

Editorial Board

Simone Diniz Junqueira Barbosa

*Pontifical Catholic University of Rio de Janeiro (PUC-Rio),  
Rio de Janeiro, Brazil*

Phoebe Chen

*La Trobe University, Melbourne, Australia*

Alfredo Cuzzocrea

*ICAR-CNR and University of Calabria, Italy*

Xiaoyong Du

*Renmin University of China, Beijing, China*

Joaquim Filipe

*Polytechnic Institute of Setúbal, Portugal*

Orhun Kara

*TÜBİTAK BİLGEM and Middle East Technical University, Turkey*

Tai-hoon Kim

*Konkuk University, Chung-ju, Chungbuk, Korea*

Igor Kotenko

*St. Petersburg Institute for Informatics and Automation  
of the Russian Academy of Sciences, Russia*

Dominik Ślęzak

*University of Warsaw and Infobright, Poland*

Xiaokang Yang

*Shanghai Jiao Tong University, China*

Jerzy Mikulski (Ed.)

# Telematics in the Transport Environment

12th International Conference  
on Transport Systems Telematics, TST 2012  
Katowice-Ustroń, Poland, October 10–13, 2012  
Selected Papers

 Springer

Volume Editor

Jerzy Mikulski  
Silesian University of Technology  
Faculty of Transport  
Kraśińskiego 8  
40-019 Katowice, Poland  
E-mail: jerzy.mikulski@polsl.pl

ISSN 1865-0929

e-ISSN 1865-0937

ISBN 978-3-642-34049-9

e-ISBN 978-3-642-34050-5

DOI 10.1007/978-3-642-34050-5

Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012948416

CR Subject Classification (1998): H.4.2, I.6.3-7, I.2.6, I.2.10, K.4.3, J.1, J.2, C.4, H.2.7

© Springer-Verlag Berlin Heidelberg 2012

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

*Typesetting:* Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Preface

Transport telematics are the systems using the information and communication technologies in the area of infrastructure and of means of transport and its participants. An intelligent transport covers systems that allow, through the data transmission and analysis, to influence the behaviour of road users and the action of technical elements in means of transport or along the traffic route. Intelligent transport systems - in accordance with the European Directive - are used for the transport management informatisation. The research shows that the use of telematics can significantly increase the efficiency of the transport system, the road safety and the environmental protection.

Solutions for intelligent transport systems are undergoing rapid technological development, and at the same time they are at the stage of intensive dissemination. The design and development of telematic transport systems is a new integrated approach to solving the transportation problems. Transport telematics offers large opportunities to strengthen the positive characteristics of transport (accessibility, mobility), while simultaneously minimizing its negative impacts (environmental pollution, energy consumption, accidents, infrastructure costs) without incurring large investment expenses.

The implementation of traffic management systems faces many problems. The principal one is the lack of an ITS architecture and standards, and also helpful descriptions of best practices are missing. Paradoxically, this situation could create the opportunity to quickly overcome the delays through the construction of entirely new transport management systems, instead of modernising only the existing ones. Transport institutions more and more eagerly reach for IT solutions because they help to manage the transport efficiently, what combined with good examples for sure will result in new good solutions.

The development, implementation and maintenance of intelligent transport systems is a complex interdisciplinary technical, organizational and financial project. We would like to introduce to you a unique opportunity that is the participation in a meeting of scientists and experienced persons dealing every day with issues of transport telematics. This book provides an overview of solutions being developed in the field of intelligent transportation systems, and includes theoretical and case studies in the countries of conference participants.

October 2012

Jerzy Mikulski

# Organization

## Organizers

- Department of Railway Engineering, Faculty of Transport, Silesian University of Technology, Poland
- Polish Academy of Sciences, Transport Committee, Poland
- Polish Association of Transport Telematics, Poland

## Co-organizers

- Faculty of Transport and Electrical Engineering, Radom University of Technology, Poland
- Faculty of Navigation, Gdynia Maritime University, Poland
- Faculty of Economics, University of Economics in Katowice, Poland
- Faculty of Social and Technical Sciences, Silesian School of Management in Katowice, Poland
- Faculty of Transport, Warsaw University of Technology
- Regional Centre of Road Traffic, Katowice, Poland
- Motor Transport Institute in Warsaw, Poland
- Railway Institute, Warsaw, Poland
- Civil Aviation Personnel Education Centre of Central and Eastern Europe, Poland

