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Preface

This volume comprises the Invited Lectures presented at The Ninth International Conference on Civil and Structural Engineering Computing (Civil-Comp 2003), and The Seventh International Conference on The Application of Artificial Intelligence to Civil and Structural Engineering (AICivil-Comp 2003). Both conferences were held at Egmond-aan-Zee, The Netherlands from 2 to 4 September 2003. These conferences are part of the Civil-Comp Series series that commenced in 1983. This year is the twentieth anniversary of the first conference. The history of these conferences with an overview of the key developments in civil and structural engineering computing can be found in Chapter 1.

In 2001 the Civil-Comp conference was held just a week after the tragic events in New York and Washington. We were delighted that so many North American authors were still able to participate. Now, two years on, Professor Grierson reviews the design of buildings under abnormal loading in Chapter 2. This chapter includes the history of structures with disasterous failures, including those destroyed by the attacks on 11th September 2001. This review, and the new techniques for the analysis of progressive collapse described in Chapter 2, contribute to the need for new knowledge and experience in this important field.

In Chapter 3, Drs Chandra and Dhayanidhi discuss the use of design models for structural design. Today this involves the use of knowledge-based systems, databases, product models and network technology. This chapter also relates to object-oriented techniques and the use of data standards such as STEP. In the future, these technologies will enable increased cooperation between designers during product development.

In Chapter 4, Professor Samartin and his co-workers describe their research to verify the design of reinforcement in reinforced concrete membrane and shell structures. This work enables the design of reinforcement for structures not envisaged by the codes of practice. In Chapter 5 Professor Bursi and Mr Ferrario describe finite element models for simulating the seismic behaviour of frames consisting of steel-concrete composite beams. They propose further research to model the force-slip laws for shear connectors. Both these chapters describe projects in which computational methods provide for the understanding of complex design problems.

In Chapter 6, Dr Kwan describes a new method for the analysis of cable structures and compares it with the dynamic relaxation approach. Professor Marti describes the use of stochastic optimization methods in plastic design in Chapter 7. In Chapter 8, Drs Ribakov and Agranovich describe how parametric optimization may be used to optimize the weighting matrices used in a feedback control system for structures subject to earthquake loading. The chapter includes the results of the simulation of the control system for a six storey steel structure.

In Chapter 9, Professor Becker reviews the use of boundary element analysis for contact mechanics. The boundary element method is demonstrated as an effective tool for practical contact problems.

In Chapter 10, Professor Saka reviews techniques for the optimization of skeletal structures. The algorithms include sequential linear programming, unconstrained minimisation with penalty functions, non-linear programming techniques, optimality criteria based methods and genetic algorithms. This chapter provides a unique comparison of these methods.

Chapters 11 and 12 relate to geotechnical problems. The first, by Dr Augarde, describes numerical modelling techniques for soft-ground tunnelling. The introduction of more accurate clay models enables the simulation of modern tunnelling methods. This in turn enables the accurate modelling of the settlement of surface structures. The second, by Professor Le Houédec, describes the soil-interaction problem of modelling ground response under the action of dynamic loads. This research is of growing interest to researchers as high speed train transport increases.

I am grateful to the authors and co-authors of the invited lectures included in this volume. Their contribution both to the Civil-Comp conferences and this book is greatly appreciated.

Other papers presented at the conferences in 2003 are published as follows:

- *The Contributed Papers from Civil-Comp 2003 are published in:* Proceedings of The Ninth International Conference on Civil and Structural Engineering Computing, B.H.V. Topping (Editor), (Book of Abstracts and CD-ROM), Civil-Comp Press, Stirling, Scotland, 2003.
- *The Contributed Papers from AICivil-Comp 2003 are published in:* Proceedings of The Seventh International Conference on The Application of Artificial Intelligence to Civil and Structural Engineering, B.H.V. Topping (Editor), (Book of Abstracts and CD-ROM), Civil-Comp Press, Stirling, Scotland, 2003.

Twenty years provides scope for reflection and introspection. The technical aspects

of this are included in the first chapter of this book. On a personal note, I would like to take this opportunity to thank the many people who have helped in the Civil-Comp Conference Series. David Taffs of Ove Arup and Partners was an early supporter of the conferences. His encouragement did not waiver and was constant. He presented the first conference paper at the first Civil-Comp Conference and kindly gave us regular overviews of the computing activities of Arups, one of the largest organisations of its type in the world. I am particularly grateful for his kind support.

I would also like to thank those who took the time to provide encouragement for the vision I had in 1983 to create a series of conferences that would provide a framework for computing in civil and structural engineering as a discipline. One early motivation was to find common representation and solution methods from apparently disparate fields within the field of civil and structural engineering. Professor Andrew Templeman was one of the first to support and encourage this strategy. The late Professor Ernie Hinton was a constant supporter and source of encouragement. Professor Don Grierson was also influential in forming many of the conference themes that are still active today. Over the years, the conferences have been held at many locations. I have enjoyed them all; but the collaboration with Professor Michael Barnes, in 1989, to organise the conference at the City University, London, from which I graduated in 1975, is still fresh in my mind. In 1994, the first Civil-Comp conference to be held outside the UK, was held in Athens with the help of Professor Manolis Papadrakakis; The second, with the help of Dr János Sziveri, was held in Budapest in 1996. Both were memorable. The conferences in 2000 and 2002 in Leuven and Prague, organised in collaboration with Professor Guide De Roeck and Professor Zdenek Bittnar respectively, marked a renewed interest in the Computational Structures Technology series.

The organisation of these conferences led to editorial collaboration with Professor A.K. Noor (Computing Systems in Engineering now Advances in Engineering Software), Professeor R. Sack (Structural Engineering Review) and Professor K.J. Bathe (Computers and Structures). Their collaboration was both stimulating and encouraging.

Of course, I am very much aware that many authors and participants attend these conferences year after year. I can only hope that they have enjoyed the conferences as much as I have and that they found as much of technical and scientific merit over the years.

Finally, I must thank my postgraduate students many of whom not only wrote papers for the conferences but also helped before, during and after the meetings. Those who helped included: Majid Abu Kassim, Alex Wong, Erik Moncrieff, Bimal Kumar, James Milne, Asad Khan, Janet Wilson, Janos Sziveri, Ardeshir Bahreininejad, Joao Leite, Biao Cheng, Colin Seale, Peter Iványi, Jelle Muylle, Roman Putanowicz, János Nezo and Renata Oliała. I would particularly like to thank János Sziveri

and Jelle Muylle without whom the conferences would have faultered long ago. I wish to record my gratitude to the past and present members of the Civil-Comp staff who helped in so many ways over the years: Maisie Sales, Szandra Koves, Rosemary Brodie, Evelyn Armitt and Judy Tait.

Barry H.V. Topping