This Issue is dedicated to Professor Constantin Udriste on
their 70th anniversary

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THE 1-JET GENERALIZED LAGRANGE GEOMETRY INDUCED BY THE RHEONOMIC CHERNOV METRIC

Vladimir BALAN, Mircea NEAGU

The aim of this paper is to develop on the 1-jet space $J^1 \left( \mathbb{R}, M^4 \right)$ the jet Generalized Lagrange Geometry ([13, 12]) for the rheonomic Chernov metric

$$F_{[3]}(t, y) = \sqrt{h^{11}(t)} \cdot \sqrt{y^1_1 y^2_1 y^3_1 + y^1_1 y^2_1 y^4_1 + y^2_1 y^3_1 y^4_1}$$

The associated gravitational and electromagnetic field equations of the associated model are determined, and the Physical relevance is emphasized.

Keywords: rheonomic Chernov metric of order three, canonical nonlinear connection, Cartan canonical connection, d-torsions and d-curvatures, geometrical Einstein equations.

MSC2000: 53C60, 53C80, 83C22.

MULTIPLE $(n,m)$-HYBRID LAPLACE TRANSFORM AND APPLICATIONS TO MULTIDIMENSIONAL HYBRID SYSTEMS. PART II: DETERMINING THE ORIGINAL

Valeriu PREPELIŢĂ, Tiberiu VASILACHE

This paper completes the study of the $(n,m)$-Hybrid Laplace Transform from [11] with the theorems regarding integration and sum of the original, integration of the image, convolution, product of originals, initial and final values.

Some methods and formulas for determining the original of a given $(n,m)$-Hybrid Laplace Transform are provided. A generalized Mellin-Fourier type inversion formula is established and two other formulas are derived using respectively the Residue Theorem and multivariable Laurent series expansions. A generalized Expansion Theorem is also given.

Keywords: Hybrid Laplace Transform, Mellin-Fourier type inversion formula, expansion theorem.
ON A CLASS OF MULTITIME VARIATIONAL PROBLEMS WITH ISOPERIMETRIC CONSTRAINTS

Stefan MITITELU, Ariana PITEA, Mihai POSTOLACHE

This paper aims to establish some results of efficiency and duality for multitime control problems, thought as variational problems with isoperimetric constraints, mainly arising when we talk about resources. First, we introduce optimality conditions for a scalar multitime variational problem (SCP). Next, we study efficiency conditions and develop a duality theory for a vector multitime problem (VCP). In x1, we recall some notions, while in x2, we substantiate our starting point. In x3 we introduce our problem (SCP) and prove a result on necessary optimality conditions. In x4, we discuss efficiency conditions to our problem (VCP) and develop a dual program theory. Our work may be viewed as a natural continuation of some recent works (see [11], by Stefan Mititelu; [22], by Constantin Udriste).

Keywords: optimal variational problem, nonlinear programming, invex functional, duality.


TWO SOLUTIONS FOR A PROBLEM OF MATHEMATICAL PHYSICS EQUATIONS

Irina MEGHEA

In this paper two approach methods to obtain and characterize weak solutions or subsolutions and supersolutions for a problem of mathematical physics equations are presented. In the first, Ekeland variational principle and a condition of Palais Smale type are both involved in order to obtain some results for the p-Laplacian. In the second approach method, some original surjectivity theorems are established to state two original results which describe new properties of the p-Laplacian.

Keywords: Ekeland variational principle, Palais-Smale condition, critical point, weak solution, Nemytskii operator, weak subsolution, weak supersolution, Carathéodory function, Sobolev space, p – Laplacian.
ON IDEMPOTENTS IN GENERALIZED RINGS

Panait ANGHEL, Camelia CIOBANU, Mirela ŞTEFĂNESCU

We study idempotents and properties of Peirce decompositions and ideals in near-rings with DCC, infra-near-rings and ringoids. For the last structure, we recall some results obtained in 1964 by S.K.Sehgal Applications to geometry are given in the last section.

