

COMPUTERS IN RAILWAYS XI

WIT*PRESS*

WIT Press publishes leading books in Science and Technology.

Visit our website for the current list of titles.

www.witpress.com

WIT*eLibrary*

Home of the Transactions of the Wessex Institute.

Papers presented at COMPRAIL 2008 are archived in the WIT eLibrary in volume 103 of

WIT Transactions on The Built Environment (ISSN 1743-3509).

The WIT electronic-library provides the international scientific community with immediate and permanent access to individual papers presented at WIT conferences.

<http://library.witpress.com>

ELEVENTH INTERNATIONAL CONFERENCE ON
COMPUTER SYSTEM DESIGN AND OPERATION IN THE
RAILWAY AND OTHER TRANSIT SYSTEMS

COMPRAIL XI

CONFERENCE CHAIRMEN

J. Allan

Rail Safety and Standards Board, UK

E. Arias

University Castilla La-Mancha, Spain

C.A. Brebbia

Wessex Institute of Technology, UK

C.J. Goodman

University of Birmingham, UK

A.F. Rumsey

Parsons Transportation Group, USA

G. Sciutto

Universita di Genova, Italy

N. Tomii

Railway Technical Research Institute, Japan

INTERNATIONAL SCIENTIFIC ADVISORY COMMITTEE

T. Albrecht

W. Daamen

A. Finlayson

I.A. Hansen

M. Jha

J.M. Mera

B. Ning

E. Pilo

F.M. Rachel

A. Radtke

J. Rodriguez

R. Takagi

P. Tzieropoulos

A. Yoshimura

Organised by

*Wessex Institute of Technology, UK
University of Castilla – La Mancha, Spain*

Sponsored by

WIT Transactions on the Built Environment

WIT Transactions

Transactions Editor

Carlos Brebbia

Wessex Institute of Technology
Ashurst Lodge, Ashurst
Southampton SO40 7AA, UK
Email: carlos@wessex.ac.uk

Editorial Board

- | | |
|--|---|
| B Abersek University of Maribor, Slovenia | M P Bekakos Democritus University of Thrace, Greece |
| Y N Abousleiman University of Oklahoma, USA | G Belingardi Politecnico di Torino, Italy |
| P L Aguilar University of Extremadura, Spain | R Belmans Katholieke Universiteit Leuven, Belgium |
| K S Al Jabri Sultan Qaboos University, Oman | C D Bertram The University of New South Wales, Australia |
| E Alarcon Universidad Politecnica de Madrid, Spain | D E Beskos University of Patras, Greece |
| A Aldama IMTA, Mexico | S K Bhattacharyya Indian Institute of Technology, India |
| C Alessandri Universita di Ferrara, Italy | E Blums Latvian Academy of Sciences, Latvia |
| D Almorza Gomar University of Cadiz, Spain | J Boarder Cartref Consulting Systems, UK |
| B Alzahabi Kettering University, USA | B Bobee Institut National de la Recherche Scientifique, Canada |
| J A C Ambrosio IDMEC, Portugal | H Boileau ESIGEC, France |
| A M Amer Cairo University, Egypt | J J Bommer Imperial College London, UK |
| S A Anagnostopoulos University of Patras, Greece | M Bonnet Ecole Polytechnique, France |
| M Andretta Montecatini, Italy | C A Borrego University of Aveiro, Portugal |
| E Angelino A.R.P.A. Lombardia, Italy | A R Bretones University of Granada, Spain |
| H Antes Technische Universitat Braunschweig, Germany | J A Bryant University of Exeter, UK |
| M A Atherton South Bank University, UK | F-G Buchholz Universitat Gesanthschule Paderborn, Germany |
| A G Atkins University of Reading, UK | M B Bush The University of Western Australia, Australia |
| D Aubry Ecole Centrale de Paris, France | F Butera Politecnico di Milano, Italy |
| H Azegami Toyohashi University of Technology, Japan | J Byrne University of Portsmouth, UK |
| A F M Azevedo University of Porto, Portugal | W Cantwell Liverpool University, UK |
| J Baish Bucknell University, USA | D J Cartwright Bucknell University, USA |
| J M Baldasano Universitat Politecnica de Catalunya, Spain | P G Carydis National Technical University of Athens, Greece |
| J G Bartzis Institute of Nuclear Technology, Greece | J J Casares Long Universidad de Santiago de Compostela, Spain, |
| A Bejan Duke University, USA | M A Celia Princeton University, USA |
| | A Chakrabarti Indian Institute of Science, India |

