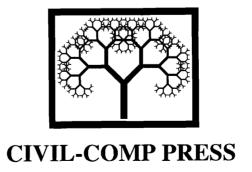
DEVELOPMENTS IN COMPUTER AIDED DESIGN AND MODELLING FOR CIVIL ENGINEERING

DEVELOPMENTS IN COMPUTER AIDED DESIGN AND MODELLING FOR CIVIL ENGINEERING

Edited by B.H.V. Topping



CIVIL-COMP PRESS 10 Saxe-Coburg Place Edinburgh, EH3 5BR, UK

© 1995, Civil-Comp Limited

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

ISBN 0-948749-32-6

Printed in the Scottish Borders by MEIGLE PRINTERS LIMITED Galashiels, Scotland

CONTENTS

1 REPRESENTATION AND PROCESSING

1.1 AN INTELLIGENT SYMBOLIC OBJECT FOR DECISION MAKING PROCEDURES, P. Bomme and Th. Zimmermann, Laboratory of Structural and Continuum Mechanics, Swiss Federal Institute of Technology, Lausanne, Switzerland
1.2 COMPUTER INTERPRETION OF PROCESS AND INSTRUMENTATION DRAWINGS, C. Howie, J. Kunz, T. Binford, T. Chen and K.H. Law, Stanford University, Stanford, USA
2 CASE-BASED REASONING IN MODELLING AND DESIGN
2.1 HARNESSING EXPERIENCE IN THE SAFESA APPROACH, M.J.H. Fox, Nuclear Electric plc, Berkeley Technology Centre, Glos, UK
2.2 CASE-BASED DESIGN APPROACH FOR INTEGRATION OF DESIGN AND ESTIMATING, S. Perera*, I. Watson# and M. Alshawi#, *Department of Building Economics, University of Moratuwa, Moratuwa, Sri Lanka, #Department of Surveying, University of Salford, Salford, UK29
3 INTEGRATION OF KNOWLEDGE-BASED SYSTEMS WITH DATA BASES FOR DESIGN
3.1 A COMPUTER INTEGRATED SYSTEM FOR CRANES SELECTION, M. Alhussein, S. Alkass and O. Moselhi, Centre for Building Studies, Concordia University, Montreal, Canada
3.2 GENSYM: AN INTELLIGENT OBJECT-ORIENTED DATABASE FOR MAINTENANCE PLANNING OF ENGINEERED ARTEFACTS, I. Watson, University of Salford, Department of Surveying, Salford, UK
4 PROJECT PLANNING, MANAGEMENT AND DESIGN
4.1 GENERATING ALTERNATIVE SCHEDULES USING AN INTERACTIVE GRAPHIC BASED SYSTEM, W.Y. Thabit* and N.N. Dawood#, *Civil Engineering Department, Union College, Schenectady, USA, #Division of Civil Engineering and Building, University of Teesside, Middelsbrough, UK
4.2 INTEGRATION OF CAD AND PEN-BASED COMPUTER TECHNOLOGIES FOR AUTOMATIC ACQUISITION OF SCHEDULE PROGRESS DATA, W. Thabet, Civil Engineering Department, Union College, Schenectady, New York, USA
4.3 METHOD OF ALLOCATING RISKS ON CONSTRUCTION CONTRACTS, G.F. Jergeas and F.T. Hartman, Department of Civil Engineering, University of Calgary, Alberta, Canada69
5 INTEGRATED DESIGN AND CONSTRUCTION
5.1 HOW STRATEGIES HAPPEN: UPGRADING CAD IN FOUR INTERNATIONAL AEC FIRMS, K.L. Hansen, Stanford University, Stanford, USA and University of Strathclyde, Glasgow, UK
5.2 ELEMENT DEFINITION IN AN INTEGRATED DESIGN AND CONSTRUCTION, M. Alshawi and C.W.F. Che Wan Putra, Department of Surveying, University of Salford, Salford, UK87

