covers a range of topics related to the addition of auxiliary systems, such as tuned absorbers and dampers. The author begins this discussion with a general definition of the effectiveness of an auxiliary system, and uses it to derive quite a general result expressed in terms of the dynamic stiffnesses of the component subsystems. Specific auxiliary systems considered include masses, springs, dampers, single frequency tuned dampers, wide-band tuned dampers, and torsional vibration absorbers. Optimization issues are addressed, as are the application to multiple degree-of-freedom systems. Practical matters such as rattle space and fatigue are also discussed.

The third technique covered is that of adding damping. Here the focus is on determining a system's inherent damping and suggested means of increasing structural damping with distributed elements. A discussion of inherent damping is presented, with appropriate emphasis on joint damping and acoustic radiation, topics that are typically not given sufficient treatment. Detailed results for unconstrained and constrained layer damping are provided, including suggested design procedures. Boundary damping and friction elements are also briefly covered. Resilient isolation is the final general category of techniques described, wherein the objective is to design subsystems that fit between the structure of interest and the source of excitation. The standard base isolation topics are covered for both translational and rocking motions of machines, including a discussion of optimizing isolators for the case of a general rigid machine with six degrees of freedom. Two-stage isolators, in which the mass of the isolator is included in the design, are considered, as is the design of isolators placed between two flexible structures. The book concludes with a short chapter that demonstrates some examples of combined methods.

As in-depth reading of some selected topics revealed appropriate levels of technical detail and useful, accurate information, with one minor exception. When discussing centrifugal pendulum vibration absorbers (used for neutralizing torsional vibration), the author indicates that the tautochronic absorber configuration is complicated and expensive when compared with the standard absorber, whereas in actual implementations it is virtually identical in terms of cost and complexity.

A book of this scope must inevitably omit some relevant topics, and each reader can make his or her own list of important missing subjects. However, the author has done an outstanding job of organizing the material into a coherent volume that will serve as a valuable resource to anyone working in the field of mechanical vibration.

S. W. SHAW

APPLICATIONS OF NONSTANDARD FINITE DIFFERENCE SCHEMES, 2000, (R. E. Mickens, editor). World Scientific Publishing Co., xii + 250pp. Price £30.00. ISBN 981-02-4133 X.

This book contains five chapters written by different people on topics related to non-standard finite difference (NSFD) schemes. These schemes are introduced in the first chapter (by Mickens) in the context of ordinary differential equations from initial-value problems whose general solutions are known. A "difference scheme" is constructed in the same pattern as a standard finite difference scheme but with the time step replaced by a formula and non-linear terms replaced by products such that the resulting difference equation is linear in the unknown forward value. The difference scheme is made such that its solution is the same as the exact solution of the differential equation for any value of the time step. Large time steps can thus be taken without affecting the accuracy. This approach is extended to types of partial differential equations with known solutions which are also suitable for the construction of NSFD schemes.

From these results tentative rules are formulated to give guidance for the construction of NSFD schemes for equations which do not known solutions. Eleven examples are given to show the power and the weaknesses of the NSFD approach. There is also some discussion about possible future directions for the application of the method.

Chapter 2 (by Kojouharov and Chen) discusses the application of NSFD methods to advection–diffusion–reaction equations particularly with regard to advection-dominated situations. Euler–Lagrange methods are used such that the advection–reaction part of the equation is treated with an "exact" time-stepping scheme and the diffusion term by standard finite difference or finite element methods. Numerical results are given comparing NSFD methods with other numerical methods showing that the NSFD schemes can propagate sharp fronts accurately even when the advection–reaction effects are dominant.

Chapter 3 (by J. B. Cole) uses NSFD methods to construct numerical solutions to the wave equation and Maxwell's equations which are more accurate than those given by standard finite differences. In two and three dimensions the computational molecules are modified and the physical significance of this is discussed. Cole emphasizes the importance of considering the physical nature of the problem before embarking on its numerical solution.

Chapter 4 (by Al-Kahby, Dannan and Elaydi) gives NSFD methods for the solution of Lotka–Volterra-type systems of ordinary differential equations. The object here is to look for numerical schemes which produce difference equations with solutions which resemble the dynamics of the differential equations. They are called "dynamically consistent" if they have the same qualitative behaviour in bifurcation, stability, etc. The authors discuss the different approaches needed for asymptotically stable versus periodic systems.

