BOOK OF ABSTRACTS

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INVITED SPEAKERS

Stochastic Nonlinear Differential Equations; an Operatorial Approach

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An infinte dimensional stochastic differential equation in a Hilbert space H

$$dX + AXdt = XdW, \quad X(0) = X_0$$

reduces to an operatorial equation of the form $\mathcal{B}X + \mathcal{A}X = f$, where $\mathcal{B}$ and $\mathcal{A}$ are maximal monotone operators in a suitable space of processes on H.

Some Remarks on a Minkowski Space (R^n, F)

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We consider a complete, totally umbilical hypersurface M of Riemannian space $(\hat{R}^n, \hat{g})$ induced by a Minkowski space (R^n, F). Under certain conditions we prove that M is isometric to a "round" hypersphere of the $(n+1)$–dimensional Euclidean space. We also prove that the Minkowski norm F must be arised from an inner product if there exist a non-zero constant vector field, which is parallel according to Levi-Civita connection of the metric tensor $\hat{g}$.

Entropic Structure of Cross Diffusion Equations

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Cross diffusion equations naturally appear in many areas of physics and biology, for example when two species are interacting by competition. When maximum principles do not exist, one has to rely on the entropy structure of the systems in order to prove existence of global solutions. We propose in this talk new results enabling to better understand this structure, and to get new cases of existence of global solutions. The results which are presented were obtained in the framework of a collaboration with Th. Lepoutre, A. Moussa and A. Trescases.

Classes of Special Surfaces in Euclidean or Minkowski Spaces and their Background PDE's

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We consider linear fractional Weingarten surfaces in the three dimensional Euclidean or Minkowski space and find the classes of surfaces having the same background partial differential equations. We discuss the natural PDE's of minimal surfaces in the four dimensional Euclidean or Minkowski space.

Sectional Curvature of Statistical Structures

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A statistical manifold is a Riemannian manifold endowed with a statistical connection, that is, a torsion-free connection for which the cubic form being the covariant derivative (relative to this connection) of the metric tensor field is symmetric in all arguments. Statistical structures appear in Riemannian geometry (for instance, as the structure consisting of the second fundamental form and the induced Riemannian connection on a locally strongly hypersurface in a space form), in the equiaffine geometry

of hypersurfces in the standard flat affine spaces, in the theory of Lagrangian submanifolds (where the second fundamental tensor is the so called difference tensor) and in statistics. The curvature tensor for a statistical connection does not have good symmetries. Therefore, the study of the curvature of statistical structures needs new concepts and definitions. In particular, the sectional curvature can be defined in few different ways. One can use the average of the curvature tensors of a statistical connection and its dual. Another way is to use the commutator of the difference tensor. In both cases the sectional curvatures provide a lot of information on the geometry of a statistical manifold.

Existence and Construction of Solutions of BVPs with State-Dependent Impulses

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We investigate the boundary value problem

$$x'(t) = f(t, x(t)) \text{ for a.e. } t \in [a, b], \quad \ell(x) = c \in R^n, \tag{1}$$

with a linear and bounded operator ℓ.

First, under the assumption that f is the Carathéodory function and that the boundary value problem (1) is subject to the state-dependent impulse conditions

$$x(t+) - x(t-) = J_i(x(t-)) \text{ for } t \in (a, b) \text{ such that } t = \gamma_i(x(t-)), \tag{2}$$

where J_i and γ_i are continuous, $i = 1, \ldots, p$, $p \in N$, we use an analytical approach and derive a general existence principle. The principle serve as a tool for the proofs of the solvability of the impulsive boundary value problem (1), (2) with various data functions f, J_i, γ_i and ℓ, see e.g. [1].

Then we consider problem (1) with f continuous and with the state-dependent impulse condition

$$x(t+) - x(t-) = J(x(t-)) \text{ for } t \in (a, b) \text{ such that } g(t, x(t-)) = 0. \tag{3}$$

For the impulsive boundary value problem (1), (3) a constructive approach is used, and conditions which allow to realize a construction of a solution are presented. Proofs and illustrative examples can be found in [2].

