ICMAA2000

Abstract

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Keynote Speakers

The Measure Problem

Louis de Branges

Email: `To be annouced`

Address: Dept. of Mathematics, Purdue Univ. West Lafayette, In 47907, USA.

Abstract

The measure problem of Stefan Banach and Casimir Kuratowski (1929) concerns the structure of a bounded measure which is defined on all subsets of a set. A trivial examples of the set in such a way that the sum of the numbers assigned to the elements of the subset. The measure problem concerns the existence of a nontrivial measure for a set. Banach and Kuratowski show that no nontrivial measure exists for the classical continuum when the classical continuum hypothesis is satisfies. The classical continuum hypothesis is consistent with the axioms of the set theory by a theorem of Kurt Gödel (1938), but is independent of these axiom by a theorem of Paul Cohen (1963). The existence of a nontrivial measure for the classical continuum is consistent with these axioms by a theorem of Robert Solovay (1971) if the existence of a nontrivial measure for some set is consistent with these axioms. These axioms are the Zermelo-Fränkel axioms supplemented by the axiom of choice. The existence of a nontrivial measure for the classical continuum (or its equivalent) has generally been accepted as a hypothesis in set theory for more than twenty years. Yet the only evidence for the existence of such a measure lies in the absence of a proof to the contrary. Such a proof is the aim of the present work. The theory of Riesz spaces is seen as the weakness in existing integration theories which hinders the discovery of such a proof. Related locally convex spaces are proposed in which order structure is replaced by module structure over an algebra of continuous functions. A generalization of the Hahn-Banach theorem applies in the present spaces as it does in Riesz spaces. But an axiomatization of the Lebesgue dominated convergence theorem in the present spaces gives a decisive advantage over Riesz spaces. The present theory has another advantage in that it applies to functions whose values are taken in a Banach space. An example due to Per Enflo (1987) shows that an operator on a Banach space need not have a nontrivial invariant subsepace. A conjecture of Victor Lomonosov (1991) asserts the existence of a nontrivial invariant subspace for the adloint operator on the dual Banach space. A proof of the conjecture is an application of the proposed integration theory and of a fixed-point theorem due to Ky Fan (1952).

Similarity problems and length

Gilles Pisier

Email: `gip@ccr.jussieu.fr`

Address: Dept. of Mathematics, Univ. of Paries VI. 70 rue Claude Bernard Paries, 75005, France.

Abstract

Let A be a unital operator algebra, *i.e.* a closed subalgebra of $B(H)$ (with H a Hilbert space). We will study the following similarity property for A: every *bounded* unital homomorphism $u\colon A \to B(H)$ is similar to a *contractive* one, *i.e.* there is an invertible operator $S\colon H \to H$ such that the "conjugate" homomorphism $a \to S^{-1}u(a)S$ is contractive. An analogous property can be formulated for any discrete group. In the talk, we will concentrate mainly on operator algebras, and especially C^*-algebras. The notion of amenability is central to the discussion. Moreover, it turns out that this study leads naturally to a notion of "length" for an operator algebra analogous to the diameter of a group for the distance associated to the word-length relative to a set of generators. Recently, using random matrices, we have been able to produce examples of (non self-adjoint) operator algebras of arbitrary length, but the C^*-case remains open, essentially equivalent to a 1955 conjecture of Kadison.

Variational Analysis and Optimization

Ralph T. Rockafellar

Email: `rtr@amath.Washington.edu`

Address: Dept. of Mathematics, Univ. of Washington, Box 354350 Seattle, WA98195-4350.

Abstract

Maximization and minimization, as operations of analysis for constructing new functions, differ from the more familiar operations like integration and composition in that they typically do not preserve differentiability. Moreover they must be treated in a context of constraints which further introduce nonsmoothness and, through modeling with infinite penalties, bring extended-real-valued functions to the focus.

For this purpose, forms of variational geometry have been developed which replace the classical duality between tangent and normal subspaces by that of tangent and normal cones in various polar relationships. Applications of this geometry to the epigraphs of extended-real-valued functions, instead of the graphs of real-valued functions, yield a kind of subdifferential calculus. Such calculus has proven to be very useful in analyzing problems of optimization and their dependence on parameters.

Convexity, Games, and Stability Problem

Mau-Hsiang Shih

Email: mhshih@poincare.math.cycu.edu.tw

Address: Department of Mathematics, Chung Yuan Christian University, Chung-Li, Taiwan 320

Abstract

This will be a description of two questions where convexity plays a crucial role in the answers of these two questions. The first is in games without side payments. The second is in stability of linear dynamical systems. The convexity tools are Fritz's convexity theorem and multiple Shapley covering theorem.

Invited and Contributive Speakers

A perturbed Ishikawa iterative algorithm for general mixed multivalued mildly non-linear variational inequalities

Rais Ahmad

Email:

Address: Dept. of Mathematics Aligarh Muslim University Aligarh - 202 002 India.

Abstract

A perturbed Ishikawa iterative algorithm is given to obtain the approximate solution for general mixed multivalued mildly nonlinear variational inequalities. The convergence criteria for perturbed algorithm is also discussed.

Criteria for Algebraic Dependence of Meromorphic Mappings

Yishihiro Aihara

Email: aihara@la.numazu-ct.ac.jp

Address: Numazu College of Technology 3600 Ooka, Numazu, Shizuoka 410-8501, Japan

Abstract

Let M be a projective algebraic manifold. Let $\pi : X \to \mathbf{C}^m$ be a finite analytic covering space. We denote by s_0 its sheet number and by B its ramification divisor. Set $M^2 = M \times M$. For meromorphic mappings $f, g : X \to M$, we define a meromorphic mapping $f \times g : X \to M^2$ by $(f \times g)(z) = (f(z), g(z))$ for $z \in X - (I(f) \cup I(g))$, where $I(f)$ and $I(g)$ are the loci of the indeterminacy of f and g respectively.

