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INTERNATIONAL CENTRE FOR MECHANICAL SCIENCES

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BOUNDARY ELEMENT ADVANCES IN SOLID MECHANICS

EDITED BY

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This volume contains 163 illustrations

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PREFACE

This volume presents and discusses recent advances in Boundary Element Methods (BEM) and their solid mechanics applications in those areas where these numerical methods prove to be the ideal solution tool. The aim is to illustrate these methods in their most recent forms developed during the last five to ten years and demonstrate their advantages when solving a wide range of solid mechanics problems encountered in many branches of engineering, such as civil, mechanical or aeronautical engineering.

The volume consists of six chapters, which comprise in an expanded and improved form the lecture notes offered during the CISM Advanced School on 'Recent Advances on Boundary Element Methods and Their Solid Mechanics Applications', Udine, June 2-6 , 2001. These chapters reflect, in general, the state-of-the-art in the field but their emphasis is on research results, which have been mainly developed by the authors, who are themselves specialists in the field of BEM.

The specific solid mechanics areas treated in the six chapters of the book are those which have received special attention by researchers in the field during the last five to ten years. These areas include

- i) Applications to large order static and dynamic problems of structural system analysis, including large three-dimensional systems, plates and shells and soil-structure interaction*
- ii) Efficient treatment of materially and geometrically nonlinear static and dynamic problems, including inelastic material behaviour, unilateral contact analysis and inelastic fracture mechanics*
- iii) Special formulations and accurate and efficient numerical treatment of BEM, including symmetric formulations and computation of singular and hypersingular integrals*
- iv) Application to various structural shape optimization and inverse or identification problems, structural optimum design and nondestructive evaluation techniques.*

More specifically, chapter one deals with dynamic analysis of large order three-dimensional structures and structural systems exhibiting elastic or inelastic material behaviour, chapter two presents methods for materially nonlinear static and dynamic analysis, while chapters three and four focus on fracture mechanics problems and their solution by hypersingular and mixed BEMs or the symmetric Galerkin BEM, respectively. Finally, classical and unilateral contact analysis in static and dynamic problems is taken up in chapter five, while sensitivity analysis, optimization of structures and inverse or identification problems are considered in chapter six.

Closing, the editors of this volume would like to express their gratitude to the Scientific Council of the CISM for organizing the course and giving them the opportunity to publish its lectures in the present book form, to the authors of the chapters and to all participants of the course for their active presence and interaction.

*Dimitri Beskos
Giulio Maier*

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