practice are clearly pointed out. I found only a few trivial misprints. The book is eminently understandable to someone who knows basic spline theory and a bit more than basic functional analysis. (Facts about compactness and metrizability in the weak* topology of L_∞ are used, with careful referencing.)

A particular aspect of this work is the constant interplay between a carefully erected abstract framework, in which convergence is proven, and very concrete examples which sometimes stretch the theory to its limits and beyond. In this, the book is not only of interest to people in the area of parameter estimation, but serves up a nice slice of life of present-day applied and numerical mathematics which may be enjoyed by a wider audience.

L. B. W.

8[65–06, 65P05, 65H20, 35B32, 58F14].—DIRK ROOSE, BART DE DIER & ALASTAIR SPENCE (Editors), *Continuation and Bifurcations: Numerical Techniques and Applications*, NATO ASI Series, Series C: Mathematical and Physical Sciences, Vol. 313, Kluwer, Dordrecht, 1990, xiii + 426 pp., 24 $\frac{1}{2}$ cm. Price \$132.00/Dfl.220.00.

The numerical solution of parameter-dependent problems has become an extremely important branch of scientific computing and numerical analysis. The theoretical understanding of bifurcation phenomena permits the development of powerful methods automatically detecting qualitative changes in solution behavior.

This book contains 26 articles and 10 abstracts of talks given at a workshop held at the Katholieke Universiteit Leuven, Belgium, in September 1989. The authors cover a wide range from theoretical investigations to numerical algorithms and applications to real-world problems.

Several articles are concerned with low-dimensional representations of the behavior of systems described by partial differential equations. The approaches discussed by the authors include the construction of approximate inertial manifolds as well as spectral methods. The resulting finite-dimensional systems are used for the computation of bifurcation diagrams for problems such as the Kuramoto-Sivashinski equation or systems of reaction-diffusion equations.

A group of articles is concerned with bifurcation in the presence of symmetries. Apart from theoretical investigations, numerical methods using information about symmetries are presented.

Methods for the computation of heteroclinic and homoclinic orbits and their use for the detection of global bifurcations are discussed. Further numerical aspects include the effect of time-discretization on the global attractor as well as the computation of Hopf bifurcations. Continuation and bifurcation software is presented, and the desirable features of such software are discussed in an article which tries to initiate a discussion about standards for continuation codes.

Several interesting applications are presented. The author of this review learned that cubature formulae can be constructed via continuation methods. Other articles describe a classification of flow structures for the Navier-Stokes equations, the dynamics of the Maxwell-Bloch equations for passive optical systems, Marangoni convection in crystal growth problems, image processing via the dynamics of reaction-diffusion systems and the stability of a robot.

This book provides a very nice picture of the variety of problems which can be attacked by continuation and bifurcation methods as well as the corresponding theoretical and numerical approaches. The articles are well written and provide a useful source of information for anybody doing research in the field or just having an interest in the subject.

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9[65–02, 65F05, 65F10, 65N22].—JACK J. DONGARRA, IAIN S. DUFF, DANNY C. SORENSEN & HENK A. VAN DER VORST, *Solving Linear Systems on Vector and Shared Memory Computers*, SIAM, Philadelphia, 1991, x + 256 pp., 23 cm. Price: Softcover $19.75.

The last twenty years have seen a revolution in scientific computing as a result of the emergence of parallel and vector computers. Particularly within the last decade, as these machines have become widely available, there has been increasing interest in algorithms capable of achieving the full potential of such computers.

One of the most frequent and important problems in scientific computing is the solution of linear systems of equations, the topic of this book. Although the title limits the scope to shared memory machines, there is, in fact, much in the book of explicit or implicit relevance to distributed memory machines also.

A fairly long Chapter 1 sets the stage with a discussion of many hardware features such as pipelining, chaining, RISC and VLIW machines, cache and other memory organization issues, connection topologies for parallel machines, ending with a few programming techniques such as loop unrolling. This is followed by two short chapters, one surveying various past and current machines, and the second discussing such issues as data dependency and control flow graphs, load balancing, synchronization, and indirect addressing. Chapter 4 gives additional general background including Amdahl's law, speed-up and scaled speed-up, and Hockney's $n_{1/2}$ and r_∞ parameters with examples of these for various machines.

Chapter 5 begins the main subject matter with a treatment of various forms of LU decomposition for dense matrices, as well as related topics such as LDL^T decomposition for indefinite matrices and QR decomposition. The main theme is the necessity of proper data management on machines with hierarchical memories (registers, cache, etc.). This leads in a natural way, and through the use of performance examples, to the desirability of blocked forms of the decompositions in which operations are performed on submatrices as much as possible. Three block organizations of LU decomposition are considered and their characteristics compared. Throughout, there is discussion of the role of the BLAS (vector operations), level-2 BLAS (matrix-vector operations), and level-3 BLAS (matrix-matrix operations). Overall, this chapter gives a good background and motivation for the development of LAPACK, the project led by the first author to replace LINPACK and EISPACK by a collection of subprograms suitable for parallel and vector machines.