## Organizing Committee

Chair: J. Młyńczak

Members:

A. Białoń

P. Gorczyca

K. Kędziora

J. Łukasik

S. Surma

Secretary: R. Skowrońska

## Conference Took Place under the Patronage of

- Minister of Transport, Construction and Maritime Economy
- Rector of Silesian University of Technology
- Silesian Voivode
- Marshal of the Silesian Voivodeship
- Bogdan Marcinkiewicz, Member of European Parliament

## Scientific Program Committee

J. Mikulski – chairman	Silesian University of Technology, Polish Association of Transport, Telematics, Poland
E. Szychta - vice-chairman	Technical University of Radom, Poland
A. Weintrit - vice-chairman	Gdynia Maritime University, Poland
K. Banaszek	Polish Air Navigation Services Agency
R. Bańczyk	Regional Centre of Road Traffic, Poland
A. Bujak	Wroclaw School of Banking, Poland
M. Bukljaš Skočibušić	University of Zagreb, Croatia
K. Chwesiuk	Maritime University of Szczecin, Poland
M. Dado	University of Zilina, Republic of Slovakia
J. Dyduch	Technical University of Radom, Polish Academy of Sciences, Transport Committee, Poland
A. Fellner	Silesian University of Technology, Poland
W. Filipowicz	Gdynia Maritime University, Poland
M. Franeková	University of Zilina, Republic of Slovakia
V. Gavriluk	Dnipropetrovsk National University of Railway Transport, Ukraine
M. Holec	Gdynia Maritime University, Poland
A. Janota	University of Zilina, Republic of Slovakia
J. Januszewski	Gdynia Maritime University, Poland
Z. Józwiak	Maritime University of Szczecin, Poland
A. Kalašová	University of Zilina, Republic of Slovakia
D. Kevicky	University of Zilina, Republic of Slovakia
J. Kisilowski	Technical University of Radom, Poland
J. Klamka	Polish Academy of Sciences, Katowice Branch, Poland
B. Kos	University of Economics in Katowice, Poland
S. Krawiec	Silesian University of Technology, Poland
O. Krettek	RWTH Aachen, Germany
R. Krystek	Motor Transport Institute, Warsaw, Poland
J. Lewitowicz	Air Force Institute of Technology, Warsaw, Poland
A. Lewiński	Technical University of Radom, Poland
M. Luft	Technical University of Radom, Poland
B. Łazarz	Silesian University of Technology, Poland
Z. Łukasik	Technical University of Radom, Poland
J. Modelski	Warsaw University of Technology, Poland
G. Nowacki	Motor Transport Institute, Warsaw, Poland
S. Oszczak	University of Warmia and Mazury in Olsztyn, Poland
Z. Pietrzykowski	Maritime University of Szczecin, Poland
B. Piotrowski	Silesian Inspectorate of Road Transport, Katowice, Poland

K. Rástočný	University of Zilina, Republic of Slovakia
M. Siergiejczyk	Warsaw University of Technology, Poland
M. Sitarz	Silesian University of Technology, Poland
J. Spalek	University of Zilina, Republic of Slovakia
R. Srp	ITS&S Czech Republic
Z. Stotsko	Lviv Polytechnic National University, Ukraine
W. Suchorzewski	Warsaw University of Technology, Poland
M. Svítek	Czech Technical University in Prague, ITS&S Czech Republic
L. Szychta	Technical University of Radom, Poland
R. Tomanek	University of Economics in Katowice, Poland
A. Tomasik	The Upper Silesian Aviation Group (GTL), Poland
Z. Toš	University of Zagreb, Croatia
M. Walencik	Silesian School of Management, Katowice, Poland
R. Wawruch	Gdynia Maritime University, Poland
W. Wawrzyński	Warsaw University of Technology, Poland
K. Wilk	Silesian University of Technology
B. Wiśniewski	Maritime University of Szczecin, Poland
A. Wojciechowski	Motor Transport Institute, Warsaw, Poland
K. Wydro	University College of Technology and Business, Warsaw, Poland
E. Załoga	University of Szczecin, Poland
J. Żurek	Air Force Institute of Technology, Warsaw, Poland

