Conclusion

As demonstrated by the applications, the DQ method is a practical technique for the free vibration and buckling analyses of skew plates. The DQ solutions are in close agreement with those of previous researchers. Since the DQ method offers a very compact procedure and gives quite accurate results, it appears to be more attractive than the classical Ritz method. For a given grid, the weighting coefficients need only be calculated once, which results in further computational efficiency of the method.

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Book Reviews

Supercomputing in Fluid Flow

T. K. S. Murthy and C. A. Brebbia (eds.), Computational Mechanics Publications, Boston, and Elsevier Science Publishers (UK) Ltd., New York, 1993, 351 pp., $180.00.

This book contains the written versions of the all-invited papers presented at the International Seminar on Supercomputing in Fluid Flow, held Oct. 3-5, 1989. While there is no lack of gatherings calling themselves international, this one has some right to claim this title since the editors succeeded in bringing together authors from nine countries. These authors contributed 14 papers (or chapters, as they are called in the book) on the development of Euler and Navier-Stokes solvers and/or their application to a variety of flow problems.

The first chapter, by R. A. Shapiro, gives a flavor of what it takes to exploit the computing power of relatively inexpensive, massively parallel processing computers through a rather detailed description of the tailoring of a standard finite-element method for the two-dimensional Euler equations to a CM-2 computer. Shapiro's paper is complemented by a chapter contributed by W. Gentzsch, who formulates some general guidelines for restructuring computational fluid dynamics (CFD) algorithms for vector and parallel computers. A third paper that emphasizes programming issues is by P. Guillen and M. Dormieux, who describe a software package that solves the three-dimensional Euler equations for ideal or real gases on block-structured grids using a wide array of different spatial and temporal discretization concepts; some of their first results are included.

Readers more interested in computational methods rather than their programming might enjoy E. Dick's review of his polynomial flux-difference splitting concept, which applies to both the compressible and the incompressible Euler equations. Another article, by J. Häuser, A. Vinckier, and S. Zemsch, describes in great detail the governing equations for hypersonic flow with non-equilibrium effects and a related computational method. As a note of caution, let it be mentioned that while Dick shows at least some results for two-dimensional flows of low to modest complexity, Häuser, Vinckier, and Zemsch have only a grid to show for computing inviscid flow over a Hermes configuration.

Three chapters deal with applications of CFD in the automotive industry. R. Himeno, K. Fujitani, and M. Takagi show results for unsteady flow over quite complete automobile geometries. T. Kobayashi, Y. Morinishi, and N. Tanaguchi report some large-eddy-simulations for flows about more generic automobile shapes. A. Taklanti presents results for unsteady flows in manifolds and in the combustion chambers of piston engines.

The simulation of three-dimensional viscous flows with and without separation is the topic of four of the entries. A. Rizzi's paper focuses on the simulation of transonic flows over large-aspect ratio wings using a Navier-Stokes solver based on his well-known finite-volume method with Runge-Kutta time-stepping for the Euler equations. Using a related computational method, D. Schwamborn, A. Hilgenstock, H. Zimmermann, and W. Kordulla build on Rizzi's results as they include simulations of massively separated flows over slender configurations. The third paper in this category, by G. B. Deng, Y. Lecointe, J. Piquet, P. Queutey, and M. Visonneau, combines theory and numerical experiments in an unusual way in the analyses of incompressible viscous flow over a tanker hull and over a prolate spheroid. Finally, H. J. Haussling, J. J. Gorski, and R. M. Coleman report on applications of a multi-block finite-volume method for the incompressible Navier-Stokes equations that allows choosing between central differencing and upwinding of the inviscid fluxes as well as between two turbulence models. Their results show a quite impressive agreement between computed and measured surface pressure for several generic submersibles.

In the remaining two chapters, K. Sørli demonstrates how a Navier-Stokes method was used in a parameter study for a centrifuge used in water purification, and S. C. Lee and D. Chen report some preliminary, albeit encouraging, results they obtained in direct simulations of transition over low-speed airfoils.

The weakest part of this volume of proceedings is its editing, which appears to have been limited to replacing American with British spelling. The book is riddled with typographical errors, and several figures are undecipherable. It also would have helped if the editors had lent their support to some of the contributors, especially those whose native tongue is obviously not English, to improve the readability of their articles.

Researchers in the subtopics mentioned previously might find something of interest in this book, but in view of the poor editing job and the steep price tag, they should try to borrow rather than buy this book.

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The Behavior of Shells Composed of Isotropic and Composite Materials

J. R. Vinson, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1993, xvii + 545 pp., $199.00.

This treatise on elastic shells is intended to be a text appropriate for a graduate course or as a self-study reference for practicing engineers. It is written in two parts: Part I (13 chapters) covers shells constructed of isotropic materials, and Part II (11 chapters) covers shells constructed of composite materials and sandwich-construction shells.

Chapter I covers the necessary mathematical preliminaries, and in Chapter 2 the governing equations for thin shells are developed. Chapters 3-7 focus on circular cylindrical shells, shells of revolution (axisymmetric loading), conical shells, spherical shells, and shells of other shapes. Chapters 8-11 treat thermoelastic effects, adhesive joints, energy methods, buckling, and vibration, respectively, all for thin isotropic shells. Part I concludes with a chapter on very thick walled cylindrical shells.

Part II begins with a chapter on anisotropic elasticity, laminate theory, hygrothermal effects, viscoelasticity, and piezoelectric effects. Chapters 15-19 cover composite shells of cylindrical, conical, shell-of-revolution, ellipsoidal/spherical, and paraboloidal geometries. Chapters 20-22 treat buckling, vibration and impact, and energy methods. The last two chapters cover very thick walled composite shells and shells of sandwich construction.

This book is full of equations, but worked-out example problems are sparse. The figures are adequate. Each chapter has an ample number of references to the literature. Some chapters also have additional bibliography and exercises. Both SI and English units are used throughout.

This book is the most modern text to appear on the subject of elastic shells and is highly recommended to structural design engineers, structural analysts, composites specialists, and research engineers involved with shell structures.

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