# 9TH INTERNATIONAL CONFERENCE ON MATHEMATICAL PROBLEMS IN ENGINEERING, AEROSPACE AND SCIENCES

ICNPAA 2012

Vienna, Austria 10 – 14 July 2012

### **EDITOR**

Seenith Sivasundaram Mathematics in Engineering, Science and Aerospace (MESA) ICNPAA 2012, Daytona Beach, Florida, USA

### All papers have been peer reviewed.

### **SPONSORING ORGANIZATIONS**

AIAA: American Institute of Aeronautics and Astronautics
IFIP: International Federation of Information Processing
IFNA: International Federation of Nonlinear Analysts
AIP: American Institute of Physics
StoDt: Wien: Vienna City Administration
Vienna Convention Bureau
Institute for Computer Languages Compilers and Languages Group
TU Wien: Vienna University of Technology



### **Editor**

Seenith Sivasundaram General Chair ICNPAA 2012 Mathematics in Engineering Science and Aerospace 104 Snow Goose Ct. Daytona Beach, FL 32119 USA

E-mail: seenithi@gmail.com

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: 978-0-7354-1105-0/12/\$30.00

© 2012 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.

# AIP Conference Proceedings, Volume 1493 9th International Conference on Mathematical Problems in Engineering, Aerospace and Sciences

## **ICNPAA 2012**

### **Table of Contents**

Preface: 9th International Conference on Mathematical Problems in Engineering, Aerospace	
and Sciences	
Seenith Sivasundaram	1
Committees and Sponsors	3
The μ-th root base of non-algebraic simple base of polynomials in Clifford setting M. Abul-Ez, D. Constales, and M. Zayed	7
Guaranteed control of feedback linearizable nonlinear object V. N. Afanasiev	13
Numerical modeling of Kelvin–Helmholtz instability by using potential equation Somayeh Ahmadi	20
<b>Boubaker polynomial approach for solving high-order linear differential-difference equations</b> Tuğçe Akkaya and Salih Yalçinbaş	26
The applications of GMRES method on Stokes problem solved by finite element method Omar Ali Aleyan	34
Method of boundary integral equations (BIEM) and generalized solutions of transient problems of thermoelastodynamics	
Bakhyt Alipova	39
Scattering theory for a Dirac type operator Franka Baaske and Swanhild Bernstein	47
Decentralized target geolocation for unmanned aerial vehicle with sensor bias estimation Kwangyul Baek and Hyochoong Bang	52
Aeroelastic flutter in axial flow-The continuum theory A. V. Balakrishnan and A. M. Tuffaha	58

A delay differential equations mathematical model for the immune response in leukemia S. Balea, A. Halanay, and D. Jardan	67
Existence of oscillatory solutions in the non simplified model  Agneta M. Balint and Stefan Balint	72
Avoiding oscillations by using an alternative flight controller  Agneta M. Balint and Stefan Balint	79
Hartman-Grobman decomposition when in presence of jumps in the relative degree of the dynamics in an energy harvesting device	
Luciano Barbanti, Berenice Camargo Damasceno, Célia Aparecida dos Reis, and Neusa A. Pereira da Silva	84
Cauchy-Stieltjes integral on time scales in banach spaces and hysteresis operators Luciano Barbanti and Berenice Camargo Damasceno	88
The solutions of partial differential equations with variable coefficient by Sumudu Transform Method	
Hasan Bulut, H. Mehmet Baskonus, and Seyma Tuluce	91
Nonlinear excited waves on the interventricular septum Naoaki Bekki, Yoshifumi Harada, and Hiroshi Kanai	96
Advances in the Natural transform F. B. M. Belgacem and R. Silambarasan	106
Solving special fractional differential equations by Sumudu transform Pranay Goswami and F. B. M. Belgacem	111
Numerical simulation of MEMS-based blade load distribution control in centrifugal compressor	
surge suppression Károly Beneda	116
Numerical modeling of the flow structures in the channels with T-junction Luděk Beneš, Petr Louda, and Radka Keslerová	124
3D flyable curves for an autonomous aircraft Yasmina Bestaoui	132
Numerical simulation of combustion processes in a gas turbine György Bicsák, Anita Hornyák, and Árpád Veress	140
Quasi-simultaneous interaction method for solving 2D boundary layer flows over plates and airfoils	
H. A. Bijleveld and A. E. P. Veldman	149

