

## BOOK REVIEW

NUMERICAL METHODS IN TRANSIENT AND COUPLED PROBLEMS: R. W. Lewis, E. Hinton, P. Bettess, B. A. Schreffler (eds.), Wiley, Chichester, 1987, Price: £49.50

This book is from the Wiley series in 'Numerical Methods in Engineering' and it may be viewed as the sequel to the text *Numerical Methods in Coupled Systems* which was published in the same series in 1984. This new text has its origins in the International Conference on 'Numerical Methods for Coupled and Transient Problems' held in Venice in July 1984. The editors have carefully selected a set of important topics from this conference and have invited prominent researchers to expound on these topics without the usual length constraint associated with conference papers.

This new text differs from its predecessor in that both transient and coupled problems are included. Consequently the domain of practical applications is extremely vast, indeed almost all-embracing. This is aptly illustrated by the editors in their preface, in which a full six pages are required in order to give a very brief overview of the topics presented in each of the fourteen chapters.

Here, for this review, space does not permit such a chapter by chapter description but the essence can be divined from the following list of chapter headings:

1. Mesh refinement and redistribution.
2. An efficient analysis of pollutant migration through soil.
3. Direct general finite difference techniques for elliptic problems defined in bounded and unbounded two-dimensional domains.
4. Solution strategies for elastic and inelastic contact problems of solids.
5. Recent developments in finite difference methods for the computation of transient flows.
6. Numerical analysis of rain effects on aircraft performance.
7. Solution techniques for boundary integral matrices.
8. Some transient and coupled problems—a state-of-the-art review.
9. The prediction of instabilities using bifurcation theory.
10. Long-time calculations and non-linear maps.
11. Modelling of coupled thermo-elastoplastic-hydraulic response of clays subjected to nuclear waste heat.
12. Numerical modelling of free-surface flows.
13. Parallel computations for mixed-time integrations.
14. Non-linear transient dynamic analysis of reinforced concrete structures using a three-dimensional approach.

The classes of numerical methods encountered in the text include finite element, finite difference, boundary integral, analytical (transforms), among others: the editors are clearly not bigots!

Many of the chapters are 'problem-directed', that is they deal with a fairly specific class of complex engineering problem and describe innovative, novel numerical algorithms and techniques which are germane to the solution. The authors of a few of the chapters, however, take a more general approach giving a state-of-the-art review. Chapter 8, for example, distils the knowledge from 89 references to give a clear, concise introduction to the fundamental techniques for the solution of transient structural dynamics problems.

The book presents methods and applications which are clearly at the leading edge of numerical methods in engineering: it will be welcomed by researchers in this rapidly expanding subject area.

JOHN S. CAMPBELL,  
*Dept. of Civil Engineering,*  
*University College,*  
*Cork, Ireland*