Definition. Let S be an analytic subset of X. Nonconstant meromorphic mappings $f, g : X \to M$ are said to be *algebraically dependent* on S if there exists a proper algebraic

subset Σ of M^2 such that Σ is not of the type $\Sigma_1 \times \Sigma_2$ with algebraic subsets $\Sigma_j \subseteq M$ for $j = 1, 2$ and $(f \times g)(S) \subseteq \Sigma$.

We fix a big line bundle $L \to M$. Now we define $[F/L]$ to be the infimum of the set of rational numbers γ such that $\gamma L \otimes F^{-1}$ is big. We always assume that there exists at least one dominant meromorphic mapping $f_0 : X \to M$. Let $D_1, \ldots, D_q$ be divisors in $|L|$ such that $D_1 + \cdots + D_q$ has only simple normal crossings. For an effective divisor E on X and a positive integer k, we denote by $\mathrm{Supp}_k\, E$ the union of all irreducible components of E with the multiplicities at most k. Let $k_1, \ldots, k_q$ be fixed positive integers. Set $E_j = \mathrm{Supp}_{k_j} f_0^* D_j$ and assume that $\dim E_i \cap E_j \leq m - 2$ for any $i \neq j$. We define a hypersurface S in X by $S = E_1 \cup \cdots \cup E_q$. Let F_1 and F_2 be big line bundles over M. Assume that, for one of F_1, F_2 (say F_0), $F_0 \otimes F_j^{-1}$ is either big or trivial. Set $\tilde{F} = \pi_1^* F_1 \otimes \pi_2^* F_2$, where $\pi_j : M^2 \to M$ are the natural projections on j-th factor. Let $\tilde{L}$ be a line bundle over M^2. Assume that there exists a positive rational number $\tilde{\gamma}$ such that $\tilde{\gamma}\tilde{F} \otimes \tilde{L}^{-1}$ is big and $\gamma \tilde{F} \otimes \tilde{L}^{-1}$ is not big for any rational number γ with $0 < \gamma < \tilde{\gamma}$. Let $\mathcal{R}$ be the set of all hypersurfaces Σ in X such that $\Sigma = \mathrm{Supp}\tilde{D}$ for some $\tilde{D} \in |\tilde{L}|$ and Σ is not of the type $\Sigma_1 \times \Sigma_2$. Let $\mathcal{F}$ be the set of all *dominant* meromorphic mappings $f : X \to M$ such that $\mathrm{Supp}_{k_j} f^* D_j = E_j$ for all $1 \leq j \leq q$. We denote by $\mathcal{F}_0$ the family of all meromorphic mappings $f \in \mathcal{F}$ such that $(f_0 \times f)(S) \subseteq \Sigma$ for some Σ in $\mathcal{R}$.

Suppose that $f_0 : X \to M$ separates the fibers of $\pi : X \to M$. Then there exist a positive integer μ and a pair of sections $\sigma_0, \sigma_1 \in H^0(M, \mu L)$ such that a meromorphic function $f^*(\sigma_0/\sigma_1)$ separates the fibers of $\pi : X \to \mathbf{C}^m$. We denote by μ_0 the least integer that satisfies the above condition. We define $L_0 \in \mathrm{Pic}(M) \otimes \mathbf{Q}$ by

$$L_0 = \left(\sum_{j=1}^{q} \frac{k_j}{k_j + 1} - 4(s_0 - 1)\mu_0 \right) L \otimes \left(-\frac{2k_0}{k_0 + 1} \right) \tilde{\gamma} F_0,$$

where $k_0 = \max\{k_1, \ldots, k_q\}$. If L_0 is sufficiently big, we can conclude that the algebraic dependence on S propagates to the whole space X as follows:

Theorem 1. *Suppose that f_0 separates the fibers of $\pi : X \to \mathbf{C}^m$. If $L_0 \otimes K_M$ is big, then f_0 and f are algebraically dependent on X for each $f \in \mathcal{F}_0$.*

Set $\gamma_0 = [L_0^{-1} \otimes K_M^{-1}/L]$. If $L_0 \otimes K_M$ is big, we see $\gamma_0 < 0$. In the case where γ_0 is nonnegative, we cannot conclude the propagation of algebraic dependence in general. In the case of $\gamma_0 > 0$, in general, the propagation of algebraic dependence does not occur. However, in the case of $\gamma_0 = 0$, we have the following theorem on the propagation of algebraic dependence under a condition on the existence of Nevanlinna's deficient divisors:

Theorem 2. *Suppose that f_0 separates the fibers of $\pi : X \to \mathbf{C}^m$ and $\gamma_0 = 0$. If $\delta_{f_0}(D_j) > 0$ for at least one $1 \leq j \leq q$, then f_0 and f are algebraically dependent on X for each $f \in \mathcal{F}_0$.*

We can deduce some unicity theorems for meromorphic mappings by taking line bundles F_j of special type in the theorems above.

Generalized Projection and Orthogonal Decompositions In Banach Spaces

Yakov Alber

Email: alberya@techunix.technion.ac.il

Address: Technion-Israel Institute of Technology, Haifa, Isreal.

Abstract

Transition Semigroups on Weighted Function spaces

Francesco Altomare

Email: altomare@pascal.dm.uniba.it

Address: Dept. of Mathematics, Purdue Univ. Bari, Italy. Campus Universitario Via E. Orabona, 4 70125 Bari - Italia

Abstract

Very recently we have been concerned with some problems dealing with positive semigroups on general weighted function spaces defined on a locally compact Hausdorff space.

Our main aim was, on one hand, to characterize those positive semigroups acting on these spaces which correspond to suitable Markov transition functions and, hence, to some Markov process on the underlying space.

On the other hand we was also interested in investigating necessary and sufficient conditions under which a given densely defined linear operator generates such positive semigroups.

In the talk we shall report on some results on this subject together with some applications.

In particular we shall be concerned with particular classes of degenerate elliptic second order differential operators on the interval $[0, +\infty[$ by showing that they generate a transition semigroup.

Furthermore, we construct a sequence of discrete-type positive operators whose iterates converge to the semigroup.

