

BULETINUL ȘTIINȚIFIC
al Universității “Politehnica” din Timișoara, Romania
SCIENTIFIC BULLETIN OF
“Politehnica” University of Timișoara, Romania

Contents and abstracts

Seria MATEMATICĂ - FIZICĂ
Transactions on MATHEMATICS & PHYSICS
Tom 55(69), Fascicola 1, 2010, ISSN 1224-6069

Contents

MATHEMATICS

1. *M. BAICA, M. CÂRDU - Possibilities to Represent Some Symmetric Functions by Unified Equations and Some of Their Applications in the Paratrigonometry 1*
2. *O. LIPOVAN – A Criterion of Probabilistic Submeasurability for Fuzzy Metric Spaces-Valued Functions 12*
3. *G. CRISTESCU, M. GĂIANU – Detecting the non-Convex sets with youness and noor types convexities 20*
4. *M. ALBICI - Continuous Dependence on Riemannian Metrics of Eigenvalues of Restriction of Hodge-de Rham $\Delta^{(p)}$ Operator to the p-Space of Exact Differential Forms and its Consequences 28*
5. *F. SOFONEA, I. ȚINCU – On an Inequality 36*
6. *A. NICOLA, C. POPA - Constrained Jacobi Projection Algorithms for Image Reconstruction 42*
7. *C. MORTICI – New Gamma Function Approximations 56*

PHYSICS

8. *G.BALAN, V.CARTAS - The Hartmann Phenomenon On The Jet Generators..... 61*
9. *I.LUMINOSU, N.POP - The Activation Energy Of A Complex Liquid 70*
10. *M.PAULESCU, E.Paulescu - On The Energy Production Of A Stand-Alone Pv System Related To The Cloud Cover Variability 77*
11. *V.CARTAS, G.BĂLAN - The Topological Interaction In Low Dimensional Physical Systems 85*
12. *V.CARTAS - The Jones Invariants Applied On The Topological Quantum Computation 91*

**POSSIBILITIES TO REPRESENT SOME SYMMETRIC FUNCTIONS
BY UNIFIED EQUATIONS AND SOME OF THEIR APPLICATIONS
IN THE PARATRIGONOMETRY**

Malvina BAICA and Mircea CÂRDU

Abstract. In this paper we introduce a new method to establish unified equations for symmetric functions which usually are represented by distinct equations. With this purpose we use some special mathematical “operators” which we name “binary operators”.

Key words: Symmetric functions, Binary operators, unified equations.

Address: Malvina Baica, The University of Wisconsin, Dep.of Mathematical and Computer Sciences, Whitewater, WI. 53190 U.S.A., E-mail: baicam@uww.edu

Mircea Cârdu, S.C.HERBING S.R.L., 9 Otetari Str. , Sector 2, Bucharest, Romania, E-mail: mircea.cardu@herbing.ro

**A CRITERION OF PROBABILISTIC SUBMEASURABILITY
FOR FUZZY METRIC SPACES-VALUED FUNCTIONS**

Octavian LIPOVAN

Abstract. In [5] the probabilistic submeasurability of fuzzy metric spaces-valued functions is defined and some properties of this concept are studied.

The purpose of this paper is to obtain a criterion of probabilistic submeasurability for fuzzy metric spaces-valued functions by using the notion of “control submeasure”.

Address: Octavian LIPOVAN, “Politehnica” University of Timisoara, Department of Mathematics, P-ta Victoriei, No. 2, Timisoara – 300006, ROMANIA, E-mail: octavian.lipovan@mat.upt.ro

**DETECTING THE NON-CONVEX SETS WITH YOUNESS
AND NOOR TYPES CONVEXITIES**

Gabriela CRISTESCU and Mihail GĂIANU

Abstract. The relationship between the g -convex sets according to the definition of Noor (2008), the E -convex sets according to the definition of Younes (1999) and Chassery's (1978) digital convexity is investigated when the space transformations g and E are chosen as a given digitization method of the plane into \mathbf{Z}^2 . A method of detecting these sets is described in \mathbf{Z}^2 .