Let us note that the impulse instants $t \in (a, b)$ in (2) or in (3) are state-dependent which means that they are not known before and depend on a solution x.

[1] I. Rachunková, J. Tomeček, *Existence principle for BVPs with state-dependent impulses*, Topol. Methods in Nonlin. Analysis 44 (2014), 349–368.

[2] I. Rachunková, L. Rachunek, A. Rontó, M. Rontó, *A constructive approach to boundary value problems with state-dependent impulses*, Applied Mathematics and Computations, submitted.

Oscillations of Delay and Difference Equations with Several Deviating Arguments

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Consider the first-order delay differential equation

$$x'(t) + \sum_{i=1}^{m} p_i(t)x(\tau_i(t)) = 0, \quad t \geq 0,$$

where, for every $i \in \{1, \ldots, m\}$, p_i is a continuous real-valued function in the interval $[0, \infty)$, and τ_i is a continuous real-valued function on $[0, \infty)$ such that

$$\tau_i(t) \leq t, \quad t \geq 0, \quad \text{and}, \quad \lim_{t\to\infty} \tau_i(t) = \infty$$

and the discrete analogue difference equation

$$\Delta x(n) + \sum_{i=1}^{m} p_i(n)x(\tau_i(n)) = 0, \quad n \in \mathbb{N}_0.$$

where $\mathbb{N} \ni m \geq 2$, p_i, $1 \leq i \leq m$, are real sequences and $\{\tau_i(n)\}_{n\in\mathbb{N}_0}$, $1 \leq i \leq m$, are sequences of integers such that

$$\tau_i(n) \leq n - 1, \quad n \in \mathbb{N}_0, \quad \text{and} \quad \lim_{n\to\infty} \tau_i(n) = \infty, \quad 1 \leq i \leq m.$$

Several optimal oscillation conditions for the above equations are presented.

General Implicit Systems: Constructive Approach, Generalized Solutions and Perturbations

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We introduce a constructive method that provides the local solution of general implicit systems in arbitrary dimension via Hamiltonian type equations. A variant of this approach constructs parametrizations of the manifold, extending the usual implicit functions solution. We also discuss the critical case of the implicit functions theorem, define the notion of generalized solution and prove existence and properties. Examples are also indicated. The applications are motivated by shape optimization problems and concern the perturbations of implicit systems, including functional variations, and the form of the corresponding equation in variations.

Kurzweil-Stieltjes Integral and its Applications to Generalized Differential Equations

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The lecture will be devoted to the Kurzweil-Stieltjes integration in abstract spaces. We will give an overview of the state of the art a present some of our recent results obtained jointly with Giselle A. Monteiro. In addition, applications to generalized differential equations (in the sense of J. Kurzweil) will be discussed.

Mathematical Modelling of Blood Coagulation

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Blood coagulation is an important physiological mechanisms based on complex biochemical reactions in plasma and platelet aggregation. Malfunctioning of this mechanism results in various pathologies including thrombosis and cardio-vascular events. In this lecture we will discuss mathematical modelling of blood coagulation and clot growth. We will identify various mechanisms of clot growth and will show how it is influenced by various factors in normal and pathological conditions.

CONTRIBUTES TALKS

Semi-Linearity of some Spaces of Multifunctions

Gabriela APREUTESEI
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We study the semi-linearity for some spaces of multifunctions. We establish sufficient and characteristic conditions for a translated topology (on the space of sn-bounded multifunctions) to be semi-linear. We also introduce two metrics on a space of multifunctions and compare the induced topologies.

Continuous Dependence on Data for the Solutions of Some Differential and Difference Equations

Narcisa APREUTESEI
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We are interested in some classes of differential and difference equations associated with maximal monotone operators in Hilbert spaces. We present some continuous dependence results for their solutions on the operator that governs the equation.

