Editors:
Prof. Metin Demiralp , Istanbul Technical University, Turkey
Prof. Constantin Udriste, University Politehnica of Bucharest, Romania
Prof. Gabriella Bognar, University of Miskolc, Hungary
Prof. Ritu Soni, GNG College, Santpura, Yumuna Nagar, Haryana, India
Prof. Hamed Nassar, Suez Canal University, Ismailia, Egypt

Associate Editors:
Prof. Abdullah Altin, Ankara University, Ankara, Turkey
Prof. Ekrem Duman, Dogus University, Istanbul, Turkey

APPLIED MATHEMATICS for SCIENCE and ENGINEERING

Published by WSEAS Press
www.wseas.org

Proceedings of the 12th WSEAS International Conference on APPLIED MATHEMATICS

Mathematics and Computers in Science and Engineering
A Series of Reference Books and Textbooks

Cairo, Egypt, December 29-31, 2007

ISBN: 978-960-6766-27-5
ISSN: 1790-2769

APPLIED MATHEMATICS
for SCIENCE and ENGINEERING

Proceedings of the 12th WSEAS International Conference on APPLIED MATHEMATICS

Cairo, Egypt, December 29-31, 2007

Mathematics and Computers in Science and Engineering
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

ISSN: 1790-2769
ISBN: 978-960-6766-27-5

APPLIED MATHEMATICS
for SCIENCE and ENGINEERING

Proceedings of the 12th WSEAS International Conference on APPLIED MATHEMATICS

Mathematics and Computers in Science and Engineering
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

ISSN: 1790-2769
ISBN: 978-960-6766-27-5

World Scientific and Engineering Academy and Society

APPLIED MATHEMATICS for SCIENCE and ENGINEERING

Proceedings of the 12th WSEAS International Conference on APPLIED MATHEMATICS

Cairo, Egypt, December 29-31, 2007

Maria Giuseppina Bruno, ITALY
Ernesto Castellanos-Velasco, MEXICO
Yung-Fu Chen, TAIWAN
Kuentai Chen, TAIWAN
Xin Chen, USA
Younhee Choi, CANADA
Yuk Ying Chung, AUSTRALIA
Lucian-Ionel Cioca, ROMANIA
Elise de Doncker, USA
Nelson Nery de Oliveira Castro, BRAZIL
Christopher Doss, USA
Jean-Pierre Ezin, BENIN
Morris Abraham Gnanamuthu Ezra, MALAYSIA
Giuseppe Fedele, ITALY
Yi Feng, CANADA
William Fornaciari, ITALY
Jiacai Fu, CHINA
Terje Gjengedal, NORWAY
Wanwu Guo, AUSTRALIA
Maneesha Gupta, INDIA
Tsai-Ming Hsieh, TAIWAN
Shyh-Jier Huang, TAIWAN
Fumiaki Imado, JAPAN
Yuan Jiahai, CHINA
Jiang Jing, CHINA
Stratis Kanarachos, GREECE
Michael Katehakis, USA
Devinder Kaur, USA
Min-Soo Kim, KOREA
Jaejoon Kim, KOREA
Seongjai Kim, USA
Seok-Bum Ko, CANADA
Arun Kulkarni, USA
Keon Myung LEE, KOREA
Jianfeng Li, CHINA
Yuan-horng Lin, TAIWAN
Anne Mangeney, USA
Aurelio Medina, MEXICO
Luis Humberto Mendoza-Huizar, MEXICO
Bugaru Mihai, ROMANIA
Joydeep Mitra, USA
Stella Morris, MALAYSIA
Panjit Musik, THAILAND
Jatinder Ohri, INDIA
Linet Ozdamar, TURKEY
Jan Panus, CZECH REPUBLIC
Dana Petcu, ROMANIA
Pedro Ponce Cruz, MEXICO
Ali Pouyan, IRAN
Poramate Pranayanuntana, THAILAND

Preface

The book you are currently holding contains the proceedings of the 12th WSEAS International Conference on APPLIED MATHEMATICS which was held in Cairo, Egypt, December 29-31, 2007

The WSEAS Conference on APPLIED MATHEMATICS has a great history. It was held for first time in 2000 in Vravrona, Attica, Greece, while in 2001, the society gave it to Cairns, Australia and in 2002 in Miedzyzdroje, Poland. We brought again the conference in Mediterranean area in 2003 (Malta). Since 2004, we have two conferences in Applied Mathematics per year, so, MATH 2004 - I: Miami, Florida, USA and MATH 2004 -II: Corfu, Greece, MATH 2005 - I: Cancun, Mexico, MATH 2005 -II: Tenerife, Spain, MATH 2006 - I: Istanbul, Turkey, MATH 2006 -II: Dallas, Texas, USA, MATH 2007 - I: Dallas, Texas, USA and this is MATH 2007 -II: Cairo Egypt.