Keywords and phrases: g -convex set, E -convex set, digital convexity, digitization

Address: **Gabriela Cristescu**, Department of Mathematics, “Aurel Vlaicu” University of Arad, Bd. Revoluției, No. 77, 310130 - Arad, ROMANIA, E-mail: gcristescu@inext.ro

Mihail Găianu, Department of Computer Science, West University of Timișoara, Bd. Vasile Pârvan 4, 300 223 - Timișoara, ROMANIA, E-mail: gaianumihail@yahoo.com

**CONTINUOUS DEPENDENCE ON RIEMANNIAN METRICS OF
EIGENVALUES OF RESTRICTION OF HODGE-DE RHAM $\Delta^{(p)}$ OPERATOR TO THE
p-SPACE OF EXACT DIFFERENTIAL
FORMS AND ITS CONSEQUENCES**

Mihaela ALBICI

Abstract. The present article improves some results in Chapters 3 and 5 of the book written by M. Craioveanu, M. Puta and Th. M. Rassias(Old and New Aspects in Spectral Geometry, Springer-Verlag, Mathematics and Its Applications, Vol. 534, Berlin, Heidelberg, New York, 2001 [4]). More precisely, it emphasizes the continuous dependence on Riemannian metrics on a closed differential manifold C^∞ of the eigenvalues of Hodge-de Rham $\Delta^{(p)}$ operators restriction upon the p-space of exact differential forms and the consequences of this feature.

Address: **Mihaela ALBICI**, „C-tin Brâncoveanu” University, N. Bălcescu Street, No. 39 Rm. Vâlcea, România, E-mail: mturmacu@yahoo.com

ON AN INEQUALITY

Florin SOFONEA and Ioan ȚINCU

Abstract. It is known that the terms of the polynomial sequence $(\Delta_n(x))_{n \in \mathbf{N}^*}$ with $(\Delta_n(x) = [R_n^{(\alpha, \alpha)}(x)]^2 - R_{n-1}^{(\alpha, \alpha)}(x)R_{n+1}^{(\alpha, \alpha)}(x))$, where $R_n^{(\alpha, \alpha)}$ represents the Jacobi polynomial normalized by $R_n^{(\alpha, \alpha)}(1) = 1$, verifies the Thuran’s inequality. In this paper, we will determine two real constants α_n, β_n so that:

$$\alpha_n \Delta_{n+1}(x) \leq \Delta_n(x) \leq \beta_n \Delta_{n+1}(x), \quad (\forall) n \in \mathbf{N}^*, \quad (\forall) x \in [-1, 1].$$

Address: **Florin Sofonea**, Department of Mathematics, “Lucian Blaga” University of Sibiu, Str.I.Ratiu, nr.5-7, Sibiu, Romania, E-mail: florin.sofonea@ulbsibiu.ro

Țincu Ioan, Department of Mathematics, “Lucian Blaga” University of Sibiu, Str.I.Ratiu, nr.5-7, Sibiu, Romania, E-mail: tincuioan@yahoo.com

CONSTRAINED JACOBI PROJECTION ALGORITHMS FOR IMAGE RECONSTRUCTION

Aurelian NICOLA and Constantin POPA

Abstract. We present in this paper a constraining technique for algebraic image reconstruction in Computerized Tomography (CT). The idea of this procedure is to keep the components of the current approximation of the image in the appropriate interval in which the corresponding components of the exact solution lie. The procedure is included in the Row Jacobi Projection (RJP) algorithm, together with its extension to inconsistent problems and a theoretical analysis of the convergence of their constrained versions is made. The numerical experiments on two phantoms, widely used in the CT literature indicate the better behaviour of the constrained versions of the RJP algorithm and its extension.

Address: **Constantin Popa**, Faculty of Mathematics and , Computer Science, “Ovidius” University of Constanta, Bd. Mamaia, No. 124, 900527 - Constanta, ROMANIA, E-mail: cpopa@univ-ovidius.ro

NEW GAMMA FUNCTION APPROXIMATIONS

Cristinel MORTICI

Abstract. The aim of this paper is to establish a new sharp approximation for the gamma function.

Address: **Cristinel Mortici**, Valahia University of Targoviste, Dept. of Mathematics, Bd. Unirii 18, 130082, Targoviste, Email: cmortici@valahia.ro

Physics

THE HARTMANN PHENOMENON ON THE JET GENERATORS

George BALAN, Viorel Laurentiu CARTAS

Abstract. One of the most powerful generators utilized actually in rocket and aircraft engine jet engineering for improving and initiation of combustion is the air- jet stem generator, which utilized for sound production the instability of annular wall supersonic gas jets. Analyses of Schlieren pictures from shadow film, made it possible to establish that detached shock wave is periodically moved between outlet section nozzle and resonator. The detached shock wave trajectory obtained from shadow film pictures is present the one complex periodically curve, especially for it back moving to obstacle. The processing of the Schlieren pictures allow to obtain exactly values of the frequency of the oscillating processes. The mathematical model of air-jet stem sonic generator was derived on the basis of mathematical technique of optimal planning.