## Referees

Gabriel Nowacki	Aleš Janota	Jerzy Mikulski
Kornel Wydro	Jakub Młyńczak	Zbigniew Pietrzykowski
Grzegorz Karoń	Stanisław Iwan	Mária Franekova

# Table of Contents

A Decision Support System for Real-Time Evacuation Management and Rescue Team Planning during Hazardous Events in Public Infrastructures . . . . .	1
<i>Iraklis Tsekourakis, Christos Orlis, Dimosthenis Ioannidis, and Dimitrios Tzovaras</i>	
The Analysis of Open Transmission Standards in Railway Control and Management . . . . .	10
<i>Andrzej Lewiński, Tomasz Perzyński, and Andrzej Toruń</i>	
Evaluation of Microsimulated Traffic Light Optimisation Using V2I Technology . . . . .	18
<i>Wolfgang Niebel, Oliver Bley, and Rüdiger Ebdndt</i>	
Electric Vehicle for the Students' Shell Eco-Marathon Competition. Design of the Car and Telemetry System . . . . .	26
<i>Kamil Sternal, Adam Cholewa, Wojciech Skarka, and Mirosław Targosz</i>	
Analysis of Chosen Aspects of a Two-Car Crash Simulation . . . . .	34
<i>Jarosław Zalewski and Jerzy Kisilowski</i>	
Theoretical Model and Activities to Change the Modal Split of Traffic . . . . .	45
<i>Grzegorz Sierpiński</i>	
Driver's Biocybernetic Monitoring and Early Warning System . . . . .	52
<i>Andrzej W. Mitas, Artur Ryguła, and Bartłomiej Pyciński</i>	
Delivering Payment Services through Manual Toll Collection System . . .	60
<i>Zbigniew Kasprzyk</i>	
Compass Made Good Correction with MTE . . . . .	69
<i>Włodzimierz Filipowicz</i>	
Data Flows in an Integrated Urban Freight Transport Telematic System . . . . .	79
<i>Stanisław Iwan and Krzysztof Malecki</i>	
Telematic Systems in Emergency Medical Services, Applied in Treatment of Acute Coronary Syndrome of STEMI Type . . . . .	87
<i>Tomasz Ilczak and Monika Mikulska</i>	



Profitability and Effectiveness of Transport Investments . . . . .	94
<i>Beata Bujna and Jerzy Mikulski</i>	
Installation of Rail Traffic Remote Control Systems in Terms of Profitability and Investment Effectiveness . . . . .	107
<i>Beata Bujna and Jerzy Mikulski</i>	
Integrated Vessel Traffic Management Systems in the Function of Inland Waterway Traffic Optimization . . . . .	117
<i>Mihaela Bukljas Skocibusic and Mato Brnardic</i>	
The Analysis of Transmission Parameters in Railway Cross Level Protection Systems with Additional Warning of Car Drivers . . . . .	124
<i>Andrzej Lewiński and Lucyna Bester</i>	
A Prototype of Economical and Universal On-board Events Recorder – A Black Box for Vehicles . . . . .	132
<i>Gabriel Nowacki and Anna Niedzicka</i>	
Selected Aspects of Message Transmission Management in ITS Systems . . . . .	141
<i>Marek Sumiła</i>	
Computational Algorithms Implemented in Marine Navigation Electronic Systems . . . . .	148
<i>Adam Weintrit and Piotr Kopacz</i>	
Application of Closed Circuit Television for Highway Telematics . . . . .	159
<i>Miroslaw Siergiejczyk, Jacek Paś, and Adam Rosiński</i>	
Theoretical and Practical Investigations of Railway Switch Drives . . . . .	166
<i>Jakub Młyńczak and Jerzy Lukasiak</i>	
Determination of the Course of Pressure in an Internal Combustion Engine Cylinder with the Use of Vibration Effects and Radial Basis Function – Preliminary Research . . . . .	175
<i>Piotr Czech</i>	
Problems of ITS Architecture Development and ITS Implementation in Upper-Silesian Conurbation in Poland . . . . .	183
<i>Grzegorz Karoń and Jerzy Mikulski</i>	
Can the Increasing of Energy Consumption of Information Interchange Be a Factor That Reduces the Total Energy Consumption of a Logistic Warehouse System? . . . . .	199
<i>Andrzej Bujak and Paweł Zajac</i>	
Attenuation Measurements of Overvoltages on Contact Line . . . . .	211
<i>Andrzej Białoń</i>	

