APPLICATIONS OF MATHEMATICS IN ENGINEERING AND ECONOMICS (AMEE '11)

Proceedings of the 37th International Conference

Sozopol, Bulgaria 8 – 13 June 2011

EDITORS

George Venkov Technical University of Sofia, Faculty of Applied Mathematics and Informatics, Bulgaria

Ralitza Kovacheva Technical University of Sofia, Faculty of Applied Mathematics and Informatics, Bulgarian Academy of Sciences, and Institute of Mathematics and Informatics, Bulgaria

Vesela Pasheva Technical University of Sofia, Faculty of Applied Mathematics and Informatics, Bulgaria

All papers have been peer reviewed.

SPONSORING ORGANIZATION

Department of Scientific Research at the Technical University of Sofia



Melville, New York, 2011 AIP | CONFERENCE PROCEEDINGS ■ 1410

Editors

George Venkov Technical University of Sofia Faculty of Applied Mathematics and Informatics 8, Kliment Ohridski Blvd. 1000 Sofia Bulgaria

Vesela Pasheva Technical University of Sofia Faculty of Applied Mathematics and Informatics

E-mail: gvenkov@tu-Sofia.bg

Ralitza Kovacheva Technical University of Sofia Faculty of Applied Mathematics and Informatics 8, Kliment Ohridski Blvd. 1000 Sofia and Bulgarian Academy of Sciences Institute of Mathematics and Informatics 1113 Sofia Bulgaria

8, Kliment Ohridski Blvd. 1000 Sofia Bulgaria

E-mail: vvp@tu-Sofia.bg

E-mail: rkovach@math.bas.bg

Authorization to photocopy items for internal or personal use, beyond the free copying permitted under the 1978 U.S. Copyright Law (see statement below), is granted by the American Institute of Physics for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$30.00 per copy is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923, USA: http://www.copyright.com. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Services is: 978-0-7354-0984-2/11/\$30.00

© 2011 American Institute of Physics

No claim is made to original U.S. Government works.

Permission is granted to quote from the AIP Conference Proceedings with the customary acknowledgment of the source. Republication of an article or portions thereof (e.g., extensive excerpts, figures, tables, etc.) in original form or in translation, as well as other types of reuse (e.g., in course packs) require formal permission from AIP and may be subject to fees. As a courtesy, the author of the original proceedings article should be informed of any request for republication/reuse. Permission may be obtained online using RightsLink. Locate the article online at http://proceedings.aip.org, then simply click on the RightsLink icon/"Permissions/ Reprints" link found in the article abstract. You may also address requests to: AIP Office of Rights and Permissions, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502, USA; Fax: 516-576-2450; Tel.: 516-576-2268; E-mail: rights@aip.org.

L.C. Catalog Card No. 2011941306 ISBN 978-0-7354-0984-2 (Original Print) ISSN 0094-243X Printed in the United States of America

AIP Conference Proceedings, Volume 1410 Applications of Mathematics in Engineering and Economics Proceedings of the 37th International Conference

Table of Contents

 Preface: Applications of Mathematics in Engineering and Economics (AMEE '11) - Proceedings of the 37th International Conference George Venkov, Ralitza Kovacheva, and Vesela Pasheva 	1
Organizing Committees	3
MATHEMATICAL MODELING	
Oscillations of a hybrid system with resistance B. Cheshankov	7
Model and predictive control for a wind turbine B. Gilev, J. Slavchev, D. Penev, and A. Yonchev	15
An analytical study of the dual mass mechanical system stability Svetoslav Nikolov, Petko Sinapov, Ivan Kralov, and Ignat Ignatov	24
Finite element analysis of a wind turbine response when the tower and the blades are modeled as distributed parameter systems V. Pasheva, Y. Slavchev, and G. Venkov	32
Mode III crack problems in functionally graded piezoelectric/piezomagnetic composites by BIEM Yonko D. Stoynov	40

NUMERICAL METHODS

First instances of generalized expo-rational finite elements on	
triangulations	
Lubomir T. Dechevsky, Peter Zanaty, Arne Lakså, and Børre Bang	49