By means of these operators we show several properties of both the semigroup and the corresponding Markov process. In particular, we give an approximation formula of the distribution of the position of the process at every time, provided the distribution of the initial position is given and possesses some finite moments.

Some of the results we shall present have been obtained jointly with I. Carbone ([1]) and E.M. Mangino ([2]).

References

[1] F. Altomare and I. Carbone, Markov processes and diffusion equations on unbounded intervals, preprint, 1999.

[2] F. Altomare and E.M. Mangino, On a class of elliptic-parabolic equations on unbounded intervals, preprint, 1999.

Bloomfield-Watson Type Inequalities for Eigenvalues

Tsuyoshi Ando

Email: ando@hokusei.ac.jp

Address: Faculty of Economics Hokusei Gakuen Univ. Atsubetsu-ku, Sapporo 004-8631, Japan.

Abstract

Let Φ be a **unital positive linear** map from the space M_n of $n \times n$ matrices to M_m. Here positivity means that $\Phi(A) \geq 0$ (positive semi-definite) whenever $A \geq 0$ while unitality means $\Phi(I_n) = I_m$. Among basic inequalities for such a map are

$$\Phi(A^2) \geq \Phi(A)^2 \quad \text{and} \quad \Phi(A) \geq \Phi(A^{-1})^{-1} \quad (A > 0).$$

For $A > 0$, denote by $\lambda_1(A) \geq \lambda_2(A) \geq \ldots \geq \lambda_n(A)(\geq 0)$ its eigenvalues arranged in non-increasing order. There have been known a reasonable upper bounds of $\Phi(A^2) - \Phi(A)^2$ in terms of a scalar (i.e. a scalar multiplie of the identity) and that of $\Phi(A^2)$ in terms of

a scalar multilple of $\Phi(A)^2$. Correspondingly there have been known a reasonable upper bound of $\Phi(A) - \Phi(A^{-1})^{-1}$ in terms of a scalar and that of $\Phi(A)$ in terms of a scalar multiplie of $\Phi(A^{-1})^{-1}$. With use of eigenvalues they are written in the following forms.

$$\lambda_1\left(\Phi(A^2) - \Phi(A)^2\right) \leq \frac{\{\lambda_1(A) - \lambda_n(A)\}^2}{4}, \tag{1}$$

$$\lambda_1\left(\Phi(A)^{-1} \cdot \Phi(A^2) \cdot \Phi(A)^{-1}\right) \leq \frac{\{\lambda_1(A) + \lambda_n(A)\}^2}{4\lambda_1(A) \cdot \lambda_n(A)} \tag{2}$$

and

$$\lambda_1\left(\Phi(A) - \Phi(A^{-1})^{-1}\right) \leq \left\{\sqrt{\lambda_1(A)} - \sqrt{\lambda_n(A)}\right\}^2, \tag{3}$$

$$\lambda_1\left(\Phi(A^{-1})^{\frac{1}{2}} \cdot \Phi(A) \cdot \Phi(A^{-1})^{\frac{1}{2}}\right) \leq \frac{\{\lambda_1(A) + \lambda_n(A)\}^2}{4\lambda_1(A) \cdot \lambda_n(A)}. \tag{4}$$

When Φ is a **compression** to an $m \times m$ (with $m \leq \frac{n}{2}$) principal diagonal, in other words

$$\Phi(X) = X_{11}$$

where

$$X = \begin{bmatrix} X_{11} & X_{12} \\ X_{21} & X_{22} \end{bmatrix}$$

is a block matrix representation with $m \times m$ matrix X_{11} we can present finer structures for the inequalities (1) to (4) by using the majorization relations of eigenvalues. These will reveal the meanings of the determinantal and tracial inequalities due to Bloomfield-Watson, Knott, Khatri-Rao, Rao and others. Let Φ be a compression. Then for $A > 0$ and $k = 1, 2, \ldots, m$ the following inequalities hold.

$$\sum_{j=1}^{k} \lambda_j\left(\Phi(A) - \Phi(A^{-1})^{-1}\right) \leq \sum_{j=1}^{k} \left\{\sqrt{\lambda_1(A)} - \sqrt{\lambda_n(A)}\right\}^2, \tag{5}$$

$$\prod_{j=1}^{k} \lambda_j\left(\Phi(A^{-1})^{\frac{1}{2}} \cdot \Phi(A) \cdot \Phi(A^{-1})^{\frac{1}{2}}\right) \leq \prod_{j=1}^{k} \frac{\{\lambda_j(A) + \lambda_{n-j+1}(A)\}^2}{4\lambda_j(A) \cdot \lambda_{n-j+1}(A)}. \tag{6}$$

The System of Vector Equilibrium Problems and Its Applications

Qamrul Hasan Ansari

Email: ansari@math.nsysu.edu.tw

Address: Dept. of Mathematics, Aligarh Muslim University, Aligarh-202 002, India

Abstract

We introduce the system of vector equilibrium problems and prove the existence of a solution. As an application, we derive some existence results for the system of vector vartiational inequalities. We also establish some existence results for the system of vector optimization problems which includes the Nash equilibrium problem as a special case.

Resolvent Positive Operators and Non-Homogeneous Boundary Conditions

W. Arendt

Email: arendt@mathematik.uni-ulm.de

Address: Dept. of Mathematics, Univ. of Ulm. Abteilung Mathematik V, Universitat Ulm, D-89069 ULM, Germany.

Abstract

The talk is devided in an abstract part on resolvent positive operators and a concrete part on the heat equation. In the first part, it will be shown that, the non-homogeneous Cauchy problem defined by a resolvent positive operator allows a unique solution for suitable data. It turns out that these results are most convenient to pass from elliptic to parabolic equations. As a concrete example, in part two, the Poisson operator is considered, which is resolvent positive, non densely defined and does not satisfy the Hille Yosida condition. It allows us to give an elegant approach to the heat equation with non homogeneous boundary contitions. Instead of L^2 spaces as usual, we here use the space of continuous functions on the closure of a bounded domain satisfying minimal regularity on the boundary (Dirichlet regularity). Well posedness is also proved for the corresponding problem for general elliptic operators with measurable coefficients. Here we use Bernstein's theorem on completely monotonic functions to deduce the paprabolic maximum principle from the elliptic maximum principle.

