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BOOK REVIEW

Annual Review of Numerical Fluid Mechanics and Heat Transfer, Vol. 2 (Edited by C. L. Tien and T. C. Chawla). Hemisphere, Washington, D.C. (1989). xi + 399 pp. ISBN 0-89116-740-4. ISSN 0892-6883.

Modern computers, in particular parallel and vector supercomputers, are dramatically changing the ways many problems are solved and insights are gained in the areas of fluid mechanics and heat transfer. From primarily having been a tool for refined analysis of model problems, large-scale computing now routinely addresses very practical problems of great complexity in terms of geometry, number of physical/chemical processes included etc. There is a matching evolution in numerical methods, both in their focus (towards solutions in complicated geometries in high dimensions etc.) as well as in their efficiency and robustness. These changes make it difficult for all but a limited number of researchers to stay in the forefront. This book is well-researched and presents carefully surveyed backgrounds, formulations and solutions for a variety of "typical" problems (and provides many references). In spite of the large number of authors, the style of writing is very consistent and uniformly clear.

The areas discussed in the first seven chapters were chosen to give a broad background (while still not avoiding intricacies typical of many problems). These chapters describe:

1. Radiation from turbulent diffusion flames.
2. Some recent developments and trends in finite element computational natural convection.
3. Thermal stratification modeling for oceans and lakes.
4. Numerical flow and heat transfer under impinging jets.
5. Some numerical aspects of cavitation bubble collapse.
6. Boundary elements in viscous fluid mechanics and rheology.
7. Computation of confined vortical flows.

Each of these chapters starts with a general introduction to the area and gives a clear formulation of the problem to be solved (governing equations, lists of all variables to be used throughout the chapter etc.). A solution method is then described and examples of results are given. The chapters terminate with a discussion and general recommendations.

The eighth and final chapter of this book, however, seems strangely out of place. It describes a method for solving certain systems of equations which can arise in the context of hyperbolic and parabolic partial differential equations. Not only has this particular method been little used since it was proposed in 1983, its complexity is such that the whole 107-page description here is limited to 1-D implementations and test cases.

To conclude: the first seven chapters of this book (about 280 pages) provide a variety of examples of realistic problems and their computational solutions. It should be helpful to novices and experts alike, both to stay up-to-date with computational procedures and to serve as a background reference when formulating and solving other problems in the general area of fluid mechanics and heat transfer.

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