An optimal modeling of dynamics of perturbed columnar vortices by sensitivity analysis  Diana A. Bistrian	157
Parabolized instability study of two-dimensional swirling flows Diana A. Bistrian	163
Impact of pulsed blowing jet on aerodynamic characteristics of wind turbine airfoils  Andreea Bobonea	170
Recent advances in the numerical solution of conservative problems Luigi Brugnano and Felice Iavernaro	175
Chaos suppression in NEMs resonators by using nonlinear control design Angelo Marcelo Tusset, Atila Madureira Bueno, Claudinor Bitencourt Nascimento, Mauricio Dos Santos Kaster, and José Manoel Balthazar	183
Detection of total rotations on 2D-vector fields with geometric correlation Roxana Bujack, Gerik Scheuermann, and Eckhard Hitzer	190
In-flight detection and identification and accommodation of aircraft icing Fikret Caliskan and Chingiz Hajiyev	200
Identification and modeling of the electrohydraulic systems of the main gun of a main battle tank Luiz C. A. Campos and Luciano L. Menegaldo	207
Influence of axial loads on the nonplanar vibrations of cantilever beams  Eulher C. Carvalho, Paulo B. Gonçalves, Zenón Del Prado, and Giuseppe Rega	215
Simulation of an active solar energy system integrated in a passive building in order to obtain	
system efficiency Mihai C. Ceacaru	223
Forced oscillations with continuum models of atomic force microscopy Julio R. Claeyssen, Teresa Tsukazan, Leticia Tonetto, and Jose M. Balthazar	230
Flapping wing applied to wind generators Alexandra Colidiuc, Stelian Galetuse, and Bogdan Suatean	238
Introducing the fractional order robotic Darwinian PSO Micael S. Couceiro, Fernando M. L. Martins, Rui P. Rocha, and Nuno M. F. Ferreira	242
On the existence of a solution to a quasilinear elliptic system of the Lane, Emden and Fowler type Dragoş-Pătru Covei	252

On the existence and non-existence of radially symmetric solutions of a system of Schrödinger	
type	
Dragoş-Pătru Covei	256
Effective conductivity of a cincularly neutrupod neutralic two phase composite with important	
Effective conductivity of a singularly perturbed periodic two-phase composite with imperfect	
thermal contact at the two-phase interface	264
Matteo Dalla Riva and Paolo Musolino	264
A family of fundamental solutions for elliptic quaternion coefficient differential operators and	
application to perturbation results for single layer potentials	
M. Dalla Riva, J. Morais, and P. Musolino	269
Quenching in a non-ideal mechanical system and the Averaging Method	
Márcio José Horta Dantas, José Manoel Balthazar, and Jorge Luiz Palacios Felix	274
Effect of free-stream turbulence properties on boundary layer laminar-turbulent transition: A	
new approach	
Sakhr A. Darag and Vladimír Horák	282
Bifurcation characteristics of fractional reaction-diffusion systems	
Bohdan Datsko, Vasyl Gafiychuk, and Yuri Luchko	290
The Constitution of the Co	
The fractional-nonlinear robotic manipulator: Modeling and dynamic simulations	200
S. A. David, J. M. Balthazar, B. H. S. Julio, and C. Oliveira	298
Boundary value problems of explicit ordinary differential equations from probabilistic evolution	
perspective	
Metin Demiralp	306
A black box optimization approach to parameter estimation in a model for long/short term	
variations dynamics of commodity prices	
Alberto De Santis, Umberto Dellepiane, and Stefano Lucidi	312
On unstable periodic regime of small HAWT	
•	317
Marat Z. Dosaev, Liubov A. Klimina, Yury D. Selyutskiy, Mi-Ching Tsai, and Hong-Tzer Yang	317
Efficient polynomials based method for a temporal stability investigation in a swirling flow	
stability problem	
Florica Ioana Dragomirescu	322
Active and passive circulation control as enhancement techniques of wind turbines performance	
Al. Dumitrache, F. Frunzulică, H. Dumitrescu, and R. Mahu	330
Numarical approach of linear dalay difference equations with you also coefficients in towards	
Numerical approach of linear delay difference equations with variable coefficients in terms of Bernoulli polynomials	
Kühra Erdem and Salih Valcinhas	338