Visualization of Hyperbolic Space by Central Projection onto a Horosphere

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Horosphere is surface in hyperbolic space that is isometric to the Euclidean plane. Therefore, we embed flat computer screen as horosphere in order to look at the hyperbolic space with "Euclidean eyes". We discuss problem of visibility considering position of a camera, a projected object and a horospere. Corresponding algorithms are implemented in Mathematica package L3toHorospere. We briefly present the package and obtain some interesting pictures and animations of hyperbolic polyhedra moving trough hyperbolic space.

Harmonicity on Semi-Riemannian Manifolds

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In the semi-Riemannian context, we provide a formula for harmonic functions, we obtain some properties of harmonic maps and we characterize the harmonicity of certain $(1,1)$–tensor fields.

Invariance Results for Fully Nonlinear Differential Inclusions

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In this talk we provide some invariance properties for a graph with respect to Carathéodory multivalued perturbation of m–dissipative differential inclusions in Banach spaces. We introduce first a new tangency concept adequate to our setting. This new tangency concept extends in a natural way these one considered in the case when the graph is as a constant subset of a Banach space and the perturbation is independent on t. Afterwards, by using tangency conditions expressed in the terms of this concept, we establish several necessary and/or necessary and sufficient conditions for invariance. As applications, we study regularity for the solutions set and we provide some null controllability results for nonlinear evolution inclusions.

Existence and Stability for a Class of Nonlinear Reaction-Diffusion Systems with Delay

Monica-Dana BURLICĂ
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The aim of this talk is to present some sufficient conditions for the existence, uniqueness and global asymptotic stability of the solutions for a class of nonlinear delay reaction-diffusion systems subjected to nonlocal initial conditions having affine growth.
Acknowledgement. The work is supported by the Romanian National Authority for Scientific Research, UEFISCDI, project code PN-II-ID-PCE-2011-3-0052.

Some Results About Weak Linear Spaces

Dan-Mircea BORŞ, **Anca CROITORU**[1]
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In our talk we point out some properties of weak linear spaces and relationships among different kinds of near linear spaces.

Considerations on Birkhoff set-valued integrability

Anca CROITORU[1], Alina GAVRILUŢ, Alina IOSIF
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We present some properties of a Birkhoff type integral for real functions with respect to set-valued measures taking values in the family of all nonempty subsets of a real Banach space.

State Feedback Stabilization for Decentralized Control Systems with Multiple Eigenvalues in Zero and Input Saturation

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Consider a decentralized control system with multiple Jordan blocks corresponding to the zero eigenvalue. The goal is to find a decentralized state feedback that stabilizes the closed loop without saturating the inputs. The design strategy consists of two stages: first a set of pre-feedbacks is applied in order to make the zero eigenvalue stabilizable from a certain channel, and afterwards a static feedback is applied on that channel such that the closed loop becomes stable while the inputs do not saturate for small enough parameters.

Curvature Properties of The Vertical Rescaled Sasaki Metric

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For a Riemannian manifold M, we determine some curvature properties of a tangent bundle TM equipped with the Vertical Rescaled Sasaki Metric G^f. The first part of the talk is to give explicit formulae of the Ricci and scalar tensors for the deformed metric in TM. We found conditions on the base manifold and the function under which (TM, G^f) is ‡at, locally symmetric or Einstein manifolds.

The second part of this talk is dedicated to study of the conditions for the curvature R^f of G^f to be recurrent or pseudo symmetric, we employ the method proposed by T.Q. Binh and L. Tamassy.

Evolutionary Dynamics in Cancer Cell Populations and Optimal Control of Targeted Chemotherapy Delivery