- S K Chakrabarti** Offshore Structure Analysis, USA
- A H-D Cheng** University of Mississippi, USA
- J Chilton** University of Lincoln, UK
- C-L Chiu** University of Pittsburgh, USA
- H Choi** Kangnung National University, Korea
- A Cieslak** Technical University of Lodz, Poland
- S Clement** Transport System Centre, Australia
- M W Collins** Brunel University, UK
- J J Connor** Massachusetts Institute of Technology, USA
- M C Constantinou** State University of New York at Buffalo, USA
- D E Cormack** University of Toronto, Canada
- M Costantino** Royal Bank of Scotland, UK
- D F Cutler** Royal Botanic Gardens, UK
- W Czyczula** Krakow University of Technology, Poland
- M da Conceicao Cunha** University of Coimbra, Portugal
- A Davies** University of Hertfordshire, UK
- M Davis** Temple University, USA
- A B de Almeida** Instituto Superior Tecnico, Portugal
- E R de Arantes e Oliveira** Instituto Superior Tecnico, Portugal
- L De Biase** University of Milan, Italy
- R de Borst** Delft University of Technology, Netherlands
- G De Mey** University of Ghent, Belgium
- A De Montis** Universita di Cagliari, Italy
- A De Naeyer** Universiteit Ghent, Belgium
- W P De Wilde** Vrije Universiteit Brussel, Belgium
- L Debnath** University of Texas-Pan American, USA
- N J Dedios Mimbela** Universidad de Cordoba, Spain
- G Degrande** Katholieke Universiteit Leuven, Belgium
- S del Giudice** University of Udine, Italy
- G Deplano** Universita di Cagliari, Italy
- I Doltsinis** University of Stuttgart, Germany
- M Domaszewski** Universite de Technologie de Belfort-Montbéliard, France
- J Dominguez** University of Seville, Spain
- K Dorow** Pacific Northwest National Laboratory, USA
- W Dover** University College London, UK
- C Dowlen** South Bank University, UK
- J P du Plessis** University of Stellenbosch, South Africa
- R Duffell** University of Hertfordshire, UK
- A Ebel** University of Cologne, Germany
- E E Edoutos** Democritus University of Thrace, Greece
- G K Egan** Monash University, Australia
- K M Elawadly** Alexandria University, Egypt
- K-H Elmer** Universitat Hannover, Germany
- D Elms** University of Canterbury, New Zealand
- M E M El-Sayed** Kettering University, USA
- D M Elsom** Oxford Brookes University, UK
- A El-Zafrany** Cranfield University, UK
- F Erdogan** Lehigh University, USA
- F P Escrig** University of Seville, Spain
- D J Evans** Nottingham Trent University, UK
- J W Everett** Rowan University, USA
- M Faghri** University of Rhode Island, USA
- R A Falconer** Cardiff University, UK
- M N Fardis** University of Patras, Greece
- P Fedelinski** Silesian Technical University, Poland
- H J S Fernando** Arizona State University, USA
- S Finger** Carnegie Mellon University, USA
- J I Frankel** University of Tennessee, USA
- D M Fraser** University of Cape Town, South Africa
- M J Fritzler** University of Calgary, Canada
- U Gabbert** Otto-von-Guericke Universitat Magdeburg, Germany
- G Gambolati** Universita di Padova, Italy
- C J Gantes** National Technical University of Athens, Greece
- L Gaul** Universitat Stuttgart, Germany
- A Genco** University of Palermo, Italy
- N Georgantzis** Universitat Jaume I, Spain
- G S Gipson** Oklahoma State University, USA
- P Giudici** Universita di Pavia, Italy
- F Gomez** Universidad Politecnica de Valencia, Spain