5.3	CONCURRENT LIFECYCLE DESIGN AND CONSTRUCTION, N.F.O. Evbuomwan* and #C.J Anumba, *Engineering Design Centre, City University, London, UK and #Construction Research Unit University of Teesside, Teesside, Middlesbrough, UK
5.4	IMPROVED MATERIALS DATA CAPTURE THROUGH BAR-CODING, A. Baldwin, A. Thorpe and J. Alkaabi, Department of Civil and Building Engineering, University of Technology, Loughborough UK
5.5	VIEWS ON THE CONCURRENT ENGINEERING PARADIGM IN CIVIL AND STRUCTURAL ENGINEERING, N.F.O. Evbuomwan and S. Sivaloganathan, Engineering Design Centre, City University, London, UK
5.6	AN INTERACTIVE CAD-BASED ENVIRONMENT FOR DATA MANAGEMENT AND RETRIEVAL IN RESTORATION STUDIES, D. Verras, P. Triantafillidis and K. Loukakis Department of Civil Engineering, Laboratory of Architectural Technology and Urban Planning University of Patra, Rio-Patra, Greece
6 N	MATERIALS DESIGN
6.1	DEVELOPMENT OF A MICROCOMPUTER AIDED DESIGN SYSTEM FOR CONCRETE MIXTURE PROPORTIONING, N. Ghafoori and J. Schmidt, Department of Civil Engineering and Mechanics, Southern Illinois University, Carbondale, USA
7 G	SEOTECHNICAL ENGINEERING
7.1	ANALYSIS OF TRANSMISSION TOWER FOUNDATION RESPONSE TO UPLIFT LOADING USING DYNA-3D, A.J. Birch and E.A. Dickin, Department of Civil Engineering, University of Liverpool, Liverpool, UK
7.2	SEISMIC RESPONSE EVALUATION OF MUNICIPAL SOLID WASTE LANDFILLS, S. Singh, Civil Engineering Department, Santa Clara University, Santa Clara, USA
	COMPUTER AIDED DESIGN OF REINFORCED EARTH RETAINING WALLS, B.M. Das*, L.W.T. Lai# and G. Singh#, *School of Engineering and Computer Science, California State University, Sacramento, USA and #Department of Civil Engineering, University of Leeds, Leeds, UK
7.4	CYCLIC LOADING INDUCED SETTLEMENT OF STRIP FOUNDATION ON GEOGRID REINFORCED SATURATED CLAY, B.M. Das*, G. Singh#, E.C. Shin** and V.K. Puri+, *School of Engineering, California State University, Sacramento, USA, #Department of Civil Engineering, University of Leeds, Leeds, UK, *Civil Engineering Department, University of Inchon, Inchon, Korea, +Southern Illinois University, Carbondale, USA
7.5	AUTOMATION IN RETAINING WALL DESIGN, YP. Huang, CC. Chen, CY. Huang, RS. Yu and KH. Chen, Department of Civil Engineering, Feng-Chia University, Taichung, Taiwan, R.O.C.155
7.6	EFFECT OF SUBGRADE MODEL ON CAPACITY OF REINFORCED CONCRETE FOOTINGS, A.A. Khathlan and M.S.A. Abbasi, Civil Engineering Department, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia
7.7	BEARING CAPACITY OF STRIP FOUNDATION ON GEORID-REINFORCED SATURATED CLAY, B.M. Das*, E.C. Shin#, G. Singh** and V.K. Puri+, *School of Engineering, California State University, Sacramento, USA, #Civil Engineering Department, University of Inchon, Inchon, Korea, **Department of Civil Engineering, University of Leeds, Leeds, UK, +Southern Illinois University, Carbondale, USA