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This study is based on a reference model defined by a sample of cancer cells. These cancer cells are characterized by heterogeneous genotypic-phenotypic profiles corresponding to different level of proliferative potential. The sample is exposed to the action of Targeted Chemotherapeutic Agents (TCAs, in the sequel), which selectively kill cancer cells according to their genotypic-phenotypic profiles. Moving toward a mathematical formalization, we look at the sample as a population structured by a continuous variable $s \in [0, 1]$ standing for the genotypic-phenotypic profile of the cells. Cancer cells are exposed to the action of TCAs, considered as an additional population, also structured by the same continuous variable s, which is related to the genotypic-phenotypic profile of the cells that the therapeutic agents are mainly able to recognize and attack. An optimal control problem associated to an ODE system resulted from the dynamics of the reference model at large time and small mutations is investigated. The cancer growth and chemo-therapeutic drugs inoculation imply systemic costs for the human body, measured by the concentrations of tumor cells and cytotoxic agents inside the system over the time interval $[0, T]$. As a result, the optimal control problem of targeted chemotherapy delivery is approached by introducing a proper functional embodying these costs, and looking for the existence of an optimal infusion rate allowing the minimization of such a functional over the time interval $[0, T]$. Results of the numerical simulations are also presented.

The Projective and H-Projective Curvature of the Tangent Bundle

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We consider a Riemannian manifold (M, g), and provide the necessary and sufficient conditions under which the total space TM of the tangent bundle, endowed with a natural diagonal metric G is a space form, or equivalently (TM, G) is projectively Euclidean. We classify the natural diagonal metrics G w.r.t. which (TM, G) is horizontally (resp. vertically) projectively flat. Moreover, when TM is endowed with a complex structure obtained as a natural diagonal lift of g and (TM, G, J) is a Kähler

manifold, we obtain the conditions under which (TM, G, J) is a complex space form (or equivalently $H-$projectively Euclidean). We also prove the equivalence between the H–projectively flatness of the natural diagonal Kähler manifold (TM, G, J), its horizontally H–projectively flatness, and its vertically H–projectively flatness.

Penalization and Metric Regularity in Vector Optimization

Marius DUREA

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We introduce a new method to penalize a constrained optimization problem by means of a scalarization functional applied to the constraints system. Then we present a general framework to get necessary optimality conditions for vector optimization problems and we briefly discuss the needed assumptions.

Coderivative Necessary Optimality Conditions for Two Efficiency Notions in Vector Optimization with Variable Ordering Structure

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In this talk we define two new concepts of efficiency for vector optimization with variable ordering structure and we study their connections with classical concepts of efficiency in vector optimization. Then we get necessary optimality conditions for them by using Fréchet and Mordukhovich calculus coupled with the Gerstewitz's (Tammer's) scalarizing functional and openness results for multifunctions.

Threshold Boundedness Conditions for n–species Models of Mutualism

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We extend a result obtained recently by Maxin, Georgescu and Sega for two-species models of mutualism to a n–dimensional framework. Specifically, we show that the main result that establishes the bounding conditions can be extended to an arbitrary number of species interacting in a mutualistic manner. Further, we analyze several examples where these conditions provide a boundedness threshold.

Some new Properties of Clelia Curves

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In this talk, some already known and some new properties of Clelia curves are presented. These spherical curves are characterized by the linear dependency of its coordinates when parameterized using spherical coordinates. Because Clelia curves emerged naturally when studying flat twisted surfaces, first the construction of twisted surfaces is explained. Then, the construction of Plücker's conoid is recalled as well as its connection with Clelia curves. Since Clelia curves are special cases of larger classes of (spherical) curves, we give an overview of these. Also, a generalization of Clelia curves to curves on superquadrics such as superellipsoids is defined.

Classification of the Weyl Tensor in 4-Dimensions and Neutral Signature

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In this talk I will present an algebraic classification of the Weyl conformal tensor C in 4-dimensions and neutral signature $(+,+,-,-)$. The tensor C naturally decomposes into a sum of a self dual and an anti-self dual part and each part can be naturally and easily classified by means of Jordan canonical forms. The classification will

then be extended to the full Weyl tensor and shows similarities to the classification in Lorentz signature (the Petrov Classification). The concepts of principal null directions and principal, totally null 2–spaces will then be explained. Algebraic symmetries of C at a point m, through certain tetrad transformations at m, will be discussed and related to the Lie algebra structure $o(2,2)$ (which is $o(1,2) \times o(1,2)$) of the space of 2–forms at m.