R Gomez Martin University of Granada, Spain
D Goulias University of Maryland, USA
K G Goulias Pennsylvania State University, USA
F Grandori Politecnico di Milano, Italy
W E Grant Texas A & M University, USA
S Grilli University of Rhode Island, USA
R H J Grimshaw, Loughborough University, UK
D Gross Technische Hochschule Darmstadt, Germany
R Grundmann Technische Universitat Dresden, Germany
A Gualtierotti IDHEAP, Switzerland
R C Gupta National University of Singapore, Singapore
J M Hale University of Newcastle, UK
K Hameyer Katholieke Universiteit Leuven, Belgium
C Hanke Danish Technical University, Denmark
K Hayami National Institute of Informatics, Japan
Y Hayashi Nagoya University, Japan
L Haydock Newage International Limited, UK
A H Hendrickx Free University of Brussels, Belgium
C Herman John Hopkins University, USA
S Heslop University of Bristol, UK
I Hideaki Nagoya University, Japan
D A Hills University of Oxford, UK
W F Huebner Southwest Research Institute, USA
J A C Humphrey Bucknell University, USA
M Y Hussaini Florida State University, USA
W Hutchinson Edith Cowan University, Australia
T H Hyde University of Nottingham, UK
M Iguchi Science University of Tokyo, Japan
D B Ingham University of Leeds, UK
L Int Panis VITO Expertisecentrum IMS, Belgium
N Ishikawa National Defence Academy, Japan
J Jaafar UiTm, Malaysia
W Jager Technical University of Dresden, Germany
Y Jaluria Rutgers University, USA
C M Jefferson University of the West of England, UK
P R Johnston Griffith University, Australia
D R H Jones University of Cambridge, UK
N Jones University of Liverpool, UK
D Kaliampakos National Technical University of Athens, Greece
N Kamiya Nagoya University, Japan
D L Karabalis University of Patras, Greece
M Karlsson Linkoping University, Sweden
T Katayama Doshisha University, Japan
K L Katsifarakis Aristotle University of Thessaloniki, Greece
J T Katsikadelis National Technical University of Athens, Greece
E Kausel Massachusetts Institute of Technology, USA
H Kawashima The University of Tokyo, Japan
B A Kazimee Washington State University, USA
S Kim University of Wisconsin-Madison, USA
D Kirkland Nicholas Grimshaw & Partners Ltd, UK
E Kita Nagoya University, Japan
A S Kobayashi University of Washington, USA
T Kobayashi University of Tokyo, Japan
D Koga Saga University, Japan
A Konrad University of Toronto, Canada
S Kotake University of Tokyo, Japan
A N Kounadis National Technical University of Athens, Greece
W B Kratzig Ruhr Universitat Bochum, Germany
T Krauthammer Penn State University, USA
C-H Lai University of Greenwich, UK
M Langseth Norwegian University of Science and Technology, Norway
B S Larsen Technical University of Denmark, Denmark
F Lattarulo, Politecnico di Bari, Italy
A Lebedev Moscow State University, Russia
L J Leon University of Montreal, Canada
D Lewis Mississippi State University, USA
S Ighobashi University of California Irvine, USA

- K-C Lin** University of New Brunswick, Canada
- A A Liolios** Democritus University of Thrace, Greece
- S Lomov** Katholieke Universiteit Leuven, Belgium
- J W S Longhurst** University of the West of England, UK
- G Loo** The University of Auckland, New Zealand
- J Lourenco** Universidade do Minho, Portugal
- J E Luco** University of California at San Diego, USA
- H Lui** State Seismological Bureau Harbin, China
- C J Lumsden** University of Toronto, Canada
- L Lundqvist** Division of Transport and Location Analysis, Sweden
- T Lyons** Murdoch University, Australia
- Y-W Mai** University of Sydney, Australia
- M Majowiecki** University of Bologna, Italy
- D Malerba** Università degli Studi di Bari, Italy
- G Manara** University of Pisa, Italy
- B N Mandal** Indian Statistical Institute, India
- Ü Mander** University of Tartu, Estonia
- H A Mang** Technische Universität Wien, Austria,
- G D, Manolis**, Aristotle University of Thessaloniki, Greece
- W J Mansur** COPPE/UF RJ, Brazil
- N Marchettini** University of Siena, Italy
- J D M Marsh** Griffith University, Australia
- J F Martin-Duque** Universidad Complutense, Spain
- T Matsui** Nagoya University, Japan
- G Mattrisch** DaimlerChrysler AG, Germany
- F M Mazzolani** University of Naples "Federico II", Italy
- K McManis** University of New Orleans, USA
- A C Mendes** Universidade de Beira Interior, Portugal,
- R A Meric** Research Institute for Basic Sciences, Turkey
- J Mikielwicz** Polish Academy of Sciences, Poland
- N Milic-Frayling** Microsoft Research Ltd, UK
- R A W Mines** University of Liverpool, UK
- C A Mitchell** University of Sydney, Australia
- K Miura** Kajima Corporation, Japan
- A Miyamoto** Yamaguchi University, Japan
- T Miyoshi** Kobe University, Japan
- G Molinari** University of Genoa, Italy
- T B Moodie** University of Alberta, Canada
- D B Murray** Trinity College Dublin, Ireland
- G Nakhaeizadeh** DaimlerChrysler AG, Germany
- M B Neace** Mercer University, USA
- D Neculescu** University of Ottawa, Canada
- F Neumann** University of Vienna, Austria
- S-I Nishida** Saga University, Japan
- H Nisitani** Kyushu Sangyo University, Japan
- B Notaros** University of Massachusetts, USA
- P O'Donoghue** University College Dublin, Ireland
- R O O'Neill** Oak Ridge National Laboratory, USA
- M Ohkusu** Kyushu University, Japan
- G Oliveto** Università di Catania, Italy
- R Olsen** Camp Dresser & McKee Inc., USA
- E Oñate** Universitat Politècnica de Catalunya, Spain
- K Onishi** Ibaraki University, Japan
- P H Oosthuizen** Queens University, Canada
- E L Ortiz** Imperial College London, UK
- E Outa** Waseda University, Japan
- A S Papageorgiou** Rensselaer Polytechnic Institute, USA
- J Park** Seoul National University, Korea
- G Passerini** Università delle Marche, Italy
- B C Patten**, University of Georgia, USA
- G Pelosi** University of Florence, Italy
- G G Penelis**, Aristotle University of Thessaloniki, Greece
- W Perrie** Bedford Institute of Oceanography, Canada
- R Pietrabissa** Politecnico di Milano, Italy
- H Pina** Instituto Superior Técnico, Portugal
- M F Platzer** Naval Postgraduate School, USA
- D Poljak** University of Split, Croatia