7.8 THE GERMAN GUIDELINES "GROUND DEFORMATIONS INDUCED BY STRUCTURES, GDS", K. Hock-Berghaus* and Th. Schröder#, *Wuppertal, Germany, #Berlin, Germany177
8 PAVEMENT ANALYSIS AND DESIGN
8.1 THE DESIGN OF LARGE PRECAST CONCRETE UNITS USED AT CRITICAL AIRFIELD LOCATIONS, J.W.Bull* and C.H. Woodford#, *Department of Civil Engineering and #Computing Services, University of Newcastle upon Tyne, UK
8.2 MECHANISTIC-EMPIRICAL METHODOLOGY FOR CONVENTIONAL FLEXIBLE PAVEMENT DESIGN, DH. Chen, M.M. Zaman and J.G. Laguros, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, USA
8.3 A NONLINEAR FINITE ELEMENT METHOD FOR THE DESIGN OF AIRFIELD PAVEMENTS, J.M. Matthews and F.C. Schmitt, Department of Civil Engineering, Temple University, Philadelphia, USA
8.4 STRESS REDUCTION IN LATERALLY LOADED PRECAST CONCRETE PAVEMENTS BY MEANS OF STEEL EDGE SURROUNDS: NUMERICAL ANALYSIS, J.W. Bull* and C.H. Woodford#,*Department of Civil Engineering and #Computing Services, University of Newcastle upon Tyne, UK
9 TRANSPORT AND TRAFFIC ENGINEERING
9.1 EXPLOITATION OF MULTI-TERMINAL TRANSPORT NETWORKS, A. Recuerdo and J.P. Gutiérrez, Eduardo Torroja Institute (CSIC), Madrid, Spain
9.2 AN INTEGRATED COMPUTER-AIDED SYSTEM FOR ANALYSIS OF HOURLY TRAFFIC VOLUME DATA, S. Lambropoulos and N. Manopoulos, Transport Consultants, Brussels, Belgium 217
9.3 A COMPUTATIONAL MODEL FOR ROAD SURFACE TEMPERATURE PREDICTION, B.W. Scotney* and G.F. Crawford#, *School of Information and Software Engineering, University of Ulster at Coleraine, UK, #School of Computing and Mathematics, University of Ulster at Jordanstown, UK227
10 WATER ENGINEERING AND HYDROLOGICAL STUDIES
10.1 CALCULATION OF FLOOD HYDROGRAPHS IN A COMPACT COMPOUND CHANNEL USING CONVEYANCES FROM THE LATERAL DISTRIBUTION METHOD, J.F. Lyness*, W.R.C. Myers* and J.B. Wark#, *School of the Built Environment, University of Ulster, UK, #The Babtie Group, Glasgow, UK
10.2 GIS DERIVED DISTRIBUTED UNIT HYDROGRAPH, A NEW TOOL FOR FLOOD MODELING, I.Muzik, Department of Civil Engineering, The University of Calgary, Calgary, Canada243
10.3 BED LOAD TRANSPORT BY FLOOD WAVES, A. Bestawy, H. Torfs and J. Berlamont, Laboratory of Hydraulics, Catholic University Leuven, Leuven, Belgium249
10.4 FUZZY REASONING IN WATER SUPPLY NETWORK DESIGN OPTIMIZATION, L.S. Vamvakeridou-Lyroudia, Department of Civil Engineering, National Technical University of Athens, Athens, Greece

10.5 COMPUTING PEARSON-I STATISTICS, P.H. McDonald, Department of Civil Engineering, North Carolina State University, Raleigh, USA
11. DATA ACQUISTION
11.1 MONITORING OF A MULTI-SPAN MASONRY ARCH BRIDGE - DATA COLLECTION, T.D. Sloan*, A. Thompson* and W.J. Harvey#, *Department of Civil Engineering, Queen's University of Belfast, Belfast, UK, #Department of Civil Engineering, Dundee University, Dundee, UK271
12. EDUCATION
12.1 THE WORLD WIDE WEB AND IT'S USE IN EDUCATION, J.A. Moran and J.C. Attree, School of Architecture and Civil Engineering, South Bank University, London, UK277
12.2 DIGITISING THE CONSTRUCTION PROCESS: PROVIDING A MULTI-MEDIA EDUCATIONAL RESOURCE, D.St. Fox and R.A. Otter, Department of Civil Engineering, University of Portsmouth, Portsmouth, UK

PREFACE

This volume contains a selection of the papers presented at the Sixth International Conference on Civil and Structural Engineering Computing and the Fourth International Conference on the Application of Artificial Intelligence to Civil and Structural Engineering held in Cambridge, England, between 28th-30th August 1995. Other papers from these conferences are published in:

- Developments in Computer Aided Design and Modelling for Structural Engineering Civil-Comp Press, 1995, ISBN 0-948-749-33-4
- Developments in Computational Techniques for Civil Engineering, Civil-Comp Press, 1995, ISBN 0-948-749-34-2
- Developments in Computational Techniques for Structural Engineering, Civil Comp Press, 1995, ISBN 0-948-749-35-0
- Developments in Neural Networks and Evolutionary Computing for Civil and Structural Engineering, Civil-Comp Press, 1995, ISBN 0-948-749-36-9
- Developments in Artificial Intelligence for Civil and Structural Engineering, Civil-Comp Press, 1995, ISBN 0-948-749-37-7

I should like to thank all the authors for their contribution and in particular those who personally presented their papers in Cambridge. I should also like to thank the members of the Conference Editorial Boards who helped in many ways before and during the conferences.