Starting from 2008, we establish the American Conference on Applied Mathematics and so the Conference on Applied Mathematics will be held once per year.

Browsing this volume you can enjoy new, original, fresh ideas on mathematical applications, new numerical schemes, new efficient algorithms from many laboratories from important universities and research centers.

The Book is composed by seven parts. In part I, you can read very interesting topics and applications of Differential Equestions, while in Part II we have selected 3 important papers related to Algorithms theory. In Part III, we start with the Special Session: Theory of Approximation and Orthogonal Polynomials: Smoothing and Approximation of Functions and Properties of Orthogonal polynomials and their Generating Functions of Abdullah Altin and. Ogen Dogru and we continue with several other high-quality contributions. The Part IV is dedicated to modern Optimization techniques, while the Part V investigates methods of Discrete Mathematics and applications. An important part (Part VI) with many excellent papers is dedicated on the Theory and Application af Probabilities, Statistics & Oprational Research, where we have the Special Session: Industrial Applications of Operations Research (Organized by Ekrem Duman, with Co-Chairmen M.Bayram Yildrim, Fusun Ulengin and Ahmet Ceranoglu). We close the volume with a Part (Part VII) on Educational Topics of Mathematics and Educational Technologies.

The MATH 2007 –II (Cairo, Egypt, December 2007) aims to disseminate the latest research and applications in the afore mentioned fields. The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports** . Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

We would like to address to each of you a warm invitation for the WSEAS Conferences of February 2008 (that will be held in the University of Cambridge) where our "father" Prof. **Lotfi A. Zadeh** will be for 4th time Plenary Speaker in a WSEAS Congress presenting the Plenary Lecture: *"Toward Human-Level Machine Intelligence"*. Details: **http://www.wseas.org/conferences/2008/cambridge/aiked/Plenary1.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: www.worldses.org/indexes.

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in these conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal).

We cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

The Editors

Plenary Lecture I

On the Solutions of Differential Equations Involving p-Laplacian and Pseudolaplacian

Professor Gabriella Bognar
University of Miskolc, Hungary
matvbg@uni-miskolc.hu

Abstract:

The investigation of qualitative properties of nonlinear second order differential equations has a long history. We recall the papers of Emden [1907] and Fowler [1930].

In this talk we deal with the basic properties of solutions of the nonlinear second order differential equation

$$(r(t)\ |x'|^{p-2}x')'^{p-1} + (c(t)\ |x|^{p-2}x)^{p-1} = 0, \quad p > 1, \tag{1}$$

where r, c are continuous functions and $r(t) > 0$ in the interval under consideration. The invetigation of solutions of (1) has attracted considerable attention in the last two decades, and it was shown that the solutions of this equation behave in many aspects like those of the Sturm-Liouville equation

$$(r(t)x')' + c(t)x = 0, \tag{2}$$

which is the special case of (1) when $p = 2$. Our aim is to show similarities in qualitative behavior of solutions of (1) and (2), we also point out phenomena where properties of solutions of (1) and (2) differ. Equation (1) is often called half-linear one. This term is motivated by the fact that the solution set of (1) preserves just one half of the properties which characterize linearity, namely homogenity but not additivity.

A particular attention is devoted to the results on boundary value problems associated with (1).

Similarly to the boundary value problems for half-linear ordinary differential equations, also partial differential equations with p-Laplacian are treated in many papers. Recall that the p-Laplacian is the partial differential operator

$$\Delta_p u(x) := \nabla(||\nabla u(x)||^{p-2}\nabla u(x)), \quad x = (x_1, \dots, x_N) \in \mathbf{R}^N, \tag{3}$$

where $\nabla := \sum_{k=1}^{N} \frac{\partial}{\partial x_k}$ is the usual divergence operator and $\nabla u(x) = \left(\frac{\partial u}{\partial x_1}, \dots, \frac{\partial u}{\partial x_N}\right)$ is the Hamilton nabla operator and $\|.\|$ denotes the Euclidean norm in $\mathbf{R}^N$.

Another partial differential equation which reduces to half-linear equation (1) in the "ordinary" case is the partial differential equation with the so-called pseudolaplacian

$$\tilde{\Delta}_p u := \sum_{i=1}^{N} \frac{\partial}{\partial x_i}\left(\left|\frac{\partial u}{\partial x_i}\right|^{p-2}\frac{\partial u}{\partial x_i}\right). \tag{4}$$

We show some properties of the solutions of the partial differential equations involving p-Laplacian or pseudolaplacian.

Numerical experiments of some examples will be presented.

