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Journal of Sound and Vibration 287 (2005) 650
JOURNAL OF SOUND AND VIBRATION
www.elsevier.com/locate/jsvi

Book Review

M. Feistauer, J. Felcman, I. Straskbraba, Mathematical and Computational Methods for Compressible Flow, Oxford Science Publication, Oxford, ISBN 0198505884, 2004 (535pp.)

The growth of computer power allows the solution of complex problems related to compressible flow, which is an important class of problems in modern day CFD. Over the last 15 years or so, many review works on CFD have been published. This book concerns both mathematical and numerical methods for compressible flow. In particular, it provides a clear cut introduction as well as in depth treatment of modern numerical methods in CFD.

This book is organised in two parts. The first part consists of Chapters 1 and 2, and is mainly devoted to theoretical discussions and results. Chapter 1 concerns fundamental physical concepts and theoretical results in gas dynamics. Chapter 2 describes the basic mathematical theory of compressible flow using the inviscid Euler equations and the viscous Navier–Stokes equations. Existence and uniqueness results are also included. The second part consists of modern numerical methods for the Euler and Navier–Stokes equations. Chapter 3 is devoted entirely to the finite volume method for the numerical solution of the Euler equations and covers fundamental concepts such as order of numerical schemes, stability and high-order schemes. The finite volume method is illustrated for 1-D as well as multidimensional Euler equations. Chapter 4 covers the theory of the finite element method and its application to compressible flow. A section is devoted to the combined finite volume–finite element method, and its background theory is also included.

Throughout the book numerous examples have been included to demonstrate the numerical methods. The book provides a good insight into the numerical schemes, theoretical analysis, and validation of test problems. It is a very useful reference for applied mathematicians, numerical analysts, and practice engineers. It is also an important reference for postgraduate researchers in the field of scientific computing and CFD.

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doi:10.1016/j.jsv.2005.05.014