Pergamon

Int. J. Heat Mass Transfer. Vol. 37, No. 13, p. 1971, 1994
Elsevier Science Ltd
Printed in Great Britain

BOOK REVIEW

S. KOTAKE and K. HIJIKATA, **Transport Processes in Engineering Series, Volume 3: Numerical Simulations of Heat Transfer and Fluid Flow on a Personal Computer.** Elsevier Science Publishers B.V., P.O. Box 1991, 1000 BZ Amsterdam, The Netherlands, Elsevier Science Publishers, Co. Inc., P. O. Box 882, Madison Square Station, NY 10159, U.S.A. Hardbound: US $209.50/Dfl 335.00, ISBN 0-444-89811-5. Paperback: US $94.00/Dfl. 150.00, ISBN 0-444-89812-3.

THIS BOOK is the English translation of the original Japanese edition published in 1988. The opportunity has been taken to incorporate quite extensive revisions and improvements in close collaboration with the authors. Two floppy disks storing complete sets of the source of simulation codes used in the programs developed in the text are attached; one is an IBM PC compatible version (for use with Q BASIC) and the other an Apple Mackintosh version.

The theme of the book which will be of interest to practical engineers is the transfer of heat during given fluid flows. The authors' stated aim is to give a catalogue of some of the techniques of numerical simulation of heat transfer and fluid flow in a way that can be easily understood and modified by a mathematically well-informed engineer. In this they have largely succeeded. Their description of the fundamental concepts and development of the necessary basic equations on which the theory rests is written with clarity.

Chapter 1 is devoted to the formation of the basic equations governing the situations which are of interest in Potential Flow, Stokes Flow, Boundary Layer Flow, Developed Flow and Turbulent Flow. Some of the assumptions underlying various models related to turbulent flow are also discussed. In Chapter 2 the foundations of the numerical solutions are developed. Representations are included of the basic equations for numerical simulation in terms of the primitive variable formulation, the stream function–vorticity formulation and velocity vector potential–vorticity formulation. An outline is then given of the basic principles involved in the following numerical approaches; the finite difference method, the finite element method, the boundary element method and difference approximations. The boundary conditions appropriate for a variety of flow fields are finally described in this chapter.

The remaining ten chapters present a series of case studies broadly divided into two areas: heat conduction in both steady and transient states, and flow around bodies in enclosed spaces. Typically a chapter begins with the development of the underlying model equations followed by their numerical descriptions. The constituent routines of the computer program are then given together with a sample illustration of the calculation output. Finally, for those interested in undertaking modifications, a full program listing is provided. A slight criticism that could perhaps be made is that the authors do not address the difficulties that might be encountered by a user in interacting with the program in, for example, deciding what input should be provided. However, this is countered by the simple menu-driven approach used by the programmers. The user only ever has to decide amongst a selection of prescribed boundary conditions and input sample numerical values in response to appropriate prompts.

The text finishes with a selection of exercises related to Chapters 3–12, a list of symbols that are used throughout and a comprehensive subject index.

A lot of material has been included in the space available and written in a style that will enlighten both the expert and newcomer to this field. This book should be useful to both students and industrial practitioners involved in solving numerically fluid flow and heat transfer problems. The numerical experiments will allow the reader to build a sufficient foundation for overviewing more complicated engineering fields.

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