Keywords: near-rings, infra-near-rings, ringoids, almost affine K-spaces, Idempotents

GENERAL QUARTIC-CUBIC-QUADRATIC FUNCTIONAL EQUATION IN NON-ARCHIMEDEAN NORMED SPACES

M. ESHAGHI GORDJI, H. KHODAEI, R. KHODABAKHSH

The aim of this paper is to find the general solution of a mixed type quartic, cubic and quadratic functional equation
\[
f(x + ky) + f(x - ky) = k^4 f(x + y) + k^2 f(x - y) + 2(1 - k^2)f(x) + k^2(k^2 - 1)/6 (f(2y) + 2f(-y) - 6f(y))
\]
\[k \in \mathbb{Z} - \{0, \pm 1\}\] in the class of functions between real vector spaces and to obtain the generalized Hyers-Ulam stability problem for the equation in non-Archimedean spaces.

Keywords: Quartic, cubic and quadratic functions; Non-Archimedean spaces; p-adic field; Stability
MSC2000: 39B82, 39B52.

GENERALIZATIONS OF JORDAN'S INEQUALITY AND CONCERNED RELATIONS

DA-WEI NIU, JIAN CAO, FENG QI

In the paper, two new Jordan type inequalities are established for bounding the Bessel function, some concerned relations among some recent results are discussed, and several simple applications are presented.
EXISTENCE AND ITERATION OF MONOTONE POSITIVE SOLUTIONS FOR MULTI-POINT BVPS OF DIFFERENTIAL EQUATIONS

YUJI LIU

By applying monotone iterative methods, we obtain not only the existence of monotone positive solutions for a kind of multi-point boundary value problems, but also establish iterative schemes for approximating the solutions. A boundary value problem that our results can readily apply, whereas the known results in the current literature do not cover, is presented at the end of the paper.

Keywords: Multi-point boundary-value problem; p-Laplacean; half-line; positive solutions; existence; uniqueness.


EARLY STAGE OF TUMOR-IMMUNE COMPETITION WITH TIME DEPENDENT PARAMETER AND EXTERNAL SOURCE

C. CATTANI, A. CIANCIO

The qualitative analysis, existence of equilibria and asymptotic behavior of the competition between tumor and immune cells are studied under the assumption of the time dependence of the parameters and the existence of a source (representing the therapeutical action). In particular, the time-dependent parameters are taken into account, by assuming that they are represented by a decaying sigmoid-like function. The background model of time-dependence parameters belongs to the hiding-learning dynamics [12, 13, 14] of kinetic models [2, 3, 4, 5, 6, 7, 8, 9, 15, 34].
 HOW QUANTUM ALGORITHMS WORK

Marcel POPESCU, Constantin P. CRISTESCU

The paper presents essential information on quantum algorithms and based on two examples demonstrates that the computational environment MATLAB is highly appropriate for classical implementation in order to test their capability.

Key words: qbit, quantum information, quantum algorithm, quantum gates.

EVALUATION OF THE OPTICAL COUPLING BETWEEN OPTICAL FIBRES AND Er³⁺:Ti:LiNbO₃ OPTICAL WAVEGUIDES

Georgiana C. VASILE, Alexandru E. BRANIȘTE, Gelu ILIE, Niculae N. P(EC)ŞCAȘ

In this paper we report some experimental and theoretical results concerning the characterization of the coupling between graded refractive-index optical fibres and also between optical fibres and Ti:LiNbO₃ and Er³⁺:Ti:LiNbO₃, respectively optical waveguides for \( \lambda = 1.55 \) µm using nondestructive methods. We evaluated the coupling loss coefficients between the above mentioned components by approximating the field profile with appropriate Gaussian functions. The refractive-index profiles of the Er³⁺:Ti:LiNbO₃ optical waveguides has been determined from near field intensity measurement using a standard optical fibre as receiver and also a CCD camera. Using the Helmholtz scalar equation and an original deconvolution procedure we evaluated some parameters which characterize Er³⁺:Ti:LiNbO₃ waveguides: the refractive-index difference and the penetration depth.