- V Popov** Wessex Institute of Technology, UK
- H Power** University of Nottingham, UK
- D Prandle** Proudman Oceanographic Laboratory, UK
- M Predeleanu** University Paris VI, France
- M R I Purvis** University of Portsmouth, UK
- I S Putra** Institute of Technology Bandung, Indonesia
- Y A Pykh** Russian Academy of Sciences, Russia
- F Rachidi** EMC Group, Switzerland
- M Rahman** Dalhousie University, Canada
- K R Rajagopal** Texas A & M University, USA
- T Rang** Tallinn Technical University, Estonia
- J Rao** Case Western Reserve University, USA
- A M Reinhorn** State University of New York at Buffalo, USA
- A D Rey** McGill University, Canada
- D N Riahi** University of Illinois at Urbana-Champaign, USA
- B Ribas** Spanish National Centre for Environmental Health, Spain
- K Richter** Graz University of Technology, Austria
- S Rinaldi** Politecnico di Milano, Italy
- F Robuste** Universitat Politècnica de Catalunya, Spain
- J Roddick** Flinders University, Australia
- A C Rodrigues** Universidade Nova de Lisboa, Portugal
- F Rodrigues** Poly Institute of Porto, Portugal
- C W Roeder** University of Washington, USA
- J M Roesset** Texas A & M University, USA
- W Roetzel** Universitaet der Bundeswehr Hamburg, Germany
- V Roje** University of Split, Croatia
- R Rosset** Laboratoire d'Aerologie, France
- J L Rubio** Centro de Investigaciones sobre Desertificacion, Spain
- T J Rudolphi** Iowa State University, USA
- S Russenckuck** Magnet Group, Switzerland
- H Ryssel** Fraunhofer Institut Integrierte Schaltungen, Germany
- S G Saad** American University in Cairo, Egypt
- M Saiidi** University of Nevada-Reno, USA
- R San Jose** Technical University of Madrid, Spain
- F J Sanchez-Sesma** Instituto Mexicano del Petroleo, Mexico
- B Sarler** Nova Gorica Polytechnic, Slovenia
- S A Savidis** Technische Universitat Berlin, Germany
- A Savini** Universita de Pavia, Italy
- G Schmid** Ruhr-Universitat Bochum, Germany
- R Schmidt** RWTH Aachen, Germany
- B Scholtes** Universitaet of Kassel, Germany
- W Schreiber** University of Alabama, USA
- A P S Selvadurai** McGill University, Canada
- J J Sendra** University of Seville, Spain
- J J Sharp** Memorial University of Newfoundland, Canada
- Q Shen** Massachusetts Institute of Technology, USA
- X Shixiong** Fudan University, China
- G C Sih** Lehigh University, USA
- L C Simoes** University of Coimbra, Portugal
- A C Singhal** Arizona State University, USA
- P Skerget** University of Maribor, Slovenia
- J Sladek** Slovak Academy of Sciences, Slovakia
- V Sladek** Slovak Academy of Sciences, Slovakia
- A C M Sousa** University of New Brunswick, Canada
- H Sozer** Illinois Institute of Technology, USA
- D B Spalding** CHAM, UK
- P D Spanos** Rice University, USA
- T Speck** Albert-Ludwigs-Universitaet Freiburg, Germany
- C C Spyarakos** National Technical University of Athens, Greece
- I V Stangeeva** St Petersburg University, Russia
- J Stasiak** Technical University of Gdansk, Poland
- G E Swaters** University of Alberta, Canada
- S Syngellakis** University of Southampton, UK
- J Szymd** University of Mining and Metallurgy, Poland
- S T Tadano** Hokkaido University, Japan