Chapter 5 (by Gander and Meyer-Spasche) has a more general approach to obtain difference schemes which preserve the important properties of the differential equation. They start by showing that classical numerical schemes can produce the exact solution for particular classes of problem. They then examine how much of the dynamics of a problem a scheme can preserve if it is not exact. A detailed discussion of the effects of using Runge–Kutta schemes is given. This is followed by answers to the question "Given a differential equation which schemes are exact for it?" and further discussion of schemes which preserve the underlying structure of the problem. With reference to the footnote on p. 229, this reviewer is of the opinion that P. Nicolson's name should always be spelt correctly in any reference to the Crank–Nicolson scheme, irrespective of what Richtmyer and Morton chose to do.

This is an interesting book and it is unfortunate that it is spoilt by what appears to be too hasty production and lack of proper checks and editing. There are a number of errors, presumably "typos" and Figure 2 on p. 126 is clearly not the Figure 2 described on p. 127. The equation numbering in Chapter 4 is not consistent with the equation references in the text. But the worst thing from the reader's point of view is the confusion over the references. In Chapter 2, the references in the text are to numbers, [11, 12] and so on. The references at the end of the chapter are in alphabetical order with no numbers. A suspicion that they are probably not correlated is confirmed on p. 62 by "Mickens [30]", whereas the 30th reference is to Morton. Also on p. 56 there are references to [36] and [37], whereas there are only 35 references at the end of this chapter.

In Chapter 4, there are references in the text to numbers, some identified with authors. At the end of the chapter there are 24 references, in alphabetical order, with no numbers. So the reference on p. 156 to Mickens [29] remains a mystery.

In Chapter 5, there are references to numbers in the text and the references at the end of the chapter are in alphabetical order with no numbers. A reference on p. 230 is to "[35, Chap. 8]", but the 35th reference is not a book. Does the reference on p. 129 to "Twizell *et al.*

[36] refer to the 35th reference: Wang, Twizell and Price? The reader should not have to be distracted by these considerations.

The Harvard system is the best way of referencing. In the text the reference is given as "Martin (1984)" or "(Martin, 1984)", depending on the context, and the references are given in alphabetical order at the end of the text. With this system the reader sees immediately the source and the date without having to be perpetually leafing forward to the end of the chapter or book.

Perhaps the World Scientific Publishers can be persuaded to instruct their authors to adopt the Harvard System.

W. L. Wood

BOUNDARY ELEMENT ACOUSTICS: FUNDAMENTALS AND COMPUTER CODES, 2000, T. W. Wu, editor. Southampton: WIT Press. iv +238 pp + CD-ROM. Price £95.00, US$ 149.00. ISBN 1-85312-570-9.

1. BACKGROUND

There is a large body of research literature dealing with the calculation of acoustic fields by the boundary element method including many variations to the theory. Attempting to learn the principles of acoustic boundary elements from the research literature alone leads to an overload of information, much of it intensely mathematical. Although, at first sight, there are a number of books dealing with the application of boundary element methods to acoustics, many of these constitute further research literature, being the proceedings of conferences. This book aims to fill the role of a tutorial text. The early chapters are written by the editor and aim to fulfill the need for a straightforward tutorial on the boundary element method for acoustic problems. This tutorial is based on the direct formulation and the CHIEF method for overcoming the well-known non-uniqueness problem. Later chapters deal with more advanced topics, but still in a style that is biased towards teaching about the methods rather than reporting the research work. The book offers computer codes to back up the subject of most of the chapters of the book so that readers can examine it and try out example problems. The intended readership therefore comprises graduate students and researchers as well as engineers.

2. CONTENTS

The book starts with a short chapter, written by Seybert of the University of Kentucky, which introduces the wave equation for linear acoustics and sets out some of the basic terms of acoustics such as intensity, power, radiation efficiency and even, very briefly, the decibel, band analysis and A-weighting. This chapter is only eight pages long, but adequately introduces the terms of acoustics needed in the rest of the book.

Chapters 2–5, out of the total of nine, are written by the editor himself, and introduce the theory of the boundary element method. Chapter 2 derives the Kirchhoff–Helmholtz integral equation and its fundamental solution, or the Green function, and produces the direct formulation by collocation at the boundary. A number of issues that will be familiar to those who already know a little about the boundary element method are discussed such as the differences between the interior and exterior problems, the singular-value term at the