Degenerate Evolution Problems and Beta-type Operators

Antonio Attalienti

Email: `attalienti@matfin.uniba.it`

Address: Universit?degli Studi di Bari Facolt?di Economia Via Camillo Rosalba 53 70124 Bari (Italy)

Abstract

The talk is concerned with the study of the differential operator $Au(x) := \alpha(x)\, u''(x) + \beta(x)u'(x)$ in the space $C([0,1])$ and of its adjoint $Bv(x) := ((\alpha v)'(x) - \beta(x)v(x))'$ in the space $L^1(0,1)$, where $\alpha(x) := x\,(1-x)/2$ $(0 \le x \le 1)$. In addition, we introduce and study two different kinds of Beta-type operators as a worthy generalization of similar operators already defined by Lupas. Among the corresponding approximation results, we show how they can be used in order to represent explicitly the solutions of the Cauchy problems associated with the operators A and $\widetilde{A}$, where $\widetilde{A}$ is equal to B up to a suitable bounded additive perturbation.

Some Inequalities for Q_p Functions

Rauno Aulaskari

Email: `Rauno.Aulaskari@joensuu.fi`

Address: Dept. of Mathematics, University of Joensuu P.O.Box 111, FIN-80101 Joensuu, Finland

Abstract

Based on joint work with Fernando Perez-Gonzalez and Hasi Wulan.

Let Ω be a domain in the complex plan with Green's function $g_\Omega(z,a)$. Suppose that f is an analytic function in Ω. Then the following theorem holds: For all p, $0 < p < \infty$, we

have

$$\int\int_\Omega |f'(z)|^2 g_\Omega^p(z,a)dxdy \le \frac{p\Gamma(p)}{2^p}\int\int_\Omega |f'(z)|^2 dxdy,\ a\in\Omega. \tag{1}$$

For $p = 1$, (1) have been proved by S. Kobayashi for arbitrary Riemann surfaces possessing Green's functions.

A Construction of the Optimal Path in a Multi–Choice Game

D. A. Ayoshin

Email: sltana@cc.hirosaki-u.ac.jp

Address: Dept. of Information Science, Faculty of Science, Hirosaki University Hirosaki 036–8561, Japan.

Abstract

Consider a finite non–cooperative game $\Gamma = \langle K(x_0), P, h\rangle$ with perfect information and without chance moves, where $K(x_0)$ is the game tree with the initial node x_0, $P = P_1 \cup \cdots \cup P_n \cup P_{n+1}$ is the player partition (P_{n+1} is the set of terminal nodes) and $h : P_{n+1} \to R^n_+$ is the terminal payoff function. Suppose that $K(x_0)$ has a special structure: 1) for any evolution of Γ players make decisions according with their index order; 2) each path has the same length. We say that a *stage* is n sequential decisions such that the first decision is made by player 1, the second — by player 2, and so on, the n–th — by player n. Let the length of Γ be $T + 1$ stages.

In [2] it was proposed to specify a coalition by n–dimensional vector $s = (s_1, \dots, s_i, \dots, s_n)$, where $s_i \in M = \{0, 1, \dots, m\}$, $m \ge 2$, shows activity of player i in the coalition s. Such coalition's definition leads to an extension of a usual cooperative game to a multi–choice cooperative (MC) game. Using a concept of partial cooperation ([3], [1]) we propose an interpretation of MC game which will be called *MC game in extensive form.*

Suppose that in the game Γ a vector $s = (s_1, \dots, s_n)$, $s_i \in \overline{L} = \{0, 1, \dots, T + 1\}$, $i \in N = \{1, \dots, n\}$, is introduced. We construct a new game $\Gamma_s(x_0)$ by assuming that players can cooperate under some conditions defined by s.

We shall say that player i does not cooperate in the game $\Gamma_s(x_0)$ with any other player to the stage $t_i = T - s_i + 1$, and he is ready to cooperate with anyone starting from the

stage t_i until the end of the game. Thus, from the initial stage until the stage $t_i - 1 = T - s_i$ player i keeps individually rational behavior, but in every stage $\tau \in \{t_i, \dots, T\}$ he has to participate in the coalition of players who are ready to cooperate in the stage τ too. If $s_i = 0$, it means that player i has to keep on a non–cooperative behavior during all game. A component s_i of the vector s shows duration of player i's cooperation in the game $\Gamma_s(x_0)$.

We propose a procedure of seeking for the optimal behavior in $\Gamma_s(x_0)$ for each player. A game $\Gamma_s(x_0)$ where players form the vector s themselves is called a MC game in extensive form and denoted by $\Gamma_L(x_0)$, $L = \prod_{i \in N} \overline{L}$. In this paper a procedure of optimal path construction for the class of MC cooperative games in extensive form is discussed.

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Some Extensions of Miyadera-Voigt Perturbation Theorem with Applications

Jacek Banasiak

Email: banasiak@scifs1.und.ac.za

Address: University of Natal, Durban School of Mathematical and Statistical Sciences
Durban 4041 South Africa

Abstract

A modified version of Miyadera-Voigt perturbation theorem for semigroups which doesn't require stong contractivity condition of the latter was originally was introduced by Arlotti to deal with Boltzmann equation with external field. We show some extensions of this modification and present a range of application for various conservative operators appearing in kinetic theory.

Random Fixed Points and Iteration Process for Asymptotically Nonexpansive Random Maps

Ismat Beg

Email: `IBEG@MATH-1.sci.kuniv.edu.kw`

Address: Dept. of Mathematics, Kuwait University, P. O. Box 5969, Safat-13060, Kuwait

Abstract

The purpose of this talk is to prove existence of random fixed point for asymptotically nonexpansive random maps. We also construct a Mann type iteration process for asymptotically nonexpansive random maps which converges to the random fixed point.

