6th International Conference on Mathematical Modeling in Physical Sciences (IC-MSquare 2017)

Journal of Physics: Conference Series Volume 936

Pafos, Cyprus
28 - 31 August 2017

Editor:

Dimitrios S. Vlachos

ISBN: 978-1-5108-5845-9
ISSN: 1742-6588

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2017) by the Institute of Physics
All rights reserved. The material featured in this book is subject to
IOP copyright protection, unless otherwise indicated.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Table of contents

Volume 936

6th International Conference on Mathematical Modelling in Physical Sciences (IC-MSQUARE 2017)

28–31 August 2017, Pafos, Cyprus

Accepted papers received: 11 December 2017
Published online: 19 February 2018

Preface

6th International Conference on Mathematical Modelling in Physical Sciences (IC-MSQUARE 2017)

Peer review statement

Papers

Mathematical modeling of polymer flooding using the unstructured Voronoi grid

T F Kireev, G T Bulgakova and I F Khatmullin.....1

Surface preparation effect on oxidation kinetics of Ni-base superalloy

Wojciech J Nowak, Bartek Wierzba and Jan Sieniawski.....9

Dissipative gravitational bouncer on a vibrating surface

J. S. Espinoza Ortiz and R. E. Lagos.....16

Quantized Vector Potential and the Photon Wave-function

C Meis and P R Dahoo.....22

Understanding dynamics of Martian winter polar vortex with "improved" moist-convective shallow water model

M. Rostami and V. Zeitlin.....27

Correction to the Wills-Harrison approach: Influence on the Fe-based liquid alloys thermodynamics

N Dubinin.....31

Diffusion of neutrons in the toroidal nuclear electrogenerator

V Yu Tertychny-Dauri.....37

Explanation of Rotation Curves in Galaxies and Clusters of them, by Generalization of Schwarzschild Metric and Combination with MOND, eliminating Dark Matter

Spyridon Vossos and Elias Vossos.....41

Accelerated procedure to solve kinetic equation for neutral atoms in a hot plasma

Mikhail Z. Tokar.....69

Numerical Procedure for Modeling of Light Emitting Diode with Mesh-Like Electrode

Yohei Nishidate and Irina Khmyrova.....79

Identification of environment symmetry for iron centers in aluminosilicates by EPR

E Apushkinskiy, B Popova, V N Romanov, V Saveliev and V Sobolevskiy.....83

Modeling of termokinetic oscillations at partial oxidation of methane

A V Arutyunov, A A Belyaev, I N Inovenkov and V V Nefedov.....88

Lorenz curves in a new science-funding model

Ding-wei Huang.....100

Restoration of valence density of states from XPS spectra

A V Krasavin, V A Kashurnikov and Ya V Zhumagulov.....104

Calculation of electron density of states for ensemble of gold nanoclusters

Ya V Zhumagulov, V A Kashurnikov and A V Krasavin.....109

First-order transition in *XY* model with higher-order interactions

Milan Žukovič.....114

Generalized logistic map and its application in chaos based cryptography

M Lawnik.....120

Magnetic reconnection in terms of catastrophe theory

E.Y. Echkina, I.N. Inovenkov and V.V. Nefedov.....124

Applicability of the lattice Boltzmann method to determine the ohmic resistance in equivalent resistor connections

Mayken Espinoza-Andaluz, Julio Barzola, Víctor H. Guarochico-Moreira and Martin Andersson.....131

Analytic approximation for the modified Bessel function $I_{-2/3}(x)$

Pablo Martin, Jorge Olivares and Fernando Maass.....135

Gauge symmetries for a coupled Korteweg-de Vries system

Alvaro Restuccia and Adrián Sotomayor.....139

Application of the multicriterion optimization techniques and hierarchy of computational models to the research of ion acceleration due to laser-plasma interaction

I.N. Inovenkov, E.Yu. Echkina, V.V. Nefedov and L.S. Ponomarenko.....144

Computer simulation of population dynamics inside the urban environment

A.S. Andreev, I.N. Inovenkov, E.Yu. Echkina, V.V. Nefedov, L.S. Ponomarenko and V.V. Tikhomirov.....149