Properties of Submanifolds in Product Metallic Riemannian Manifolds

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The main aim of this talk is to find some properties of submanifolds in the product metallic Riemannian manifolds. We focus on submanifolds with the usual problem to obtain some conditions for totally geodesic, umbilical or minimal submanifolds in a metallic Riemannian manifold.

An Almost Contact Structure of the Vertical Liouville Distribution on the Big-Tangent Manifold

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In this talk we introduce a natural framed $f(3,1)$–structure of corank 2 on the vertical bundle over the big-tangent manifold associated to a riemannian space (M,g). When we restrict it to an integrable vertical Liouville distribution over the big-tangent manifold, we obtain an almost contact structure.

Determining the Main Probabilistic Characteristics for the Duration of the Stationary Games Defined on Stochastic Systems with Final Sequence of States and Independent Transitions

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A stochastic system with final sequence of states and independent transitions represents a zero-order Markov process that stops its evolution as soon as given sequence of states is reached. The transition time of the system is unitary and the transition probability depends only on the destination state. We consider the following game. Initially, each player defines his distribution of the states. The initial distribution of the states is established according to the distribution given by the first player. After that, the stochastic system passes consecutively to the next state according to the distribution given by the next player. After the last player, the first player acts on the system evolution and the game continues in this way until the given final sequence of states is achieved. Our goal is to study the duration of this game, knowing the distribution established by each player and the final sequence of states of the stochastic system. It is proved that the distribution of the duration of the game is a homogeneous recurrent linear sequence and it is developed a polynomial algorithm to determine the initial state and the generating vector of this recurrence. Using the generating function, the main probabilistic characteristics are determined.

Generalized Solutions of Semilinear Evolution Inclusions

Alina Ilinca LAZU
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We consider different types of (generalized) solutions for semilinear evolution inclusions in general Banach spaces and we study the topological properties of the solution set.

Positive Solutions for a Multi-Point Discrete Boundary Value Problem

Rodica LUCA TUDORACHE
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We investigate the existence and nonexistence of positive solutions for a system of nonlinear second-order difference equations with parameters subject to multi-point boundary conditions. In the proof of our main existence results we use the Guo-Krasnoselkii's fixed point theorem. This is a joint work with Prof. Johnny Henderson (Baylor University, Waco, Texas, USA).

A Multivalued Càdlàg Reflected Problem

Lucian MATICIUC
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We provide an existence and uniqueness result for a càdlàg Skorokhod problem driven by a maximal monotone operator and a generalized projection.

This is a part of a joint work with Aurel Răşcanu, Leszek Słomiński and Mateusz Topolewski.

On Existence pre-Semigeodesic Coordinates

Josef MIKEŠ
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We consider (with I. Hinterleitner) a problem of the existence of pre-semigeodesic coordinates on manifolds with affine connection. We obtain new results: for manifolds with differentiable affine connection there exists a pre-semigeodesic coordinate system.

Marginally Trapped Surfaces with Pointwise 1-type Gauss Map

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The concept of trapped surfaces was introduced in 1965 by Roger Penrose and plays an important role in General Relativity and the theory of cosmic black holes. A marginally trapped surface in the Minkowski 4–space is a spacelike surface whose mean curvature vector is lightlike at each point. Marginally trapped surfaces satisfying some extra conditions have been intensively studied in the last few years in connection with the rapid development of the theory of black holes in Physics. In the present talk we give the classification of marginally trapped surfaces with pointwise 1–type Gauss map. Our main result states that a marginally trapped surface free of flat points is of pointwise 1–type Gauss map if and only if it has parallel mean curvature vector field. In recent times, great attention is also paid to surfaces in pseudo-Euclidean spaces with neutral metric, since pseudo-Riemannian geometry has many important applications in Physics. In the pseudo-Riemannian geometry, the analogue of marginally trapped surface is the so called quasi-minimal surface. We give the complete classification of quasi-minimal Lorentz surfaces with pointwise 1–type Gauss map in the pseudo-Euclidean 4–space with neutral metric.

