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Preface

This volume comprises the invited lectures presented at The Third International Conference on Engineering Computational Technology (ECT 2002). The conference was held concurrently with The Sixth International Conference on Computational Structures Technology (CST 2002). Both conferences were organised in conjuction with, and held at, the Faculty of Civil Engineering, Czech Technical University in Prague, Czech Republic, from 4 to 6 September 2002. These conferences are part of the CST–ECT series that commenced in 1991.

The First Computational Structures Technology Conference was held in Edinburgh in 1991. From pure structural engineering the theme of this conference was expanded in The First Engineering Computational Technology Conference held in Edinburgh in 1998. The additional themes of the ECT series include: geotechnical engineering, fluid flow problems; electromagnetic problems; mechanical engineering, aeronautics and aerospace engineering. The themes also cover all aspects of computational technology including computing hardware and software developments.

Hardware and software developments provide engineers with opportunities to develop new algorthims and techniques which could not be implemented using old technology. In the first chapter of this book, Professor Noor reviews recent developments in computer technology and shows us new and emerging technologies for engineering analysis and design. Recent developments discussed include virtual reality, distributed collaboration and tele-immersion. Among the emerging technologies reviewed are grid, pervasive and autonomic computing techniques.

One of the recent developments, virtual reality, is further discussed in Chapter 2 by Professor Thabet and his colleagues. Their review takes a detailed look at how virtual reality technology is contributing to construction engineering. In Chapter 3, Dr McCarthy reviews developments in knowledge-based systems (KBS) for the design of structural steelwork over the last twenty years concluding that their age is just begining!

In Chapter 4, Professor Armstrong's group look at integrating CAE concepts with CAD geometry. This technology is key to the efficient processing and simulation of many engineering problems. In Chapter 5, Professor Morgan and his colleagues describe techniques for finite element analysis of electromagnetic scattering problems. In Chapter 6, Professor Crouch reviews finite element techniques for nonlinear dynamic fluid-soil-structure interaction of reinforced concrete structures. Professor Meyer considers, in Chapter 7, projection techniques used within the preconditioned conjugate gradient method for solving contact problems with hanging and contact

nodes.

In Chapter 8, Professors Nikishkov and Atluri describe a method of combining the Galerkin boundary element method and the finite element method for modelling crack growth. The alternating procedure is implemented using an object-oriented (O-O) code. In Chapter 9, Dr Jimack reviews domain decomposition techniques for parallel solution of partial differential equations using iterative solvers. The theme of parallel computing is also discussed in Chapter 10 by Professors Sotelino and Dere. Again, an object-oriented approach is used by the authors to develop the software for parallel and distributed finite element dynamic analysis. In Chapter 11, Professor Benim reviews techniques for the equilibrium Euler-Euler modelling of pulverized coal combustion.

In Chapter 12, Dr Zimmermann discusses how intelligent object-oriented techniques may be used to solve engineering problems. This chapter links themes that have also been discussed in Chapters 3 (KBS), 8 (O-O) and 10 (O-O).

We are grateful to the authors and co-authors of the invited lectures included in this volume. Their contribution both to the ECT 2002 conference and this book is greatly appreciated.

We are indebted to Professor A.K. Noor and J. Peters at the Center for Advanced Engineering Environments, Old Dominion University, NASA Langley Research Center, Hampton VA for the two computer generated images shown on the cover of this book.

Other papers presented at the conferences in 2002 are published as follows:

- *The Invited Lectures from CST 2002 are published in:* Computational Structures Technology, B.H.V. Topping and Z. Bittnar (Editors), Saxe-Coburg Publications, Stirling, Scotland, 2002.
- *The Contributed Papers from CST 2002 are published in:* Proceedings of the Sixth International Conference on Computational Structures Technology, B.H.V. Topping and Z. Bittnar (Editors), (Book of Abstracts and CD-ROM), Civil-Comp Press, Stirling, Scotland, 2002.
- *The Contributed Papers from ECT 2002 are published in:* Proceedings of the Third International Conference on Engineering Computational Technology, B.H. V. Topping and Z. Bittnar (Editors), Saxe-Coburg Publications, Stirling, Scotland, 2002.

These Conferences could not have been organised without the contribution of many who helped in their planning, organisation and execution. We are particularly grateful to Jelle Muylle who once again, so expertly guided the design of this volume of lectures. We are also grateful to the following staff and students of the Faculty of Civil Engineering at the Czech Technical University: Alexandra Kurfürstová, secretary of the Department of Structural Mechanics and PhD students Jitka Poděbradská, Richard Vondráček and Matěj Lepš.

Barry H.V. Topping and Zdeněk Bittnar