H Takemiya Okayama University, Japan
I Takewaki Kyoto University, Japan
C-L Tan Carleton University, Canada
M Tanaka Shinshu University, Japan
E Taniguchi Kyoto University, Japan
S Tanimura Aichi University of Technology, Japan
J L Tassoulas University of Texas at Austin, USA
M A P Taylor University of South Australia, Australia
A Terranova Politecnico di Milano, Italy
E Tiezzi University of Siena, Italy
A G Tjihuis Technische Universiteit Eindhoven, Netherlands
T Tirabassi Institute FISBAT-CNR, Italy
S Tkachenko Otto-von-Guericke-University, Germany
N Tosaka Nihon University, Japan
T Tran-Cong University of Southern Queensland, Australia
R Tremblay Ecole Polytechnique, Canada
I Tsukrov University of New Hampshire, USA
R Turra CINECA Interuniversity Computing Centre, Italy
S G Tushinski Moscow State University, Russia
J-L Uso Universitat Jaume I, Spain
E Van den Bulck Katholieke Universiteit Leuven, Belgium
D Van den Poel Ghent University, Belgium
R van der Heijden Radboud University, Netherlands
R van Duin Delft University of Technology, Netherlands
P Vas University of Aberdeen, UK
W S Venturini University of Sao Paulo, Brazil
R Verhoeven Ghent University, Belgium
A Viguri Universitat Jaume I, Spain
Y Villacampa Esteve Universidad de Alicante, Spain
F F V Vincent University of Bath, UK
S Walker Imperial College, UK
G Walters University of Exeter, UK
B Weiss University of Vienna, Austria
H Westphal University of Magdeburg, Germany
J R Whiteman Brunel University, UK
Z-Y Yan Peking University, China
S Yanniotis Agricultural University of Athens, Greece
A Yeh University of Hong Kong, China
J Yoon Old Dominion University, USA
K Yoshizato Hiroshima University, Japan
T X Yu Hong Kong University of Science & Technology, Hong Kong
M Zador Technical University of Budapest, Hungary
K Zakrzewski Politechnika Lodzka, Poland
M Zamir University of Western Ontario, Canada
R Zarnic University of Ljubljana, Slovenia
G Zharkova Institute of Theoretical and Applied Mechanics, Russia
N Zhong Maebashi Institute of Technology, Japan
H G Zimmermann Siemens AG, Germany

COMPUTERS IN RAILWAYS XI

COMPUTER SYSTEM DESIGN AND OPERATION IN THE
RAILWAY AND OTHER TRANSIT SYSTEMS

Editors

J. Allan

Rail Safety and Standards Board, UK

E. Arias

University Castilla La-Mancha, Spain

C.A. Brebbia

Wessex Institute of Technology, UK

C. Goodman

University of Birmingham, UK

A.F. Rumsey

Parsons Transportation Group, USA

G. Sciutto

Universita di Genova, Italy

N. Tomii

Railway Technical Research Institute, Japan

WITPRESS Southampton, Boston



J. Allan
Rail Safety and Standards Board, UK

E. Arias
University Castilla La-Mancha, Spain

C.A. Brebbia
Wessex Institute of Technology, UK

C. Goodman
University of Birmingham, UK

A.F. Rumsey
Parsons Transportation Group, USA

G. Sciutto
Universita di Genova, Italy

N. Tomii
*Railway Technical Research Institute,
Japan*

Published by

WIT Press

Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK
Tel: 44 (0) 238 029 3223; Fax: 44 (0) 238 029 2853
E-Mail: witpress@witpress.com
<http://www.witpress.com>

For USA, Canada and Mexico

Computational Mechanics Inc
25 Bridge Street, Billerica, MA 01821, USA
Tel: 978 667 5841; Fax: 978 667 7582
E-Mail: infousa@witpress.com
<http://www.witpress.com>

British Library Cataloguing-in-Publication Data
A Catalogue record for this book is available
from the British Library

ISBN: 978-1-84564-126-9
ISSN: 1746-4498 (print)
ISSN: 1743-3509 (on-line)

The texts of the papers in this volume were set individually by the authors or under their supervision. Only minor corrections to the text may have been carried out by the publisher.

No responsibility is assumed by the Publisher, the Editors and Authors for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. The Publisher does not necessarily endorse the ideas held, or views expressed by the Editors or Authors of the material contained in its publications.