Symmetry reductions and some exact solutions for rotating flows of an Oldroyd-B fluid with Hall	
currents	
K. Fakhar, B. Z. H. Joseph, A. H. Kara, R. Morris, and T. Hayat	345
On pseudo-complex bases for monogenic polynomials	
C. Cruz, M. I. Falcão, and H. R. Malonek	350
An inverse preconditioner for a free surface ocean circulation model	
R. Farina, S. Cuomo, and P. De Michele	356
The rigid-flexible robotic manipulator: Nonlinear control and state estimation considering a	
different mathematical model for estimation	
André Fenili	363
Three function decomposition theorems in Clifford analysis with applications in	
electromagnetism	
Ghislain R. Franssens	371
$L_z$ -transform application to reliability measures estimation of aging MSS refrigeration system:	
Case study	
Ilia Frenkel, Anatoly Lisnianski, and Lev Khvatskin	377
Vibrations of a simply supported beam with a fractional derivative order viscoelastic material	
model - Supports movement excitation	
Jan Freundlich	383
A numerical investigation of the stall-delay phenomenon for horizontal axis wind turbine	
Florin Frunzulica, Razvan Mahu, and Horia Dumitrescu	389
Validation with experiments on simplified numerical prediction of hybrid rocket internal	
ballistics	
Yuki Funami and Toru Shimada	395
On assessment of numerical methods for diffusion-combustion flow with fast chemistry	
Yuki Funami and Toru Shimada	401
Numerical simulation of lifting mechanism	
E. S. Gebel, B. I. Zhursenbaev, and V. Yu. Solomin	408
Application of MARS for modeling local nonlinear relationships in data on ultraviolet copper ion	
lasers	
Snezhana Georgieva Gocheva-Ilieva, Desislava Stoyanova Voynikova, and Iliycho Petkov Iliev	416
Mathematical models in simulation process in rehabilitation of persons with disabilities	
Nina Gorie, Valer Dolga, and Alina Mondoc	424

Not all empirical divergence minimizing statistical methods are created equal?  M. Grendár and G. Judge	432
Research on the modeling of the missile's disturbance motion and the initial control point optimization	
Jie Guo, Dalin Zhu, and Shengjing Tang	436
On 3D Riesz systems of harmonic conjugates K. Avetisyan, K. Gürlebeck, and J. Morais	441
Periodicity in cell dynamics in some mathematical models for the treatment of leukemia A. Halanay	446
Sustaining trajectory flexibility for air traffic complexity alleviation Saam N. Hasan and J. A. Rossiter	451
Comparison of LQ-optimal actuator / sensor selection approaches for flexible structure systems Mark Hemedi, Alexander Schirrer, and Martin Kozek	459
Highly flexible flight vehicle aeroelastic and aero-viscoelastic flutter issues  Craig G. Merrett and Harry H. Hilton	467
Clifford Fourier-Mellin transform with two real square roots of $-1$ in $Cl(p, q)$ , $p + q = 2$ Eckhard Hitzer	480
Model of the hardness prediction for the diffusion nitriding Vladimír Horák, Vladimir V. Kulish, Vojtěch Hrubý, and Tereza Mrázková	486
Translating cosmological special relativity into geometric algebra  Martin Erik Horn	492
Some stability properties for impulsive differential equations with respect to initial time difference	400
S. G. Hristova	499
Application of the hybrid method with constant coefficients to solving the integro-differential equations of first order	
Galina Mehdiyeva, Mehriban Imanova, and Vagif Ibrahimov	506
Transient inverse heat conduction analysis of atmospheric reentry vehicle using FEM Yukihiro Kamimura, Toshiya Nakamura, Hirotaka Igawa, and Yoshiki Morino	511
Quantum mechanics problems in observer's mathematics Boris Khots and Dmitriy Khots	518