Multivariate hermite interpolation on scattered point sets using tensor- product expo-rational B-splines ^{0.0}	
Lubomir T. Dechevsky, Børre Bang, Arne Lakså, and Peter Zanaty	62
An approach to accelerate iterative methods for solving nonlinear operator equations	
Gyurhan H. Nedzhibov	76
Wavelet-based lossless one- and two-dimensional representation of multidimensional geometric data	
Joakim Gundersen	83
Comparison between polynomial, Euler Beta-function and expo-rational	
b-spline bases Arnt R. Kristoffersen, Lubomir T. Dechevsky, Arne Lakså, and Børre Bang	98
Conservative finite difference schemes to a nonlinear parabolic system of	
cancer invasion Mikhail K. Kolev and Lubin G. Vulkov	111
Efficient numerical method for solving Cauchy problem for the Gamma	
equation Miglena N. Koleva	120
First instances of univariate and tensor-product multivariate generalized expo-rational finite elements	
Lubomir T. Dechevsky and Peter Zanaty	128
A two-level second-order finite difference scheme for the single term structure equation	
T. Chernogorova and R. Valkov	139
Matrix-vector multiplication in adaptive wavelet methods	
Dana Černá and Václav Finěk	147

DIFFERENTIAL EQUATIONS AND APPLICATIONS

Uniqueness and symmetry of minimizers to repulsive nonlocal	
functionals	
Hristo Genev and George Venkov	155

Operational calculi for multidimensional nonlocal evolution boundary value problems	
Ivan H. Dimovski and Yulian T. Tsankov	167
Boundary value problems with integral conditions L. I. Karandzhulov and N. D. Sirakova	181
On the number of periodical solutions of a class of autonomous systems Maya Raeva	189
Classical and weak solutions for two models in mathematical finance Tihomir B. Gyulov and Radoslav L. Valkov	195
Comparison results for some equations under several boundary	
Z. Petrova	203
MATHMATICAL ANALYSIS AND APPLICATIONS	
Constructions of rational surfaces in the three-sphere Georgi H. Georgiev	213
Some special spaces of analytic functions and sequence spaces I. P. Dimitrov	221
Problems in hypercomplex analysis over some matrix hypercomplex	
systems Lilia N. Apostolova, Stancho Dimiev, Marin S. Marinov, and Peter Stoev	229
Some estimates for real functionals in finite-dimensional spaces Todor Stoyanov	241
Fractional order differential and integral equations with Erdélyi-Kober operators: Explicit solutions by means of the transmutation method Virginia S. Kiryakova	247
Definition of the α-Mellin transform and some of its properties Yanka Nikolova	259
Transitive properties of some partial differential operators Vladimir Todorov	267

OPERATIONS RESEARCH

Licensing in an international triopoly Fernanda A. Ferreira and Flávio Ferreira	273
Desirable role in a price-setting international mixed duopoly Fernanda A. Ferreira and Flávio Ferreira	281
Model based predictive control of thermal comfort for integrated building system Tz. Georgiev, T. Jonkov, E. Yonchev, and D. Tsankov	288
Optimal dynamic advertising strategy under age-specific market segmentation	296
ALGEBRA, SCIENTIFIC COMPUTING, AND E-LEARNING	270
Software development of XML parser based on algebraic tools Bozhidar Georgiev and Adriana Georgieva	305
Semigroups and computer algebra in finite discrete structures G. Bijev	311
Marks of change in sequences H. Jürgensen	319
New public key cryptosystem based on semirings and semimodules Ivan D. Trendafilov and Mariana I. Durcheva	331
Theoretical graph approach for research of the sparse linear	
underdetermined systems to the sensor location problem L. A. Pilipchuk, Y. H. Pesheva, and T. S. Vishnevetskaya	339
I incorproblems of antimization of non-homogeneous flows in the	
generalized network L. A. Pilipchuk, Y. H. Pesheva, and T. S. Vishnevetskaya	346
Security of data stored in information systems of Rubgarian municipal	
administrations	
Petko Kapralyakov	352

Experimental method for register of the deformations G. Todorova and S. Baeva	358
Method of accelerating complex SQL requests Peter Spaskovsky	367
Mathematical education in the Bulgarian technical universities Mihail Konstantinov and Vesela Pasheva	375
List of Participants	389
Author Index	395