A mathematical model for the occurrence of historical events

Teruaki Ohnishi.....157

Modeling of multidimensional light bullets in Fermi liquid and ADS/CFT correspondence

NN Konobeeva and MB Belonenko.....164

A model of jam formation in congested traffic

N Zh Bunzarova, N C Pesheva, V B Priezzhev and J G Brankov.....171

Simple method to improve comb frequency characteristic in passband and folding bands

G. Jovanovic Dolecek.....175

Finding exact constants in a Markov model of Zipfs law generation

V.V. Bochkarev, E.Yu. Lerner, A.A. Nikiforov and A.A. Pismenskiy.....181

Structural characterization of nano and micro-fractals using lacunarity analysis and small-angle scattering

A. Slyamov.....187

Simulation of small-angle scattering patterns using a CPU-efficient algorithm

E M Anitas.....192

Small-angle scattering from 3D Sierpinski tetrahedron generated using chaos game

Azat Slyamov.....199

Mathematical model of highways network optimization

R L Sakhapov, R V Nikolaeva, M H Gatiyatullin and M M Makhmutov.....205

Modeling of traction-coupling properties of wheel propulsor

R L Sakhapov, R V Nikolaeva, M H Gatiyatullin and M M Makhmutov.....213

The Wang Landau parallel algorithm for the simple grids. Optimizing OpenMPI parallel implementation

A S Kussainov.....221

On the natural small vibrations of dislocation in an isotropic medium

I. L. Bataronov and V V Dezhin.....227

Numerical and approximate calculation of the generalized susceptibility matrix elements of dislocation segment in nondissipative crystal

I. L. Bataronov and V V Dezhin.....232

Models of evaluation of public joint-stock property management

N M Yakupova, S Levachkova, S G Absalyamova and G Kvon.....237

Finsler Geometry Modeling of an Orientation-Asymmetric Surface Model for Membranes

Evgenii Proutorov and Hiroshi Koibuchi.....245

Network structures sustained by internal links and distributed lifetime of old nodes in stationary state of number of nodes

Nobutoshi Ikeda.....249

Propagation of Ultra High Energy Cosmic Rays from Galactic Sources in a Fractal Interstellar Medium and Origin Studies

Pantea Davoudifar, Keihanak Rowshan Tabari and Saeed Doostmohammadi.....254

Modeling of light scattering by polymer coatings of rolled metal surface

A Maksimov, E Maksimova and V Egorov.....258

Effect of thickness on the magnitude of spontaneous polarization in thin ferroelectric films

O G Maksimova, O S Baruzdina and E A Maksimova.....263

Numerical simulation in nonlinear dynamic systems with retiming of motions of individual components

D Apushkinskaya and E Apushkinskiy.....269

Dual Energy Tomosynthesis breast phantom imaging

V Koukou, N Martini, G Fountos, G Messaris, C Michail, I Kandarakis and G Nikiforidis.....273

Darboux transformation and soliton solution for the (2+1)-dimensional complex modified Korteweg-de Vries equations

K Yesmakhanova, G Shaikhova, G Bekova and R Myrzakulov.....277

Statistical homogeneity tests applied to large data sets from high energy physics experiments

J Trusina, J Franc and V Kůs.....286

Data collection system for a wide range of gas-discharge proportional neutron counters

V Oskomov, A Sedov, N Saduyev, O Kalikulov, I Kenzhina, E Tautaev, Y Mukhamejanov, V Dyachkov and Sh Utey.....292

Numerical simulation of a device with two spin crossover complexes: application for temperature and pressure sensors

Jorge Linares, Salah Eddine Allal, Pierre Richard Dahoo and Yann Garcia.....297

Mathematical modeling of elementary trapping-reduction processes in positron annihilation lifetime spectroscopy: methodology of Ps-to-positron trapping conversion