© WIT Press 2008

Printed in Great Britain by Athenaeum Press Ltd.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Publisher.

Preface

COMPRAIL 2008, the eleventh in a series of well-established and successful international conferences on Computer System Design and Operation in the Railway and Other Transit Systems, was held in Toledo, Spain, in 2008. Since 1987, COMPRAIL has provided a world forum for planners, designers, manufacturers and operators to discuss how they can benefit from computer-based techniques.

This book contains most of the papers presented at COMPRAIL 2008, representing the latest research, development and application of computers to the management, design, manufacture and operations of railways and other passenger, freight and transit systems.

The Conference attracted a large number of papers, divided into the following sections:

- Planning
- Safety and Security
- Advanced Train Control
- Communications
- Energy Management
- Power Supply
- Operations Quality
- Timetable Planning
- Level Crossings and Obstacle Detection
- Computer Techniques
- Dynamics and Wheel/Rail Interface
- Maintenance
- Rolling Stock
- Training Tools and Technology

This book is distributed throughout the world by WIT Press, the publishing arm of the Wessex Institute of Technology. In addition, together with all other COMPRAIL Conferences held from 1993 onwards, the papers are displayed

in the electronic library of the Transactions of the Wessex Institute (see <http://library.witpress.com>), permanently available to the international scientific community.

The Editors are grateful to all the authors for the excellent papers and to those members of the International Scientific Advisory Committee who participated in the review process. The success of the conference is the result of their significant contribution of time and energy.

The Editors
Toledo, 2008

Contents

Section 1: Planning

Method and software tool for an optimized passenger orientated connection management <i>M. Klemenz & A. Radtke</i>	3
FASTA: a new life for a former dinosaur adapting the modelling scope to new planning requirements <i>P. Tzieropoulos, A. Curchod & Y. Putallaz</i>	15
Analyzing and forecasting railway data using linear data analysis <i>E. T. Selig, G. M. Cardillo, E. Stephens & A. Smith</i>	25
Using a rail simulation library to assess impacts of transit network planning on operational quality <i>E. M. Kanacilo & N. van Oort</i>	35
Analysing the Metro Cityring in Copenhagen <i>A. H. Kaas & E. M. Jacobsen</i>	45
Capacity measurement with the UIC 406 capacity method <i>A. Landex, B. Schittenhelm, A. H. Kaas & J. Schneider-Tilli</i>	55
RAILONOMICS® – determining investment strategies for railway signalling through simulation <i>K. Beck, B. Scheier & B. Jäger</i>	65
Applying the lessons learnt in Asset Management around the world to the development of the AMPLE tool <i>A. J. Howard</i>	75
Banverket capacity consumption, congested infrastructure and traffic simulation with Railsys <i>M. Wahlborg</i>	85

High-speed lines (HSL) as an environmentally friendly transportation system – the Polish case <i>W. Czychula & S. Lisowski</i>	93
---	----

Section 2: Safety and security

Safety concept of railway signalling based on Galileo Safety-of-Life Service <i>A. Filip, J. Beugin, J. Marais & H. Mocek</i>	103
--	-----

A safety-related transmission method for a new railway signalling system based on an IP-Network <i>M. Endo, T. Okada, D. Watanabe, K. Aimi, T. Kunifuji & M. Matsumoto</i>	113
---	-----

A Discrete Time Markov Chain approach to global risk analysis in railway transportation <i>P. Cesario, N. Sacco & M. Sciutto</i>	123
---	-----

Software RAMS: the opportunity <i>Y. González-Arechavala, J. A. Rodríguez-Mondéjar & G. Latorre-Lario</i>	133
--	-----

Industrialising a proof-based verification approach of computerised interlocking systems <i>S. Behnia, A. Mammar, J.-M. Mota, N. Breton, P. Caspi & P. Raymond</i>	143
---	-----

Taking advantage of some complementary modelling methods to meet critical system requirement specifications <i>F. Defossez, P. Bon & S. Collart-Dutilleul</i>	153
--	-----

SPAD – reducing timetable related risk <i>H.-H. Kohls & R. Watson</i>	163
--	-----

Section 3: Advanced train control

Multi-objective optimization method for the ATO system using Cellular Automata <i>J. Xun, B. Ning & K. P. Li</i>	173
---	-----

Computer-aided design of ATO speed commands according to energy consumption criteria <i>M. Domínguez, A. Fernández, A. P. Cucala & L. P. Cayuela</i>	183
---	-----