Brief Biography of the speaker: Not available, contact **matvbg@uni-miskolc.hu**

Plenary Lecture II

Multi-Time Optimal Control

Professor Constantin Udriste
University Politehnica of Bucharest
Faculty of Applied Sciences
Department of Mathematics, Splaiul Independentei 313
Bucharest 060042, Romania

Abstract: This lecture joins some concepts (adjointness, Hamiltonian systems, duality, Riemannian manifolds) that appears in Mechanics, Field Theory, Differential Geometry, and Control Theory in order to create a multi-time maximum principle.Near the classical theory we introduce new types of Euler-Lagrange or Hamilton PDEs for optimal control problems with performance criteria involving curvilinear or multiple integrals and evolutions of multidimensional flow type. The main novel feature of the anti-trace multi-time Euler-Lagrange or Hamilton PDEs is that they are connected to the multi-time maximum principle. The topics include: variational calculus with gradient variations and curvilinear or multiple integral functionals, properties of multi-time Euler-Lagrange operator (changing of the Lagrangian by addition and multiplication, anti-trace multi-time Euler-Lagrange PDEs and new conservation laws), the conversion to multi-time Hamilton PDEs (canonical variables, first kind and second kind of anti-trace multi-time Hamilton PDEs), the multi-time maximum principle approach of anti-trace multi-time Euler-Lagrange or Hamilton PDEs.

Brief Biography of the speaker: Constantin Udriste was born in Turceni, Gorj, Romania on January 22, 1940. He earned his professor title from University of Timisoara in 1963 and his PhD from University Babes-Bolyai from Cluj-Napoca in 1971. Now he is Full Professor of Mathematics and Dean of the Faculty of Applied Sciences at University Politehnica of Bucharest. Also it is President of Balkan Society of Geometers.

Professor Udriste has served on many advisory committees and editorial boards, and was the main organizer of over 10 International Mathematical Meetings. He is author and contributor of over 40 books, over 200 articles to mathematical journals and over 200 papers to mathematical meetings. Topics: group of motion, properties of the tangent bundle, almost coquaternion metric manifolds, variational calculus on Riemannian manifolds, Finsler-Lagrange-Hamilton manifolds, Riemannian convexity and optimization, magnetic dynamical systems, geometric dynamics and optimal control, the theory of spatial mechanisms, solar tower concentrator. A person of incredible energy and entusiasm, Udriste has trained 12 PhD students, many of whom are now faculty members. Prof. Udriste has been the recipient of the following honors and awards: Dragomir Hurmuzescu Prize, Academy of Romania, 1985; Award for Distinguished Didactic and Scientific Activity, Ministry of Education and Instruction of Romania, 1988; Correspondent Member of the Academia Peloritana dei Pericolanti, 1997-; Member Research Board of Advisors, ABI, 1999-. Prize COPIRO - 2000 for Exact Sciences; Premio Anassilaos International 2002, Arte Cultura Scienze.

Plenary Lecture III
Recent Developments In The Fluctuation Expansion Of Univariate Functions' Matrix Representations

Professor Metin Demiralp
Informatics Institute
Istanbul Technical University
ITU Bilisim Enstitusu Ayazaga Yerleskesi
Maslak, 34469, Istanbul, Turkey

Abstract: The matrix representations of univariate or multivariate functions play important roles in many mathematical applications of sciences and in many engineering problems. They are mostly employed to truncate infinite dimensional problems for approximations. The residual terms can be, in principle, suppressed as long as there is convergence which depends on the choice of the basis set of the Hilbert space constructed for the problem under consideration. The best basis set choice, of course, is the one which diagonalizes the matrix representation. However it is the main difficulty in these problems. Hence, a new way is needed to reflect the omitted terms' contributions to the truncated matrix representation. This has been done, at least, in one way which is called "Fluctuation Expansion". A very important practical fact is revealed through this new concept: "A truncated matrix representation of a univariate function can be efficiently approximated, within quite high precision, by a matrix which is the image of the independent variable's same type truncated matrix representation under the considered univariate function". This is called Fluctuationless Approximation. The fluctuationless approximation can also be improved by adding correction terms which contain certain type universal matrices, fluctuation matrices. The construction of these terms was quite cumbersome and containing infinite series which cause new trun- cation errors. Our recent efforts have changed this undesirable structures to compact analytical ones by using Cauchy theorem of complex analysis through certain appropriate operator argumented contour integrals. The geometric series expansion of the kernels of these integrals, and, the separation to rather simple matrix inverses and the going back via Cauchy theorem again enable us to get compact formulae for the fluctuation involving correction terms. This presentation focuses on certain level details of this procedure.