Ya Shpotyuk, J Cebulski, A Ingram and O Shpotyuk.....302

Kinetics models describing degradation-relaxation effects in nanoinhomogeneous substances

O Shpotyuk, V Balitska and M Brunner.....306

Investigation of humidity using the muon component of cosmic rays

V Oskomov, A Sedov, N Saduyev, O Kalikulov, I Kenzhina, A Naurzbayeva, N Alimgazinova, A Zhumabaev, S Shinbulatov and N Erezhep.....311

2D Spin Crossover Nanoparticles described by the Ising-like model solved in Local Mean-Field Approximation

Salah Eddine Allal, Jorge Linares, K. Boukheddaden, Pierre Richard Dahoo and F. de Zela.....318

Edge Effect on Nanoparticles of an Interconnect Alloy from the ABV Model

Chemseddine Saada, Pierre Richard Dahoo, Jorge Linares, Tarek Merzouki, Philippe Pougnet and Abdelkhalak El hami.....325

On efficiency of fire simulation realization: parallelization with greater number of computational meshes

Lukas Valasek and Jan Glasa.....331

Simulation of the weakly interacting Bose gas relaxation for cases of various interaction types

P F Kartsev and I O Kuznetsov.....335

To the problem of decomposition of the initial boundary value problems in mechanics

Mikhail U. Nikabadze.....341

Quasi-coherent structures and flows in turbulent transport

M Vlad and F Spineanu.....352

A cryptographic hash function based on chaotic network automata

Jeaneth Machicao and Odemir M Bruno.....359

Modeling the assessment of the economic factors impact on the development of social entrepreneurship

T Absalyamov, R Kundakchyan, L Zulfakarova and Z Zapparova.....363

Enhancement of the space of solutions of the kinetic-conformal Hořava theory

Alvaro Restuccia, Jorge Bellorín and Adrián Sotomayor.....368

Numerical Investigations of the Thermal, Pressure and Size Effects on 2D Spin Crossover Nanoparticles

C. Harlé, S.E. Allal, D. Sohier, T. Dufaud, R. Caballero, F. de Zela, P. R. Dahoo, K. Boukheddaden and J. Linares.....376

On damping of an edge dislocation vibrations in a dissipative crystal: limiting cases

V V Dezhin.....384

Data re-arranging techniques leading to proper variable selections in high energy physics

Václav Kůs and Petr Bouř.....388

The Use of Modeling Approach for Teaching Exponential Functions

L. F. Nunes, D. B. Prates and J. M. da Silva.....394

Hydrodynamic instabilities at decay flow of nematic liquid crystals through the plane capillary of a variable gap

D Shmeliova, S Pasechnik, A Girgidov and G Maksimochkin.....401

Model of personal consumption under conditions of modern economy

D K Rakhmatullina, E R Akhmetshina and O A Ignatjeva.....408

Semantic similarity and analysis of the word frequency dynamics

V V Bochkarev, Yu S Maslennikova and A A Svetovidov.....413

Modelling Plane Geometry: the connection between Geometrical Visualization and Algebraic Demonstration

L. R. Pereira, D. F. Jardim and J. M. da Silva.....417

A study about teaching quadratic functions using mathematical models and free software

T. V. Nepomucena, A. C. da Silva, D. F. Jardim and J. M. da Silva.....423

Modeling the dynamics of multipartite quantum systems created departing from two-level systems using general local and non-local interactions

Francisco Delgado.....430

Investigating CH_4 Thermal Activation in Clathrate Nanocages

A. Lakhlifi, P. R. Dahoo, C. Meis and J. D. Gale.....434

ASYMPTOTIC SYMMETRIES IN 3-DIM GENERAL RELATIVITY: THE B(2,1) CASE

Evangelos Melas.....440

Design of Oscillator Networks for Generating Signal with Prescribed Statistical Property

Tatsuo Yanagita.....447

Methods of verification of compliance with an asymptotically power law

I A Belashova, V V Bochkarev and V A Tyurin.....455

The continuous-time quantum walk with transition moments of the Gaussian distribution as a mathematical model of rotational excitation in molecules by an optical pulse