Keywords: coupling loss, optical fibres, Er³⁺:Ti:LiNbO₃ optical waveguides, refractive-index profile, near field.
STUDIES ON THE MESOMORPHIC STATE OF THE STEARIC ACID

Elena SLAVNICU, Mihaela GHELMEZ (DUMITRU), Emil PETRESCU, Dan St. SLAVNICU

In the paper, we present a study on the behavior of the stearic (octadecanoic) acid in a thermal and electric field, and subjected to a thermal neutron beam. The current I dependence on the voltage U applied to the sample was measured at increasing and decreasing voltage values and at different temperatures. Optical microscopy studies were carried out on non-irradiated samples, at different temperatures and have shown the effect of the irradiation on the samples, while in the mesomorphic state. Dependencies I=I (U) at T=ct. and I=I(T) at U=ct. are presented and analysed and finally the activation energy is determined.

Keywords: stearic acid, thermal neutron beam, thermal and electric field

MECHANISM OF CENTRAL WAVELENGTH TUNING OF THE SOLITONS FORMED IN A PMFL WHEN VARYING THE TOTAL ATTENUATION IN THE CAVITY OR WHEN CHANGING THE PUMP POWER

Ionuț-Romeo ŞCHIOPU, Paul ŞCHIOPU

We report on the experimental observation a central wavelength tuning with up to 18 nm of the fundamental soliton in a passively mode-locked fiber ring laser (PMFL) when applying an extra attenuation in a certain position in the laser cavity, or by varying the pump power. Depending on the cavity configuration and the polarization setting the effect of central wavelength tuning is tightly correlated to solitonic stability. In the same configuration of the laser cavity two solitonic spectra can be observed in the same time, one at 1544 nm and the other at 1557 nm, their existence being possible for certain polarization settings and for a narrow range of the pump power. In the same time we obtained experimentally that the dependence of the solitonic stability on the wavelength is correlated to the wavelength favorable to the solitonic state formation, thus the dual solitonic spectrum discussed above is formed at the wavelengths for which the soliton has maximum stability.

Keywords: solitons, passively mode-locked soliton fiber laser Acronyms used: EDFA - Erbium Doped Fiber Amplifier SESAM- SEmiconductor Saturable Absorber Mirror
IDENTIFICATION ATTEMPT OF THE MAIN STAGES OF HUMAN BEING GROWTH AND OF UNIVERSE EVOLUTION

Dan A. IORDACHE, Pier P. DELSANTO, Ion APOSTOL

Despite the very limited knowledge and existing data about the human body growth and the Universe evolution, we try to identify the basic stages of human body growth and Universe expansion. For this purpose we use some tools offered by the physical theory of Complexity, such as e.g. the Universality classes, and we assume some hypotheses referring to the: a) similar behavior of complex systems of different nature, b) validity of power laws, etc. The outstanding role of the inflation growth is pointed out, and the result conjectures about the basic stages of human body growth and Universe evolution are reported.

Key words: Similitude models, Growth processes, Universality Classes, Human growth, Universe evolution, Complexity theory, Power laws, Inflation stages.

ON THE NONLINEAR RESONANCE WAVE INTERACTION

Petre P. TEODORESCU, Veturia CHIROIU

This paper is studying the dynamic interaction of a dispersive linear rod resting on a continuous elastic foundation, with a nonlinear end attachment that is weakly connected to its right end. The resonant interactions of the attachment with incident traveling wave propagating in the rod are studied by using the cnoidal method. The solutions are written as a sum between a linear and a nonlinear superposition of cnoidal vibrations.

Keywords: resonant wave interaction, resonance capture, energy pumping.
THEORY OF CHAOS APPROACH TO ASSESS THE MANAGEMENT DECENTRALIZATION

Cezar SCARLAT, Eugen I. SCARLAT

Based on an original matrix model, this interdisciplinary paper uses the concepts of econophysics and fractal structure, which has been extended to read out properties emerging from the economic systems. As the theory of chaos could be the solution for explaining unlikely events that remain otherwise deeply hidden in a complex information mixture, a chaotic approach and a nonlinear analysis are performed. An original method to assess the degree of management centralization is proposed. This method is applied to investigate the time series of the exchange rates for 26 economic systems over 12 years. The results support the model and method applicability.

Keywords: Econophysics, matrix economic model, centralized/decentralized management, time series, correlation dimension