On Some New Spaces of Lacunary Strongly σ-Convergent Sequences Defined By Orlicz Functions

Vinod K. Bhardwaj

Email: `search@vidya.kuk.ernet.in`

Address: Dept. of Mathematics, Kurukshetra University Kurukshetra-136119 India

Abstract

The main object of this paper is to introduce and study a new concept of lacunary strong σ-convergence with respect to an Orlicz function M. We examine some topological properties of the resulting sequence spaces, and establish some elementary connections between lacunary strong σ-convergence and lacunary strong σ-convergence with respect to an Orlicz function which satisfies Δ_2-condition. We also give the relation between strong σ-convergence with respect to an Orlicz function and lacunary strong σ-convergence with respest to an Orlicz function.

q-Concavity and Related Properties on Symmetric Sequence Spaces.

Oscar Blasco

Email: Oscar.Blasco@uv.es

Address: Dept. de Analisis Matematico. Universidad de Valencia. 461000 Burjassot (Valencia) Spain

Abstract

We introduce a new property between the q-concavity and the lower q-estimate of a Banach lattice and we get a general method to construct maximal symmetric sequence spaces that satisfies this new property but fails to be q-concave. In particular this gives examples of spaces with the Orlicz property but without cotype 2.

Von Neumann Relations over Heyting Lattices

Sam L. Blyumin

Email: slb@stu.lipetsk.su

Address: Lipetsk State Techn Univ 30 Moskovskaya, 398055 Lipetsk, Russia

Abstract

Von Neumann Relations over Heyting Lattices are introduced.

Cancellation Properties of Murray-von Neumann Equivalence

L. G. Brown

Email: `lgb@math.purdue.edu`

Address: Dept. of Mathematics, Purdue Univ. West Lafayette. In 47907, USA.

Abstract

Two projections, p and q, in a C*-algebra A are Murray-von Neumann equivalent, in symbols p q, if there is a partial isometry u in A such that u*u = p and uu* = q. In general p + r q + r does not imply that p q, but there are important cases in which this does hold. There are other cancellation properties which are also interesting. One of these arose in the joint work of Gert Pedersen and myself and was called weak cancellation. The talk will describe three different cancellation properties and will focus particularly on a property which is intermediate between weak cancellation and the (strong) cancellation described above. This intermediate property holds for all C*-algebras with the property (IR) of Friis and Rordam. Here is some relevant history: In the first half of the 90's, Huaxin Lin solved a longstanding problem, showing thqt every pair of almost commuting self-adjoint n x n matrices can be approximated by a commuting pair, independently of n. Friis and Rordam gave a much simplified proof and simultaneously generalized the result, replacing matrices by elements of C*-algebras with (IR). My work was motivated by the desire to understand the class (IR).

A semi-Opial property

monika Budzyńska

Email: monikab@golem.umcs.lublin.pl

Address: Institute of Mathematics University of Maria Curie-Sklodowska, 20-031 Lublin, Poland

Abstract

In the talk we will present a few applications of a semi-Opial property in the metric fixed point theory.

Ergodic Theorems for Actions of Several Contracting Operators

Alexander Bufetov

Email: bufetov@mccme.ru

Address: Independent University of Moscow 121002, Moscow, Bolshoi Vlasievskiy per., 11

Abstract

Suppose we have several contracting operators acting on on a functional space. Such situations arise in ergodic theory, random dynamical systems, complex differential equations, etc. New averaging process is introduced and ergodic theorems are established for such actions. The main difficulty is to prove the invariance of the limit functions under the action of each operator. This is easier in reflexive spaces, where the theorems of Lorch and Ackoglu are used, and more complicated in L_1-spaces, where approximation techniques need to be employed.

Some Properties of The KMS-Function

Jan A. van Casteren

Email: vcaster@uia.ua.ac.be

Address: Dept. of Mathematics and Computer Science, University of Antwerp (UIA) Universiteitsplein 1, 2610 Antwerp/Wilrijk, Belgium

Abstract

Let, for $j = 0, 1$, $H_j = H_j^* \geq -\omega_j > -\infty$, be a self-adjoint operator in the Hilbert spaces $\mathcal{H}_j$. Let $T : \mathcal{H}_1 \to \mathcal{H}_0$ be a linear operator with domain in $\mathcal{H}_1$ and range in $\mathcal{H}_0$. Let $V_j(t) = \exp(-tH_j)$, $t \geq 0$, be the strongly continuous semigroup generated by H_j, $j = 0$, 1. If the operators

$$(aI + H_0)\, V_0\,(t_0)\, T\,(aI + H_1)^{-1} \text{ and } (aI + H_0)^{-1}\, T\,(aI + H_1)\, V_1\,(t_0)$$

are compact, (Hilbert-Schmidt, Trace class), then so is the operator

$$\int_0^{t_0} V_0(u) T V_1\,(t_0 - u)\, du.$$

The result is applicable if $T = \mathcal{J} H_1 - H_0 \mathcal{J}$, where $\mathcal{J} : \mathcal{H}_1 \to \mathcal{H}_0$ is a bounded linear (identification) operator. In this case $\int_0^{t_0} V_0(u) T V_1(t_0 - u) du = V_0\,(t_0)\,\mathcal{J} - \mathcal{J} V_1\,(t_0)$; i.e. the difference of the semigroups. Some convergence and approximation results are presented as well. For example the operator $\int_0^{t_0} V_0(u) T V_1\,(t_0 - u)\, du$ is expressed in terms of the operator $t_0 V_0\,(t_0/2)\, T V_1\,(t_0/2)$.

A Minimax Theorem Involving Two Functions

Cao-Zong Cheng

Email: czcheng@263.net

Address: Dept. of Mathematics, Beijing Polytechnic University, Beijing100022, China

Abstract

A minimax theorem involving two functions is derived, where the convexity assumptions on two functions are given by “cross” conditions. Simons’ upward-downward minimax theorem and Lin-Quan’s two functions symmetric minimax theorem are generalized.

