Proceedings of the
Ninth International Conference on
Civil and Structural Engineering Computing

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Edited by: B.H.V. Topping

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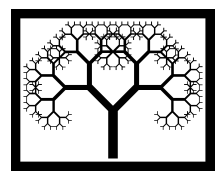

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Cover Image: The J.C.J. Van Speyk lighthouse at Egmond-aan-Zee was built in 1833-34. It was redesigned in 1838-41 and dedicated to maritime hero Lieutenant Van Speyk, who blew up his ship including himself in 1831 to escape from the hands of Belgian rebels in Antwerp harbour. It is still a working lighthouse guarding the North Sea. (International Navigation Aid number B0842. Position: 52 37.3N 4 37.6E. Character: Iso.W.R. 10s. Specifics: W. 010-175, R. -188, obsc. -010. Range: W. 18nm (45000cd), R. 14 nm (11000cd). Light elevation: 37m. Structure height 28m.)

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Contents

Preface

This volume comprises the extended abstracts of contributed papers presented at The Ninth International Conference on Civil and Structural Engineering Computing (Civil-Comp 2003). The full papers from the conference are available on the accompanying CD-ROM.

The conference was held concurrently with 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 that commenced in 1983. This conference, held on the 20th anniversary of the first Civil-Comp Conference, demonstrates that even after twenty years many of the original domains of the 1983 conference are still active research themes, although the technology is now at a state of development that we could only dream about in 1983. The topics included in these Proceedings are:

- Internet Applications
- Software Developments and Applications
- Construction Engineering: Design, Control and Management
- Structural Analysis and Structural Re-Analysis
- Chaos
- Boundary and Finite Element Methods: Theory and Methods
- Modelling and Finite Element Mesh Generation
- Solution Methods for Large Scale Problems
- Finite Element Studies
- Analysis of Plates
- Computer Aided Design and Analysis of Steel Structures (special session organised by M. Iványi)
- Reinforced Concrete Modelling and Analysis
- Reinforced Concrete Structures: Analysis and Design
- Materials Modelling
- Static and Dynamic Analysis of Steel and Composite Structures (special session

organised by P.C.G. da S. Vellasco and J.G.S. da Silva)

- Vibration Engineering
- Behaviour of Structures for Dynamic and Moving Loads (special session organised by D. Le Houédec and L. Frýba)
- Bridge, Railway and Road Engineering: Dynamics and Modelling
- Computational Techniques for Composite Materials (special session organised by A. Riccio)
- Analysis of Masonry Structures
- Seismic Analysis and Design
- Active and Passive Control of Structures
- Structural Identification and Damage Detection
- Structural Reliability: Analysis and Design
- Water Engineering
- Geotechnical Engineering
- Structural Optimisation
- Parallel and Distributed Computations
- Education

I should like to thank all the authors and co-authors of the papers included in this volume of proceedings. I am especially grateful to those who took the time and made the effort to participate at Egmond-aan-Zee.

Finally, I should like to thank the members of the Conference Editorial Board for their help before and during the conference: Professor H. Adeli, USA; Dr A.M. Alsugair, Saudi Arabia; Dr A.J. Aref, USA; Dr C.E. Augarde, England; Professor A.N. Baldwin, England; Professor C.C. Baniotopoulos, Greece; Professor M.R. Barnes, England; Dr J. Baugh, USA; Professor A.A. Becker, England; Dr D.W. Begg, England; Professor A. Benjeddou, France; Dr F.A. Branco, Portugal; Dr J. Bull, England; Professor O. Bursi, Italy; Dr F. Cai, Japan; Dr R. Carneiro-Barros, Portugal; Dr J.M.A. Cesar de Sa, Portugal; Dr S. Chandra, India; Professor Y.K. Chow, Singapore; Professor G. Cooper, England; Professor G. De Roeck, Belgium; Professor G. Degrande, Belgium; Professor M.C. Deo, India; Professor J. Ermopoulos, Greece; Dr W. Ferguson, Scotland; Dr M.A. Fischer, USA; Professor L. Frýba, Czech Republic; Dr M. Fuchs, Israel; Dr H. Furuta, Japan; Dr P. Gardner, England; Professor D. Grierson, Canada; Dr R.M. Guedes, Portugal; Dr M.N.S. Hadi, Australia; Professor P. Hajela, USA; Dr M. Hirokane, Japan; Professor G. Hofstetter, Austria; Dr S.H. Hsieh, Taiwan; Dr D.C.K. Huat, Singapore; Professor M. Iványi, Hungary; Dr P. Iványi, Scotland; Dr B.A. Izzuddin, England; Dr P. Jayachandran, USA; Dr D.S. Jeng, Australia; Dr E. Kameshki, Bahrain; Dr M. Kaminski, Poland; Professor A. Kaveh, Iran; Dr T. Kerh, Taiwan; Dr E. Kita, Japan; Professor S. Kmet, Slovakia; Dr H.G. Kwak, Korea; Dr A.K.H. Kwan, Hong Kong; Dr A.S.K. Kwan, Wales; Professor D. Le Houédec,

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

- *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.
- *The Invited Lectures from Civil-Comp 2003 and AICivil-Comp 2003 are published in:* Progress in Civil and Structural Engineering Computing, B.H.V. Topping, (Editor), Saxe-Coburg Publications, Stirling, Scotland, 2003.

These Conferences could not have been organised without the contribution of many who helped in their planning, organisation and execution. I am particularly grateful to Jelle Muylle, Judy Tait and Peter Iványi.

Barry H.V. Topping