Evaluation of the capacity limitations and suitability of the European Traffic Management System to support Automatic Train Operation on Main Line Applications <i>P. Thomas, D. Fisher & F. Sheikh</i>	193
Development of a LRT simulator for demand forecasting <i>N. Kudo & T. Mizuma</i>	203
ERTMS Level 2: effect on capacity compared with “best practice” conventional signalling <i>W. A. M. Barter</i>	213
Enhanced ETCS_L3 train control system <i>D. Emery</i>	223
The impact of GSM-R on railway capacity <i>D. N. Jansen, S. G. Klages & E. Wendler</i>	233
Towards interoperability on Northwest European railway corridors: signalling on the high-speed railway Amsterdam–Antwerp <i>J. H. Baggen, J. M. Vleugel & J. A. A. M. Stoop</i>	243
Basic train control system for regional branch lines – field test report <i>B. Stadlmann</i>	253
A new tool for railway planning and line management <i>J. Garzón Núñez, J. de D. Sanz Bobi, J. Gómez Ramírez & J. Cano Noguerras</i>	263
Analysis of braking performance for the definition of emergency braking intervention in ATP systems <i>M. Malvezzi, F. Bartolini, M. Rinchi & A. Rindi</i>	273
Operation simulation of traction systems <i>L. Abrahamsson & L. Söder</i>	283
 Section 4: Communications	
Development of a high-speed rail transmission system using digital signal processors for railway signalling <i>H. Mochizuki, S. Takahashi, H. Nakamura, S. Nishida & R. Ishikawa</i>	295

A location-based MAC protocol for safety-of-life vehicle-to-vehicle communication <i>C. R. Garcia, T. Strang & A. Lehner</i>	305
--	-----

Experimental evaluation of a telecommunications network along railway lines by ad hoc network technology <i>K. Seki</i>	315
---	-----

Robust data transmission with eddy current sensor system <i>S. Hensel, C. Hasberg & R. Rütters</i>	325
---	-----

Section 5: Energy management

Charge/discharge control of a train with on-board energy storage devices for energy minimization and consideration of catenary free operation <i>M. Miyatake, K. Matsuda & H. Haga</i>	339
---	-----

Evaluation of energy saving strategies in heavily used rail networks by implementing an integrated real-time rescheduling system <i>M. Luethi</i>	349
--	-----

A production train diagram of train control to save power consumption used for dynamic programming <i>T. Katori & T. Izumi</i>	359
--	-----

Section 6: Power supply

A three dimensional model for the mechanical study of railway catenaries <i>J. Benet, T. Rojo, F. Cuartero & E. Arias</i>	371
---	-----

Adapting the CIM model to describe electrified railway systems <i>R. Santodomingo, E. Pilo, J. A. Rodriguez-Mondejar & M. A. Garcia-Vaquero</i>	381
--	-----

Optimal design of power supply systems using genetic algorithms <i>J. R. Jimenez-Octavio & E. Pilo</i>	391
---	-----

Application of linear analysis in traction power system stability studies <i>S. Danielsen, T. Toftevaag & O. B. Fosso</i>	401
---	-----

Fast estimation of aggregated results of many load flow solutions in electric traction systems <i>L. Abrahamsson & L. Söder</i>	411
DC protection calculations – an acceptable approach <i>R. Leach, D. Tregay & M. Berova</i>	425
A study of corrosion of zinc-coated stranded steel wire used as messenger wire <i>T. Kuraoka & Y. Sato</i>	439
OpenPowerNet – simulation of railway power supply systems <i>A. Stephan</i>	449

Section 7: Operations quality

Performance analysis: improving the Dutch railway service <i>V. A. Weeda & K. S. Hofstra</i>	463
Automatic identification of route conflict occurrences and their consequences <i>R. M. P. Goverde, W. Daamen & I. A. Hansen</i>	473
A Petri nets based decision support tool for railway traffic conflicts forecasting and resolution <i>S. Ricci & A. Tieri</i>	483

Section 8: Timetable planning

An incremental decision algorithm for railway traffic optimisation in a complex station <i>J. Rodriguez</i>	495
Improvement of a railway planning tool using Genetic Algorithms <i>J. de D. Sanz Bobi, J. Gómez Ramírez, J. Garzón Núñez & R. Galán López</i>	505
Day-to-day tuning of the Tokaido Shinkansen timetable – carried out for every single operating hour throughout the year <i>H. Ogawa, S. Kawai, Y. Kojima, M. Goto & H. Shoji</i>	515
Development of a dwell time calculation model for timetable planning <i>S. Buchmueller, U. Weidmann & A. Nash</i>	525