Theorem 1. *Let X be a compact topological space and Y be a nonempty set. Let $f, g : X \times Y \to R$ such that $f(\cdot, y)$ and $g(\cdot, y)$ are usc on X for any y in Y. suppose that:*

(1) for any $x_1, x_2 \in X$ and any finite subset A of Y, there exists $x_0 \in X$ such that for all $y \in A$, $f(x_0, y) \geq \min\{f(x_1, y), g(x_2, y)\}$ and for all $y \in \{y \in A : f(x_1, y) \neq g(x_2, y)\}$, $f(x_0, y) > \min\{f(x_1, y), g(x_2, y)\}$,

(2) for any $\varepsilon > 0$, there exists $\delta > 0$ such that for any $y_1, y_2 \in Y$, there exists $y_0 \in Y$ such that for all $x \in X$, $g(x, y_0) \leq \max\{f(x, y_1), g(x, y_2)\}$ and for all $x \in \{x \in X : |f(x, y_1) - g(x, y_2)| \geq \varepsilon\}$, $g(x, y_0) \leq \max\{f(x, y_1), g(x, y_2)\} - \delta$. Then $f^* \leq g_*$.

The Existence Theorem of Proximate Lower Phy-Order and its Applications

Tien-Yu Peter Chern

Email: tychern@nas07.isu.edu.tw

Address: Dept. of Applied Math, I-Shou Univ Ta-Hsu, Kaohsiung County 840, Taiwan, R.O.C.

Abstract

We prove the existence theorem of proximate lower ϕ-order and give a simple systematic method for proving many elementary relations between inferior limits on quantities of nonconstant meromorphic functions.

Dilations and Numerical Ranges

Man-Duan Choi

Email: choi@math.toronto.edu

Address: Dept. of Mathematics, Univ. of Toronto. Toronto, Canada M5S 3G3.

Abstract

Here are re-encounters with dilations and numerical ranges of Hilbert-space operators. Hopefully, it is never late to find a new meaning of the old value.

The First Eigenvalue of The Laplacian for Plane Ring Domains

Chie-Ping Chu

Email: chieping@math.scu.edu.tw

Address: Dept. of Mathematics, Soochow University

Abstract

We obtain through conformal mappings and variational methods some relations among the first Dirichlet eigenvalues of plane circular ring domains as the inner hole moving .Out of them, we could get lower bounds for the first Dirichlet eigenvalue of a plane doubly connected domain in terms of its shape.

Schroeder's Equation in Several Variables

Carl Cowen

Email: cowen@math.purdue.edu

Address: Dept. of Mathematics, Purdue Univ., West Lafayette, In 47907, USA.

Abstract

Over the past half century, there has been strong interplay between complex analysis on the one hand and the theory of operators acting on function spaces on the other. Most often, complex analysis has been used to explain and motivate advances in the structure of operators; it is rarer for operator theory to explain the underlying structure of analytic functions.

This talk will describe the use of the theory of compact composition operators on weighted Hardy spaces of the unit ball in $\mathbf{C}^N$ to study the generalized Schroeder's functional equation, $f \circ \varphi = Af$, where f and φ are analytic on the ball and φ maps the ball into itself with $\varphi(0) = 0$ and $A = \varphi'(0)$.

In one variable, Schroeder's functional equation was solved by Koenigs in 1884 and it has provided a means of understanding the iteration of an analytic function in a neighborhood of an attractive fixed point. Indeed, if f is univalent on some neighborhood of zero, then $\varphi(z) = f^{-1}(Af(z))$ near zero which says that, using f to change variables, φ "is like" multiplication by A. Thus, a solution of $f \circ \varphi = Af$ can be thought as giving a "change of variables" (even if f is not univalent) under which composition by φ on the whole ball "is like" multiplication by A on $f(\mathbf{B}_N)$.

In several variables, there are algebraic obstructions to finding solutions of Schroeder's equation, univalent near 0, that are not present in the one variable case. Up to now, only local or formal solutions of Schroeder's equation have been found. Some of the obstructions in the several variable case will be described and, under hypotheses preventing these from occurring, a construction of global solutions of the equation will be given.

Perturbations and Approximate Minimum in Constrained Optimization

B. D. Craven

Email: craven@ms.umimelb.edu.au

Address: Dept. of Mathematics, Univ. of Melbourne. Parkville, Victoria 3052, Australia.

Abstract

An approximate minimum, for the minimization of a function f over a feasible set S, is a point ξ such that $f(x) \leq f(\xi) - \epsilon$ for all feasible x near the minimum point p of f on S. This concept is relevant when the problem data, or the computation, are approximate. Under regularity asswumptions, an approximate minimum is a local minimum of a perturbation of the given problem. This depends on the properties of a strict local minima, that a small perturbation moves the minimum point only by a small amount.

On the Perturbations and Extension of Isometries.

Guang-gui Ding

Email: `ding_gg@SUN.nankai.edu.cn`

Address: Nankai University Tianjin, China

Abstract

In this talk, I will introduce our work on the "(S)-stability problem" of linear isometries, and the extension Problem from unit sphere and in F-space for isometries. [Note. The (S)-stability problem of linear isometries: E, F-normed spaces, Is there $\delta(\epsilon)$ s.t. $\delta(\epsilon) \to 0$ as $\epsilon \to 0$, and for every ϵ-isometry $T \in B(E, F)$, there exists an isometry $V \in B(E, F)$ satisfing $||T - V|| \leq \delta(\epsilon)$?]

Asymptotically Isometric Copies of c_0 In Dual Spaces.

Patrick Dowling

Email: `dowlinpn@muohio.edu`

Address: Dept. of Mathematics and Statistics, Miami University Oxford, Ohio 45056, USA

Abstract

We will give characterizations of when the dual of a Banach space contains an asymptotically isometric copy of c_0.

