reflect a growing awareness of the importance of this process to the development of sophisticated technology by the scientific community at large.

The present volume should prove to be a valuable resource to mathematically oriented individuals engaged in applications related to research, education, and creative research management.

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