New reduced order modeling technique using aeroelastic time response data Y. H. Kim, D. H. Kim, and T. Kim	523
CFD-based design load analysis of 5MW offshore wind turbine T. T. Tran, G. J. Ryu, Y. H. Kim, and D. H. Kim	533
Ising antiferromagnet in the critical magnetic field on square lattice with free boundary conditions  Seung-Yeon Kim	546
Feedback control of flow alignment in a sheared liquid crystal David A. Strehober, Eckehard Schöll, and Sabine H. L. Klapp	552
Stability analysis of a time-periodic 2-dof MEMS structure Till Jochen Kniffka, Johannes Welte, and Horst Ecker	559
Antenna array geometry optimization for a passive coherent localisation system Peter Knott, Heiner Kuschel, and Daniel O'Hagan	567
Compensation of static deformation and vibrations of antenna arrays Peter Knott, Claudius Loecker, Stephan Algermissen, and Robert Sekora	573
On tight polyhedral estimates for reachable sets of linear differential systems Elena K. Kostousova	579
Problem-oriented systems technique in spacecraft Alexander S. Kucherov and Vladimir I. Kurenkov	587
A model of laminar-turbulent transition based on viscous stream buckling Vladimir Kulish, Martin Skote, and Vladimir Horak	590
An orthogonal decomposition of the complex quaternion Hilbert space and its applications H. T. Le, J. Morais, and W. Sprößig	595
A cooperative guidance law with decentralized structure for target estimation Wonsuk Lee and Hyochoong Bang	603
<b>Bayesian networks as a tool for epidemiological systems analysis</b> F. I. Lewis	610
Numerical simulation of subsonic and transonic turbulent flows in turbine cascades including wall heat flux and roughness P. Louda, K. Kozel, P. Sváček, and J. Příhoda	618
Models of the neutral-fractional anomalous diffusion and their analysis Yuri Luchko	626

Technological assessment of local manufacturers for wind turbine blade manufacturing in	
Pakistan	
Khurram Mahmood and Haroon General	633
Stochastic models with memory effects	
Honaida Malaikah	639
Simulation of reliability in multiserver computer networks	
Saulius Minkevičius	649
Effects of number of side dumps and side dump angles on outlet parameters in a side-dump	
combustor	
M. Mojtahedpoor, M. M. Doustdar, H. Soltani, and M. Chegini	653
Methods in the analysis of mobile robots behavior in unstructured environment	
Alina Mondoc, Valer Dolga, and Nina Gorie	661
Bochner's theorem on Fourier-Stieltjes integrals in the framework of quaternion analysis	
S. Georgiev and J. Morais	666
On M-conformal mappings	
K. Gürlebeck, M. H. Nguyen, and J. Morais	674
Mathematical models used in segmentation and fractal methods of 2-D ultrasound images	
Simona Moldovanu, Luminita Moraru, and Dorin Bibicu	678
Fuzzy membership function optimization	
Endre Nagy	684
Multiple existence of positive solutions to quasilinear elliptic equations involving indefinite lower	
terms	
Kimiaki Narukawa	691
Analysis of aerodynamic field and noise of a small wind turbine	
Mihai Leonida Niculescu, Marius Gabriel Cojocaru, and Mihai Victor Pricop	699
Local distortion of monogenic functions	
J. Morais and C. A. Nolder	703
Conjugate thermal explosion and the theory of fires	
Vasily Novozhilov	710
Identification of stability and control derivatives for AS 355 L2 helicopter with Quad-M/CTA	
methodology	
Sérgio Servilha de Oliveira and Luciano Luporini Menegaldo	716