Brief Biography of the speaker: Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was all in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he is working on methodology for computational sciences. He has a group (Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute). He collaborated with the Prof. H. A. Rabitz's group at Princeton University (NJ, USA) at summer and winter semester breaks during the period 1985--2003 after his 14 months long postdoctoral visit to same group in 1979--1980.Metin Demiralp has roughly 70 papers in well known scientific journals and is the full member of Turkish Academy of Sciences ince 1994. He is also a member of European Mathematical Society and the chief--editor of WSEAS Transactions on Mathematics currently. He has also two important awards of Turkish scientific establishments.

Plenary Lecture IV
Extended Surfaces Heat Transfer Processes – Class of Approximate and Exact Solutions

Professor Andris Buikis
Institute of Mathematics and Computer Science
University of Latvia, Raina bulv. 29, Riga, LV1459, LATVIA
E-mail: buikis@latnet.lv

Abstract: Systems with extended surfaces (with fins and/or spines) have very broad field of applications: from space apparatus, engines, conditioners, fridges etc. to cooling systems for microchips of PC. From praxis point of view the mathematical description (mathematical models) must be formulated as conjugated problem. In other words, the determination of temperature fields in solid system with extended surfaces can't be disconnected from the calculation of the temperature and hydrodynamic fields in the flowing around of the system media (gas or fluid). It means that the boundary conditions on the surface of the system are essentially non-homogeneous. In this talk there is presented an original (based on the Green function's method) approach for the determination of the exact solutions in the systems with extended surfaces of quite complicated geometrical and thermal structure. This approach is applicable for both - steady-state and transient processes and it reduces the problem for the partial differential equations to the system of the 2nd kind Fredholm integral equations (the number of integral equations is equal to the number of canonical elements in the systems with extended surfaces).

Brief Biography of the speaker: From **http://www.lza.lv/scientists/buikis.htm** Experience: Junior Researcher, Senior Researcher, Computing Centre, University of Latvia, 1962 - 1972 . Assistant Professor and Head of Chair of Applied Mathematics, Faculty of Physics and Mathematics, University of Latvia, 1972 - 1976 . Assistant Professor and Head of Chair of Differential Equations and Numerical Methods, Faculty of Physics and Mathematics, University of Latvia, 1976 - 1984 . Senior Researcher, Faculty of Physics and Mathematics, University of Latvia, 1984 - 1986 . Assistant Professor, Chair of Differential Equations and Numerical Methods, Faculty of Physics and Mathematics, University of Latvia, 1986 - 1988 . Senior Researcher, Head of Laboratory of Mathematical Physics, Institute of Physics, Latvian Academy of Sciences, 1988 - 1991 . Director, Institute of Mathematics, Latvian Academy of Sciences and Latvian University, 1991 - 1996; 2003 - . Head of Laboratory of Mathematical Physics and Head of Scientific Council, Institute of Mathematics, 1996 - . Director, Science and Dialogue Centre of Latvia, 1993 - . Head of Laboratory of Mathematical Physics (1996 -) and Head of Scientific Council (1996 – 2003), Institute of Mathematics, Latvian Academy of Sciences and Latvian University . Honours and Awards: Corresponding Member, Latvian Academy of Sciences, 1992 - 1997 . Full Member, Latvian Academy of Sciences, 1997 . The Latvian Academy of Sciences Piers Bohl Prize for a cycle of papers "Method of Conservative Averaging, Theory and Applications", 2005 . Member of Board, Soros Foundation - Latvia, 1997 . Head of "Spidola" Council, Culture Foundation of Latvia, 1987 - 1992 . Member of Board, Vidzemes University College, 1996 - 1998 . Professional Activties and Memberships: Member, Senate of the Latvian Academy of Sciences, 1994 - , Member, Vidzeme University College Advisory Board, 1997-2002, Vice-Chairman (in Mathematics), Latvian Council of Science Expert Committee on "Physics, Mathematics & Astronomy", 1991 - 1993 . Chairman, Promotion Council for Mathematics, 1992 - . Member, Editorial Advisory Board for Proceedings of the Latvian Academy of Sciences, 1988-1995 . Member, Editorial Advisory Board for Mathematical Modelling and Analysis, 1999- . Member, Editorial Advisory Board for Computational Methods in Applied Mathematics, 2000- . Member of Editorial Advisory Board, journal Mathematical Modelling

and Analysis (The Baltic Journal on Mathematical Applications, Numerical Analysis and Differential Equations), Lithuania, 1999- . Editor, Progress in Industrial Mathematics at ECMI 2002 , Springer . Member, Editorial Board for International Journal of Applied Mathematical Sciences (IJAMS), 2004 - . Member, Gesellschaft Angewandte Matematik und Mechanik, Germany 1991 - . Member, International Sociological Association, 1998-2002 . Member, Americal Mathematical Society, 1999 . Holder of state capital share at The Latvian Institute, 1998 -2004 . Member, American Mathematical Society, 1999 -

TABLE OF CONTENTS

AUTHOR INDEX