Continuous Algorithms In Multivariate n-Term Approximation By Families of Integer Translates of Mixed Dyadic Scales of a Single Function

DINH Dung

Email: ddung@ioit.ncst.ac.vn

Address: Institute of Information Technology Nghia Do, Cau Giay, Hanoi, Vietnam

Abstract

We investigate best continuous algorithms in multivariate non-linear n-term approximation by families of integer translates of the mixed dyadic scales of the tensor product kernels, and non-linear n-widths based on continuous algorithms in non-linear n-term approximation. A central question to be considered is what, if any, are the advantages of non-linear approximation over approximation by linear manifolds, in the first place for smoothness classes of functions. The smoothness of functions to be approximated is more converniently and, maybe more naturally given by boundedness of Besov (quasi-)norm. We give the asymptotic orders of the non-linear n-widths and best n-term approximation by the family $\mathbf{V}$ formed from the integer translates of the mixed dyadic scales of the tensor product multivariate de la Vallée Poussin kernel, in the space $L_q(\mathbf{T}^d)$ of the unit ball $\mathbf{SB}^r_{p,\theta}$ of the Besov space of functions on d-dimensional torus $\mathbf{T}^d$ with common mixed smoothness r. Moreover, these asymptotic orders coincide and are achieved by a continuous algorithm of n-term approximation by $\mathbf{V}$, which is explicitly constructed.

Existence and Uniqueness for Davey-Stewartson System on a Circle

Yung-fu Fang

Email: fang@math1.math.ncku.edu.tw

Address: Dept. of Mathematics, Cheng Kung University, Tainan, 701 Taiwan

Abstract

The generalized Davey-Stewartson systems:

$$\begin{cases} iu_t + \sigma u_{xx} + u_{yy} = \lambda |u|^2 u + \mu u v_x, & (t;x,y) \in \mathbb{R}^+ \times \mathbb{R}^2, \\ v_{xx} + \nu v_{yy} = (|u|^2)_x, \end{cases} \tag{1}$$

where u is a complex value function related to the amplitude of the water wave and v is a real value function related to the mean velocity potential of the water wave.

In this talk we want to consider the Cauchy problem of the following Dayvey-Stewartson system on a circle.

$$\begin{cases} iu_t + \Delta u = \alpha |u|^{p-2} u + \beta u v_{x_1}, & (t,x) \in \mathbb{R}^+ \times \mathbb{T}^n, \\ -\Delta v = \gamma (|u|^2)_{x_1}, \\ u(0,x) = u_0(x), \end{cases} \tag{2}$$

where u and v are complex and real valued functions, respectively, Δ is the Laplace operator on $\mathbb{R}^n$, and α, β and γ are real constants.

Let u, v be the solutions of (2). Take the x_1 derivative, then take Fourier transform on the second equation in (2), we get

$$v_{x_1} = -\gamma \mathcal{F}^{-1}\big(\xi_1^2/|\xi|^2 \mathcal{F}(|u|^2)\big). \tag{3}$$

Denote $\quad E(\psi) = \mathcal{F}^{-1}\big(\xi_1^2/|\xi|^2 \mathcal{F}(\psi)\big) = \sum_\xi e^{ix\cdot\xi} \frac{\xi_1^2}{|\xi|^2} \int e^{it\tau} \widehat{\psi}(\xi,\tau) d\tau.$

The problem (2) is reduced to

$$\begin{cases} iu_t + \Delta u = \alpha |u|^{p-2} u - \beta\gamma E(|u|^2) u, & (t,x) \in \mathbb{R}^+ \times \mathbb{T}^n, \\ u(0,x) = u_0(x), \end{cases}$$

The main ingredients for the results are the fix point argument and the following apriori estimate. We follow the ideas of Bourgain and Guo, and make some modification.

Summing Multipliers and Nuclearity of Operators on Sequence Spaces.

Jan H. Fourie

Email: `wskjhf@puknet.puk.ac.za`

Address: Mathematics and Applied Mathematics School for CSM Potchefstroom University for Che Potchefstroom 2520 South Africa

Abstract

We introduce the concept of p-summing multiplier for a Banach space X. This is a scalar sequence such that its product with each weakly p-summable sequence in X is absolutely p-summable. Using this concept, we prove necessary and sufficient conditions for certain X-valued bounded linear operators on ℓ^p (which we call multiplier operators) to be nuclear. We show that X and X^{**} have the same p-summing multipliers and apply this result to exactly describe when the product of a fixed scalar sequence with each null sequence in the dual space X^* will be in the range of some X^*-valued measure of bounded variation. Similarly, we investigate sequences in the range of X-valued measures of bounded variation by means of summing multipliers for X^*. Some examples of summing multipliers and applications (for instance, equivalent formulation of the Orlicz property) are considered.

Normal Structure and the Arc Length in Banach Spaces

Ji Gao

Email: `jgao@ccp.cc.pa.us`

Address: Dept. of Mathematics Community College of Philadelphia 1700 Spring Garden Str. Philadelphia, Pa 19130-3991

Abstract

Let X be a Banach space, $X_2 \subset X$ be a two dimensional subspace of X, and $S(X) = \{x \in X : \|x\| = 1\}$ be the unit sphere of X. The relationship between normal structure and the arc lengths in X are studied. Let $R(X) = \inf\{l(S(X_2)) - r(X_2) : X_2 \subset X\}$, where $l(S(X_2))$ is the circumference of $S(X_2)$ and $r(X_2) = \sup\{2(\|x+y\|+\|x-y\|) : x, y \in S(X_2)\}$

is the least upper bound of the perimeters of the inscribed parallelogram of $S(X_2)$. The main result is that $R(X) > 0$ implies that X has uniform normal structure.

Some topics on (scalar and vector) Variational Inequalities

F. Giannessi

Email:

Address: Dept. of Mathematics, Univ. of Pisa. Italy, Viale delle Piagge 12.

Abstract

Some new equilibrium problems in Structural Engineering, Mathematical Physics, Operation Research, Statistics, Economics have stimulated the study of mathematical models of variational type, in particular Variational and Quasi-Variational Inequalities both in scalar and in vector format. This has opened new fields of mathematical research as well as new ways of analysing real problems. Some aspects of this development are discussed here. After a very short introduction to the Image space Analysis, some topics on Variational and Quasi-Variational Inequalities are considered; in particular, the existence of a primitive of a Variational Inequality and the potential, connections between penalization and regularization are discussed. Such an analysis leads to detect a new variational item. Then, the extension to Vector Variational Inequalities is considered and, among other questions, their scalarization is analysed from both numerical and analytic points of view. Scalar and vector optimization problems are considered as special cases.