Comparing the effectiveness of two real-time train rescheduling systems in case of perturbed traffic conditions <i>S. Wegele, F. Corman & A. D'Ariano</i>	535
Evaluation of punctuality on a heavily utilised railway line with mixed traffic <i>O. Lindfeldt</i>	545
Real-time asynchronous conflict solving algorithms for computer aided train dispatching assistance systems <i>A. Kuckelberg & E. Wendler</i>	555
A novel train rescheduling algorithm for correcting disrupted train operations in a dense urban environment <i>K. Kumazawa, K. Hara & T. Koseki</i>	565
Automated analysis of train event recorder data to improve micro-simulation models <i>S. de Fabris, G. Longo & G. Medeossi</i>	575
Automatic generation of car shunting scheduling in railway car depots <i>Y. Nagasaki & S. Takahashi</i>	585
Applying multiscaling analysis to detect capacity resources in railway networks <i>A. Gille, M. Klemenz & Th. Siefer</i>	595
TTPLib 2008 – a library for train timetabling problems <i>B. Erol, M. Klemenz, T. Schlechte, S. Schultz & A. Tanner</i>	605

Section 9: Level crossings and obstacle detection

Obstacle recognition from forward view images from trams <i>H. Miyayama, T. Ohya, T. Katori & T. Izumi</i>	617
The methodology development of railway level crossing safety systems – South Australia case study <i>S. Z. Ishak, W. L. Yue & S. V. C. Somenahalli</i>	629

Section 10: Computer techniques

The multi-agent programming paradigm use for railway applications <i>F. M. Rachel & P. S. Cugnasca</i>	641
---	-----

Train control language – teaching computers interlocking <i>J. Endresen, E. Carlson, T. Moen, K. J. Alme, Ø. Haugen, G. K. Olsen & A. Svendsen</i>	651
---	-----

Section 11: Dynamics and wheel/rail interface

Study on the influence of track conditions on dynamic wheel load variation <i>Y. Kawasaki, M. Miwa & A. Yoshimura</i>	663
Dynamic vehicle response on horizontal curves equivalent to turnout curves through Swedish UIC60 turnouts <i>B. Kufver & O. Rydell</i>	673
Digital inertial algorithm for recording track geometry on commercial shinkansen trains <i>M. Kobayashi, Y. Naganuma, M. Nakagawa & T. Okumura</i>	683
Simulation of railway track deterioration influenced by ballast stiffness and dry friction <i>J. Drożdźiel & B. Sowiński</i>	693
A study on the evaluation method of the characteristics of the contact point between wheel and rail <i>M. Adachi & T. Shimomura</i>	703
Influence of vehicle unsprung-mass on dynamic wheel load <i>M. Miwa, Y. Kawasaki & A. Yoshimura</i>	715
Characteristic identification of oil dampers for railway vehicles using Neural Networks <i>R. Koganei, K. Sasaki & N. Watanabe</i>	725
<i>TrainDy</i> , a new UIC simulator for the longitudinal dynamics of trains <i>L. Cantone, L. Müller, D. Negretti & V. Vullo</i>	735
On the evaluation of wheel sets and railway track quality <i>R. Bogacz, P. Meinke & B. Zajac</i>	745

Section 12: Maintenance

Efficient maintenance strategy through System Dynamics <i>T. Böhm, K. Beck, A. Knaak & B. Jäger</i>	755
A model for the life expectancy of railway switches and crossings for maintenance and renewal planning in asset management systems <i>W.-J. Zwanenburg</i>	765

Section 13: Rolling stock

Measurement of vehicle ground speed with inertia sensors – computation issues <i>T. X. Mei & H. Li</i>	777
The connected IP train and interdependent integration at the control centre <i>V. Scinteie</i>	787
Visualization study of the influence of parapets on the flow around a train vehicle under cross winds <i>M. A. Barcala & J. Meseguer</i>	797
A computer tool for automatic braking distance calculation <i>C. Sicre, A. P. Cucala, A. Fernández & L. Cano</i>	807

Section 14: Training tools and technology

Technical development at the 2TRAIN project <i>J. M. Mera, L. Brue, M. Hintenender, A. Gil & L. M. Gutierrez</i>	819
The use of computer-based training tools in Europe – an overview and new approaches <i>M. Schmitz, C. Maag & J. M. Mera</i>	829
The new driving and faults solving simulator for the Madrid light rail system <i>L. M. Gutierrez, J. M. Mera, E. Castellote, A. Garcerán & F. Ariza</i>	839
Simulation of the ASFA system in an ERTMS simulator <i>I. Gómez-Rey, J. M. Mera & A. Lorenzo</i>	853
Author Index	865