The members of the CIVIL-COMP95 Conference Editorial Board were: Professor H. Adeli, USA; Professor N. Akkas, Turkey; Professor M.R. Barnes, UK; Professor J.W. Baugh, USA; Professor C. Bedard, Canada; Dr P. Bhatt, UK; Dr.-Ing. K.-U. Bletzinger, Germany; Dr J.W. Bull, UK; Professor J. Christian, Canada; Professor M.B. Fuchs, Israel; Professor B.M. Das, USA; Professor D.E. Grierson, Canada; Professor D.V. Griffiths, USA; Professor Dr.-Ing. D. Hartmann, Germany; Professor E. Hinton, UK; Professor K. Hover, USA; Professor W.M. Jenkins, UK; Professor A. Kaveh, Iran; Professor U. Kirsch, Israel; Professor J.G. Laguros, USA; Dr R. Levy, USA; Professor I.A. MacLeod, UK; Professor P.H. McDonald, USA; Dr J. Miles, UK; Professor F. Molenkamp, UK; Professor M. Papadrakakis, Greece; Professor M. Pastor, Spain; Dr M.N. Pavlovic, UK; Dr V. Peshkam, UK; Professor S. Pietruszczak, Canada; Professor D. Potts, UK; Professor R.M. Richard, USA; Professor R.L. Sack, USA; Professor M.P. Saka, Bahrain; Professor A. Samartin, Spain; Professor N. Shiraishi, Japan; Professor I.M. Smith, UK; Dr G. Singh, UK; Professor H. Sugimoto, Japan; D. Taffs, UK; Professor A.B. Templeman, UK; Dr D.G. Toll, UK; Professor N.S. Trahair, Australia; Dr G.J. Turvey, UK; Dr A.S. Watson, UK; Dr F.L.A. Wong, UK; Dr P.K. Woodward, UK; and Professor Y.-B. Yang, Republic of China.

The members of the Artificial Intelligence CIVIL-COMP95 Conference Editorial Board were: Professor S. Alkass, Canada; Dr M. Alshawi, UK; Professor T. Arciszewski, USA; Professor D.I. Blockley, UK; Dr D.A. Bradley, UK; Dr W.T. Chan, Singapore; T. Cornick, UK; Dr E.G. Davey-Wilson, UK; E.W. East, USA; Professor P. Fazio, Canada; Professor S.J. Fenves, USA; Dr R. Fruchter, USA; Professor H. Furuta, Japan; Professor J.S. Gero, Australia; Dr A. Goh, Australia; Professor W.J. Grenney, USA; Professor P. Hajela, USA; Dr B. Heydecker, UK; Dr P. Jayachandran, USA; K. Kahkonen, Finland; Dr P.H. Kirkegaard, Denmark; Professor C.S. Krishnamoorthy, India; Dr B. Kumar, UK; Professor K.H. Law, USA; Dr M.J. Mawdesley, UK; Dr T.J. McCarthy, UK; Dr C.T. Moore, UK; Dr J. Oliphant, UK; Dr I.C. Parmee, UK; Dr S. Rowlinson, Hong Kong; Professor G.G. Roy, Australia; Dr I.F.C. Smith, Switzerland; Dr C.K. Soh, Singapore; Professor C.A. Syrmakezis, Greece; Professor G. Yagawa, Japan; Professor K. Zreik, France; and Dr T. Zimmermann, Switzerland,

I also wish to thank all at Civil-Comp Press for their help and perseverance in the realisation of these conferences particularly Maisie Sales and Szandra Köves. I am grateful also for the assistance of members of the Structural Engineering Computational Technology Research Group at Heriot-Watt University, Edinburgh, is particularly János Sziveri, Péter Iványi and Biao Cheng. I should also like to thank all those who made possible my recent move from the Department of Civil and Offshore Engineering to the Department of Mechanical and Chemical Engineering, Heriot-Watt University. My interest in all aspects of the use of computers in civil and structural engineering is undiminished by this move and I look forward to more conferences on this theme.

Barry Topping
Department of Mechanical and Chemical Engineering
Heriot-Watt University, Edinburgh
July 1995