Geometrical Determinants of Car Equivalents for Heavy Vehicles Crossing Circular Intersections . . . . .	221
<i>Elżbieta Macioszek</i>	
Development of Telematic System Solution for Public Transport Sustainability . . . . .	229
<i>Antons Patlins and Nadezhda Kunicina</i>	
A Proposed Model of Extended Coordination for the Traffic Light Control at Intersections . . . . .	240
<i>Filip Tresler</i>	
How the Ionosphere Affects Positioning Solution Using Terrestrial and Satellite Navigation Systems? . . . . .	249
<i>Jacek Januszewski</i>	
The Benefits of Cloud Computing in the Maritime Transport . . . . .	258
<i>Jolanta Jozczuk-Januszevska</i>	
The FTTD Method Application to the Safety Analysis of Changeable Block Distance System . . . . .	267
<i>Jan Magott, Andrzej Lewiński, Piotr Skrobaneek, and Andrzej Toruń</i>	
Development of Cellular Automata for Simulation of the Crossroads Model with a Traffic Detection System . . . . .	276
<i>Krzysztof Malecki and Stanisław Iwan</i>	
Marine Integrated Navigational Decision Support System . . . . .	284
<i>Zbigniew Pietrzykowski, Piotr Borkowski, and Piotr Wolejsza</i>	
UML – A Part of an Interlocking System Development Process . . . . .	293
<i>Karol Rástočný and Karol Rástočný Jr.</i>	
Approaches to a Solution of Key Management System for Cryptography Communications within Railway Applications . . . . .	301
<i>Mária Franeková and Marek Výrostko</i>	
Changes in System of Civil Aviation Protection . . . . .	314
<i>Piotr Uchroński</i>	
Development of the Coastal and Global Ships Traffic Monitoring Systems . . . . .	319
<i>Ryszard Wawruch</i>	
Efficiency of Induction Heating of Rails with Oblong Heaters . . . . .	328
<i>Leszek Szychta, Elżbieta Szychta, and Kamil Kiraga</i>	
Marine and Offshore Telematics Systems . . . . .	334
<i>Adam Weintrit</i>	

Some Specific Activities at the Railway Signalling System Development .....	349
<i>Karol Rástočný, Juraj Ždánsky, and Peter Nagy</i>	
Assessing Transport Telematic Systems in Terms of Data Services Quality .....	356
<i>Miroslaw Siergiejszyk</i>	
Traffic Flow Analysis Based on the Real Data Using Neural Networks .....	364
<i>Teresa Pamula</i>	
Background Suppression for Video Vehicle Tracking Systems with Moving Cameras Using Camera Motion Estimation .....	372
<i>Przemyslaw Mazurek and Krzysztof Okarma</i>	
Using Neural Networks for Route and Destination Prediction in Intelligent Transport Systems .....	380
<i>Tomáš Mikluščák, Michal Gregor, and Aleš Janota</i>	
A New Approach to Road Safety in Slovakia .....	388
<i>Alica Kalašová, Ľubomír Černický, and Milan Hamar</i>	
Safety and Functionality Assessment of Railway Applications in Terms of Software .....	396
<i>Peter Lüley, Mária Franeková, and Marek Hudák</i>	
Monitoring System of Vibration Propagation in Vehicles and Method of Analysing Vibration Modes .....	406
<i>Rafał Burdzik</i>	
Identification of Leakages in the Inlet System of an Internal Combustion Engine with the Use of Wigner-Ville Transform and RBF Neural Networks .....	414
<i>Piotr Czech</i>	
Implementation and Managing of Innovation in the Conditions of Legal and Economic Constraints on the Based of Rail Transport .....	423
<i>Adam Jabłoński and Marek Jabłoński</i>	
<b>Author Index</b> .....	433