Obstacle Problems with Nonstandard Growth Conditions on Metric Measure Spaces

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We consider an obstacle problem on metric measure spaces, for a variational integral generalizing the p–Dirichlet integral, where the unknown is a function belonging to an Orlicz-Sobolev space and the role of the length of the gradient is played by a minimal weak upper gradient. The nonlinear potential theory on metric measure spaces was developed during the last decade as a study of the quasiminimizers of the p–Dirichlet integral. We provide sufficient conditions for the existence and uniqueness of the solution of the above obstacle problem, using a Poincaré inequality for Orlicz-Sobolev functions with zero boundary values. We also study the interplay between the solutions of obstacle problems and the superminimizers of the variational integral, as well as some of their properties, generalizing known results regarding the case of the p–Dirichlet integral.

Invariant Metrizability and Projective Metrizability on Lie Groups and Homogeneous Spaces

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We investigate the invariant metrizability and projective metrizability problem for the special case of the geodesic flow associated to the canonical connection of a Lie group. We prove that the canonical connection is projectively Finsler metrizable if and only if it is Riemann metrizable. Generalization of these results for geodesic orbit spaces are given.

Quadratic Residuosity Based Cryptography

Anca-Maria NICA
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The aim of this talk is to present some cryptographic schemes whose security is based on the quadratic residuosity problem. It is hard to distinguish between a quadratic residue and a quadratic non residue when the modulus is a composite integer. We also discus some attempts to extend allowing us to encrypt blocks of bits.
Acknowledgement. The work is supported by the POSDRU project, no. POSDRU/187/1.5/S/155397.

Magnetic Trajectories in Cosymplectic Manifolds

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In this communication we classify the trajectories of charged particles moving in the magnetic background of a cosymplectic manifold of arbitrary dimension. In particular, we consider the 3–dimensional case of the product manifold $M^2 \times R$.

Properties of Biconservative Surfaces

Simona NISTOR
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In our talk we will introduce the biconservative submanifolds, and we will focus on the properties of biconservative surfaces. First, we will present a link between the biconservative surfaces and the Ricci surfaces. Then, we will find the necessary and sufficient condition for an abstract Riemannian surface in order to admit a biconservative immersion into a three dimensional space forms.

Minimal time function with respect to a set of directions

Marian Dumitru PANŢIRUC
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A special minimal time function, given with respect to a set of directions is studied. Several properties, concerning continuity, convexity, Lipschitz behavior and subdifferential calculus are explored.

On a Class of Almost Paracontact Structures on T^2M

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A new class of almost paracontact structures on second order tangent bundle built on a Riemannian space is defined and studied in this paper. In particular, characterizations for the integrability and normality of this class of almost paracontact structures are given. Also, compatible linear connections with this class of almost paracontact structures are introduced and certain characterization of them is obtained. This is a joint work with Adrian Sandovici.

An Existence Result for a Nonlinear Multi-Valued Delay System with Nonlocal Initial Conditions

Daniela ROŞU
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We present some sufficient conditions for the existence of C^0–solutions for a general nonlinear multi-valued delay system with nonlocal implicit initial conditions. An example to a reaction-diffusion system is also included.
Acknowledgement. The work is supported by the Romanian National Authority for Scientific Research, UEFISCDI, project code PN-II-ID-PCE-2011-3-0052.

Singular Limit of Solutions to the Cauchy Problem for Abstract Second Order Differential Equations with two Small Parameters and Depending on Time Operators

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In a real Hilbert space we consider a singularly perturbed Cauchy problem for abstract linear second order differential equations with two small parameters and depending on time operators. We study the behavior of solutions to the perturbed problem relative to solution to the corresponding unperturbed problem, as small parameters tend to zero. We establish that the solution to the unperturbed problem has a singular behavior, relative to both parameters, in the neighborhood of $t = 0$. We show the boundary layer and boundary layer function in two different cases.

On Spectral Theory of Linear Relations in Complex Banach Spaces

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Let X and Y be two complex Banach spaces. Let A be a multi-valued linear operator (a linear relation) from X to Y and let B be an everywhere defined bounded operator also from X to Y. The operator B plays the role of a transition operator from X to Y. It is the main goal of the present talk to present the basic spectral properties of A linked to the transition operator B. The talk is based on joint work with Marcel Roman.