The geometrical and gasdynamical parameters of that generator were optimized. The designing of air-jet axial and radial generators is present.

Key-words: generator/sound/shock/wave/optimization/calculus/gas dynamic/ nozzle/resonator.

Address: Balan George, Viorel Laurentiu CARTAS, Department of Fundamental Science, BRAILA Engineering Faculty, “Dunarea de Jos” University of GALATI, 29 Calarasilor str., BRAILA 6100, ROMANIA, tel: +(40 239)684958 , tel/fax: +(40 239) 612572, E-mail: gbalan@ugal.ro, Cartas.Viorel@ugal.ro

THE ACTIVATION ENERGY OF A COMPLEX LIQUID

Ioan LUMINOSU, Nicolina POP

Abstract: The rheological and diffusion characteristics of ferrofluids cause the quality and reliability of the technological systems with ferrofluids. The coefficients of viscosity friction dynamics, diffusion and energy activate of rheology viscosity respectively diffusion falling pregnantly at base fluid of biphasic system magnetit-hydrocarbours. Hereby, a case in point, energy activate of diffusion asses: $E_{D,1} = 13,57$ kJ/mol for ferrofluid, $E_{D,2} = 16,34$ kJ/mol for petroleum and $E_{D,3} = 3,02$ kJ/mol for oleic acid.

Address: Ioan LUMINOSU, Nicolina POP, Department of Physical Foundation of Engineering, University “Politehnica” of Timișoara, Bv. Vasile Parvan No. 2, 300223, Timișoara, România

ON THE ENERGY PRODUCTION OF A STAND-ALONE PV SYSTEM RELATED TO THE CLOUD COVER VARIABILITY

Marius PAULESCU, Eugenia TULCAN-PAULESCU

Abstract: The paper deals with relationships between energy production of a stand-alone photovoltaic (PV) system and the variability of incoming solar energy. First, a simple way for the translation of standard AM1.5G PV module efficiency to the field operation is established. Second, empirical relations between PV electricity production and atmospheric specific parameters are assessed at two temporal scale: hourly and daily. Data collected on the Solar Platform of the West University of Timisoara are used in this study and therefore the results could be useful to engineers engaged in solar projects developed in Banat, Western Romania.

Address: EUGENIA TULCAN-PAULESCU and MARIUS PAULESCU, Physics Department, West University of Timisoara, V Parvan Ave. 4, 300223 Timisoara, Romania, E-mail: marius@physics.uvt.ro

THE TOPOLOGICAL INTERACTION

IN LOW DIMENSIONAL PHYSICAL SYSTEMS

Viorel Laurentiu Cartas
George Balan

Abstract: In some special semiconductors, in certain physical conditions connected to low temperatures and very strong magnetic fields, are studied new effects. These effects have as main object the topological defects. They appear as discontinuity relative to the an order parameter which is continuum in the semiconductor material. Among these effects is the Aharonov-Bohm effect which is entirely a quantum one. The paper highlights the special features of this effect, features which determine a new kind of quantum statistics, the anyons statistics. The anyons as physical object evolving in two dimensional systems are strongly related to the knot and braiding theories and consequently are connected to the polynomial knot and links invariants. Some features of this connection are presented here.

Address: **Viorel Laurentiu Cartas, George Balan**, Universitatea Dunarea de jos, Galati, Str.Domneasca nr.49,Galati, Facultatea de inginerie Braila, Braila, Calea Calarasilor, nr.29,Braila, Departamentul de Stiinte Fundamentale, e-mail: Cartas.Viorel@ugal.ro , gbalan@ugal.ro

THE JONES INVARIANTS APPLIED ON THE TOPOLOGICAL QUANTUM COMPUTATION

Viorel Laurentiu Cartas

Abstract: In the present paper the entire work is done considering the two qubits register diagrams. These diagrams represent very complex links and for them we have computed some important polynomial invariants such as the Alexander and the Jones invariants. Focusing to the Jones invariants we eventually seek a connection between the polynomials, connection which is made by the action of the unitary quantum gates.

Address: **Viorel Laurentiu Cartas**, Universitatea Dunarea de jos, Galati, Str.Domneasca nr.49,Galati, Facultatea de inginerie Braila, Braila, Calea Calarasilor, nr.29,Braila, Departamentul de Stiinte Fundamentale, E-mail: Cartas.Viorel@ugal.ro