L Matsuoka and H Lavička.....460

Object recognition of real targets using modelled SAR images

D.A. Zherdev.....465

Evaluation of the implementation of entrepreneurial potential (on the example of the Republic of Tatarstan)

G T Guzelbaeva, D K Rakhmatullina and E R Akhmetshina.....469

Hadronization via gravitational confinement

C.G. Vayenas and D. Grigoriou.....475

Dynamics of nanoparticle concentration in nanofluids under laser light field

A I Livashvili, V V Krishtop, P V Vinogradova, G V Kostina and T N Bryukhanova.....483

The Use of Logistic Model in RUL Assessment

R Gumiński and S Radkowski.....489

Interplay of frustrations, interaction length, and dilution on magnetic transitions in vector models

Petr D. Andriushchenko, Alexei A. Peretyatko, Vitalii Yu. Kapitan, Alexander V. Perzhu and Konstantin V. Nefedev.....497

An analytic relation between the fractional parameter in the Mittag–Leffler function and the chemical potential in the Bose–Einstein distribution through the analysis of the NASA COBE monopole data

Minoru Biyajima, Takuya Mizoguchi and Naomichi Suzuki.....507

Generalized Bell states map physical systems' quantum evolution into a grammar for quantum information processing

Francisco Delgado.....511

Modelling of magnetic elastomer deformation dependence on magnetic field

D A Solodkiy and L L Afremov.....515

Geometry from stomata networks at leaves of the *Ctenanthe oppenheimiana*

Humberto Antunes de Almeida Filho, Jeaneth Machicao and Odemir Martinez Bruno.....519

QKD optical scheme calibration system

A. Duplinskiy, V. Ustimchik, A. Kanapin, V. Kurochkin and Y. Kurochkin.....523

Modelling of pulsed electron beam induced graphite ablation: Sublimation versus melting

Muddassir Ali and Redhouane Henda.....527

Approximate Bayesian Computation in the estimation of the parameters of the Forbush decrease model

A. Wawrzynczak and P. Kopka.....533

An analysis of the influence of production conditions on the development of the microporous structure of the activated carbon fibres using the LBET method

Mirosław Kwiatkowski.....541

An analysis of burn-off impact on the structure microporous of activated carbons formation

Mirosław Kwiatkowski and Türkan Kopac.....545

Modeling Interdisciplinary Notion "Substance" with Information Model

Tatyana Gnitetskaya, Elena Ivanova, Natalya Kovalchuk, Yuliya Shutko, Larisa Dubovaya and Elena Karnaukhova.....551

Modeling the Interdisciplinary in the Process of Training Physics

Tatyana Gnitetskaya, Elena Ivanova, Larisa Dubovaya, Yuliya Shutko, Natalya Kovalchuk and Elena Karnaukhova.....557

Impact of telecommunication technologies on the middle class formation

A Khusnullova, S Absalyamova, R Sakhapov and Ch Mukhametgalieva.....564

Geometric plasticity at leaves from *Ctenanthe oppenheimiana* probed by measure of distances between stomata

Humberto Antunes de Almeida Filho, Jeaneth Machicao and Odemir M. Bruno.....570

On the decomposition of modular multiplicative inverse operators via a new functional algorithm approach to Bachet's-Bezout's Lemma

Luis A. Cortés–Vega.....574

The linear response function of a screw dislocation in a ferroelectrics

V V Dezhin.....581

Behavior of the solution of the Cauchy problem for an inhomogeneous hyperbolic equation with periodic coefficients

Hovik A. Matevossian and Anatoly V. Vestyak.....587

Conservation laws of the Hirota-Maxwell-Bloch system and its reductions

G. Shaikhova, K. Yesmakhanova, G. Bekova and S. Ybyraiymova.....592

Aspects and Some Results on Passivity and Positivity of Dynamic Systems

M. De la Sen.....598

Hipergeometric solutions to some nonhomogeneous equations of fractional order

Jorge Olivares, Pablo Martin and Fernando Maass.....604