The Decomposision Principle Applied to Approximate the Plane Fractional Diffusion Equation

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The classical model of the evolution process in different domain apply the usual partial derivatives of first and second order of unknown function (as in [1]). In recent years many authors use the fractional space derivative to modeling such process. The class of approximate schemes for the transport of any substance in atmosphere has been constructed in [2] for the case of one space variable. In this article it is considered the same problem with two space variables of the form

$$\frac{\partial \varphi}{\partial t} - d_+(x)\frac{\partial^\alpha \varphi}{\partial_+ x^\alpha} - d_-(x)\frac{\partial^\alpha \varphi}{\partial_- x^\alpha} - d_+(y)\frac{\partial^\alpha \varphi}{\partial_+ y^\alpha} - d_-(y)\frac{\partial^\alpha \varphi}{\partial_- y^\alpha} = f(x,y,t),$$
$$\varphi(x,y,0) = s(x,y),$$
$$\varphi(x,y,t) = 0 \quad \text{on } \partial D,$$

in the domain $D = [0,a]\times[0,b]$ with the boundary ∂D and the time interval $[0,T]$. Using the decomposition principle [1] the stability of the class of the weighted approximate schemes, constructed in [3] is proved for considered problem.

[1] G.I. Marchuk, *Mathematical modeling in problem to protection the environment*, Nauka, Moscow, 1982 (in Russian).

[2] I. Secrieru, V. Ticau, *Weighted approximate scheme for fractional order diffusion equation*, Buletinul Institutului Politehnic din Iaşi, LVII (LXI), Iaşi, Romania, 2011.

[3] I. Secrieru, *Application of the decomposition principle for plane fractional diffusion equation*, 201–205, Proceedings, "Modelare mathematica, Optimizare si Tehnologii Informationale", ATIC, Chisinau, Evrica, Republica Moldova, 2014.

Composition Set-Valued Mappings: Metric Subregularity and Fixed Points

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We underline the importance of the parametric subregularity property of set-valued mappings, defined with respect to fixed sets. We show that this property appears naturally for some very simple mappings which play an important role in the theory of metric regularity. We show a result concerning the preservation of metric subregularity at generalized compositions. Then we obtain, on purely metric setting, several fixed point assertions for set-valued mappings in local and global frameworks.

Global Bifurcation of Steady Gravity Water Waves with Critical Layers

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I will present some recent results on the problem of two-dimensional travelling water waves propagating under the influence of gravity in a flow of constant vorticity over a flat bed. By means of a conformal mapping and an application of Riemann-Hilbert theory, the free-boundary problem is equivalently reformulated as a one-dimensional pseudo-differential equation which involves a modified Hilbert transform.

Using the new formulation, existence is established, by means of real-analytic global bifurcation theory, of a family of solutions which includes waves of large amplitude, even in the presence of critical layers in the flow. This is joint work with Adrian Constantin and Walter Strauss.

Left-Invariant Metrics on Heisenberg Lie Group

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Heisenberg Lie algebra is the unique nilpotent Lie algebra with one-dimensional center. The corresponding simpy connected Lie group is Heisenberg group H^{2n+1}.

In this talk we classify left-invariant metrics of signature $(2n+1,0)$ and $(2n,1)$ on Heisenberg group and investigate their geometry.

A Boundary Control Problem for a Stochastic PDE with Nonlinear Dynamical Boundary Conditions

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We study a control problem where the state equation is a nonlinear partial differential equation of the calculus of variation in a bounded domain, perturbed by noise. We allow the control to act on the boundary and set stochastic boundary conditions that depend on the time derivative of the solution on the boundary. This work provides necessary and sufficient conditions of optimality in the form of a maximum principle. We also give a result of existence of an optimal control in the case when the control acts linearly. This is a joint work with Stefano Bonaccorsi (University of Trento, Italy).