Componentwise block partitioning: A new strategy to solve stiff ordinary differential equations K. I. Othman and Z. B. Ibrahim	724
Use of an analytic approach to proof numerical calculations of the deflection behaviour of thin	
plates Thomas Ottnad, Franz Irlinger, and Tim C. Lueth	727
Slice regular functions of several Clifford variables R. Ghiloni and A. Perotti	734
On some new developments of Hardy-type inequalities Shoshana Abramovich, Lars-Erik Persson, and Natasha Samko	739
Trajectory design for satellite relative angles-only navigation Jaehwan Pi and Hyochoong Bang	747
New approaches to the development and employment of the UAV Ivo Pikner	752
Stability and bifurcation in a model for the dynamics of stem-like cells in leukemia under treatment	
I. R. Rădulescu, D. Cândea, and A. Halanay	758
Multiobjective hyper heuristic scheme for system design and optimization Amer Farhan Rafique	764
On some trends on regularity results in Morrey spaces  Maria Alessandra Ragusa	770
On the derivatives of local minimizers of variational integrals  Maria Alessandra Ragusa and Atsushi Tachikawa	778
Trajectory optimization study of a lifting body re-entry vehicle for medium to intermediate range applications	
S. Tauqeer ul Islam Rizvi, He Linshu, Tawfiq ur Rehman, and Amer Farhan Rafique	782
Identification of nonlinear stochastic systems with variable structure Nikolay E. Rodnishev and Kirill G. Denisov	790
Multidimensional fractional Schrödinger equation M. M. Rodrigues and N. Vieira	798
Dynamic model of cutting process with modulated spindle speed R. Rusinek, K. Kecik, J. Warminski, and A. Weremczuk	805

Free compression tube. Applications Ioan Rusu	810
Algorithm of adaptation in the attitude control system of a flexible spacecraft V. Yu. Rutkovsky, V. M. Sukhanov, and V. M. Glumov	816
Nonlinear dynamics of a MEMS resonator: Theoretical and experimental investigation Laura Ruzziconi, Ahmad M. Bataineh, Mohammad I. Younis, Weili Cui, and Stefano Lenci	822
Periodic optimal control for range maximization of powered sailplanes with retractable electric motor	
G. Sachs, J. Lenz, and F. Holzapfel	830
What can be learned from birds for achieving directional stability without a fin Gottfried Sachs	838
Dynamics of the non-ideal autoparametric system with MR damper  Danuta Sado	847
Analysis of the dynamics of a delay system modeling a longitudinal flight C. A. Safta, A. Halanay, and A. Ionita	854
Commutators of Hardy operators in vanishing Morrey spaces  Lars-Erik Persson, Maria Alessandra Ragusa, Natasha Samko, and Peter Wall	859
On precise embeddings between the generalized Morrey spaces and Stummel classes Stefan Samko	867
DRBEM solution for unsteady natural convection flow in primitive variables with fractional step time advancement	
A. Sariaydın and M. Tezer - Sezgin	871
Non-Newtonian fluid effects on surface reactions in a microfluidic flow cell M. Bahattin Akgül, Gözde Sarı, and Mehmet Pakdemirli	878
Effects of non-ideal boundary conditions on the vibrations of a slightly curved micro beam Gözde Sarı and Mehmet Pakdemirli	883
Analysis of aerodynamic pendulum oscillations Yury D. Selyutskiy	891
Numerical approximation of oscillating Turing patterns in a reaction-diffusion model for	
electrochemical material growth Ivonne Sgura, Benedetto Bozzini, and Deborah Lacitignola	896

Integral equation methods in problems of wave diffraction by a strip with higher order reactance conditions	904
L. P. Castro and A. M. Simões	
Conformally invariant higher order higher spin operators on the sphere  Dalibor Šmíd	911
<b>CFD on hypersonic flow geometries with aeroheating</b> Muhammad Amjad Sohail, Yan Chao, Zhang Hui Hui, and Rizwan Ullah	917
On nonlinear equation of Schrödinger type Kamal N. Soltanov	923
Spacecraft attitude pulse-width control at initial, service and emergency modes Sergey Somov	933
Methods for attitude guidance and precise robust gyromoment control of large-scale agile observation spacecraft	0.41
Sergey Somov, Sergey Butyrin, and Yevgeny Somov	941
Calibration and alignment of strapped-down astro-inertial system for attitude determination of large-scale information spacecraft	
Yevgeny Somov, Sergey Butyrin, and Viktor Fedosov	949
Nonlinear dynamics of a flexible portal frame under support excitation Aline Souza de Paula, José Manoel Balthazar, and Jorge Luis Palacios Felix	957
Optimal control choice of non-keplerian orbits with low-thrust propulsion Olga L. Starinova, Dmitriy V. Kurochkin, and Irina L. Materova	964
Decompositions of information divergences: Recent development, open problems and applications	
M. Stehlík	972
Sensitivity analysis of eigenvalues for an electro-hydraulic servomechanism M. Stoia-Djeska, C. A. Safta, A. Halanay, and C. Petrescu	977
Mathematical and computational model for the analysis of micro hybrid rocket motor Marius Stoia-Djeska and Florin Mingireanu	983
Nonuniform asymptotical behaviors of stochastic skew-evolution semiflows in Hilbert spaces Diana Monica Stoica and Mihail Megan	988
Chernoff product formula for $C_0$ -semigroups on $L^{\infty}$ Ludovic Dan Lemle and Diana Monica Stoica	994

CFD methods for wind turbines Bogdan Suatean, Alexandra Colidiuc, and Slelian Galetuse	998
Influence of biologic factor on the velocity of propagation of pulse waves in vessels of living	
organisms Pavel Sumets	1003
A method of non-commutative Galois theory for binary and ternary Clifford analysis J. Larynowicz, K. Nouno, D. Nagayama, and O. Suzuki	1007
Finite element approximation of turbulent flow applied for simulation of fluid structure interactions  P. Sváček	1015
Linear stability of a non slipping gas flow in a rectangular lined duct with respect to perturbations of the initial value by indefinitely differentiable disturbances having compact support	
Agneta M. Balint, Stefan Balint, and Robert Szabo	1023
Development of flutter margin prediction program  Masato Tamayama, Hitoshi Arizono, Kenichi Saitoh, and Norio Yoshimoto	1028
Existence of non zero modes in an annular lined duct Agneta M. Balint, Stefan Balint, and Loredana Tanasie	1034
A mathematical model for the thrust force generated by a flapping elastic wing Alexander E. Tarasov and Mezhlum A. Sumbatyan	1043
Localization of the most amplified perturbation in a vortex rope located in Francis turbine at partial discharge	
Marcel Topor and Diana A. Bistrian	1047
Probabilistic evolution approach for initial value problems over Fourier basis set Süha Tuna and Metin Demiralp	1054
Synthesis of a combined precision stabilization system for a space telescope R. I. Kozlov, E. I. Druzhynin, S. A. Ulyanov, V. A. Voronov, and B. B. Belyaev	1059
Common and multiple Lyapunov functions in stability analysis of nonlinear switched systems S. N. Vassilyev and A. A. Kosov	1066
Stability, control and automation problems in scientific work of V.M. Matrosov S. N. Vassilyev	1074
Orbital trajectories control around non-spherical bodies  Flaviane C. F. Venditti, Evandro M. Rocco, and Antonio F. B. A. Prado	1083

Generalized divergence measures for survival and reliability data	
Ilia Vonta and Alex Karagrigoriou	1090
Necessary conditions for tumbling in the rotational motion	
Danny H. Z. Carrera and Hans I. Weber	1096
Boundary-layer flow of a nano-liquid film on an unsteady stretching surface	
Hang Xu	1103
A parallelization of the row-searching algorithm	
Malika Yaici, Hayet Khaled, Zakia Khaled, and Athmane Bentahar	1108
Chosen aspects of modeling and control of quadrotor platform	
Radosław Zawiski and Marian Błachuta	1116
Author Index	1125