Exotic Problems in Metric Fixed Point Theory

Kazimierz Goebel

Email: goebel@golem.umcs.lublin.pl

Address: Maria Curie-Sklodowska University (UMCS) Lublin, Poland UMCS Institute of Mathematics 20-031 Lublin, Poland

Abstract

The talk is devoted to present several open or only partially solved problems concerning existence of fixed points of lipschitzian mappings. The list of problems includes: minimal displacement, retracting balls onto spheres, contracting spheres to a point, fixed point free involutions and others. The present state of knowledge on this subject will be discussed.

Weighted Estimates for Stein's Maximal Function

Hendra Gunawan

Email: hgunawan@bdg.centrin.net.id

Address: Dept. of Mathematics Bandung Institute of Technology Jalan Ganesa 10 Bandung 40132 Indonesia

Abstract

Let ϕ_r be the normalised surface measure on the sphere of radius r, centre 0 in $\mathbf{R}^n$. Consider Stein's maximal funtion $M_\phi f$, which is defined by

$$M_\phi f = \sup_{r>0} |\phi_r * f|$$

for any nice function f on $\mathbf{R}^n$. We shall then be interested in the weighted estimate

$$\|M_\phi f\|_{L^p(w)} \leq C_p \|f\|_{L^p(w)}$$

where w is an A_p weight,$1 < p < \infty$. By using the Mellin transformation approach and interpolation techniques, we reprove and extend the result in [Garcia-Cuerva & Rubio

de Francia, *Weighted Norm Inequalities and Related Topics*, North-Holland, Amsterdam, 1985].

Fast Fourier Techniques in Structured Matrices

Georg Heinig

Email: georg@mcs.sci.kuniv.edu.kw

Address: Dept. of Math. & Comp. Sci. Kuwait University P.O.Box 5969 Safat 13060, Kuwait

Abstract

In the talk a survey of recent developments in theory and algorithms for structured matrices like Toeplitz, Hankel, Toeplitz-plus-Hankel, Vandermonde and Cauchy matrices will be given and some new results will be presented. Main attention is paid to the use of the FFT or related trigonometric transformations. This concerns:

- Representations of structured matrices using trigonometric transforms with application to fast matrix-vector multiplication,
- Fourier transformations between different classe of structured matrices with applications to stabilzation techniques
- superfast solvers for Toeplitz and related equations.

Random Matrix Models in Free Probability Theory

Fumio Hiai

Email: hiai@math.is.tohoku.ac.jp

Address: Graduate School of Information Sciences, Tohoku Univ. Aoba-ku, Sendai 980-8577, Japan

Abstract

The classical Wigner theorem says that a random symmetric (or Hermitian) matrix to the semicircle law as the matrix size goes to infinity under a suitable condition on moments of entries. Voiculescu's asymptotic freeness has played the leading role in recent development of free probability theory; it says that independent Hermitian Gaussian random matrices consitute an asymptotic random matrix model of a free family of semicircular variables, that is, the joint moments of independent Hermitian Gaussian matrices converge to those of free semicirculars. We extend Voiculescu's results to rather general unitarily invariant random matrices with the stronger almost sure convergence. To do so, we first treat the asymptotic freeness of Haar distributed unitary random matrices, a model of free Haar unitaries. Also, we discuss random matrix models of free circular variables, (compound) free Poisson variables and R-diagonal variables; all of them are fundamental exmaples of noncommutative random variables in free probability theory.

Next, we show that large deviation results exist behind the convergence of these random matrix models; roughly speaking, our large deviations mean that the empirical eigenvalue distribution of random matrices converges exponentially fast to the distribution of the corresponding noncommutative random variable.

Furthermore, based on random matrix models and their large deviations, we discuss Voiculescu's free entropy of noncommutative random variables, a sort of the free analogue of the classical Boltzmann-Gibbs entropy.

This lecture is based on the work jointly with D. Petz.

Reversibility and Irreversibility of Random Volutional Phenomena In Terms of White Noise

T. Hida

Email: thida@meijo-u.ac.jp

Address: Dept. of Mathematics, Meijo Univ., Japan.

Abstract

White noise is viewed as a stochastic representation of the time t. It is, therefore, quite natural to discuss reversibility and irreversibility of time-oriented random phenomena by using a white noise. In the case of one-dimensional parameter, that is time t, the most basic

reversible random process is a Brownian bridge. We shall generalize this result to the case of multi-dimensional parameter random fields. Namely, we wish to study the reversibility of random fields in terms of white noise. There the infinite dimensional rotation group, in particular a subgroup isomorphic to the conformal group, plays a dominat role. Some connections to the unitary representation of a Lie group will also be discussed.

Projection Theorems for Fractal Dimensions

John Howroyd

Email: msaoijdh@gold.ac.uk

Address: Department of Mathematics, Goldsmiths College, University of London, New Cross London SE14 6NW, England

Abstract

The fundamental result on the fractal dimension of projections concerns Hausdorff dimension. Although Hausdorff dimension is convenient for many mathematical purposes, other definitions of dimension, such as packing dimension and box dimensions are increasingly being used. It is natural to consider projection theorems that relate to these definitions of dimension. Surprisingly the direct analogue of the Hausdorff dimension result is not true. We outline mathematical techniques which may be used to derive appropriate results for these 'new' dimensions.

Comparison Theorems for Eigenvalues of One-Dimensional Schrodinger Operators

Min-Jei Huang

Email: mjhuang@math.nthu.edu.tw

Address: Dept. of Mathematics, National Tsing Hua Univ. Dept. of Mathematics, Meijo Univ., Hsinchu, Taiwan 30043.

Abstract

The Schrodinger operator $H = -d^2/dx^2 + V(x)$ on an interval with Dirichlet or Neumann boundary conditions has discrete spectrum $E_1 < E_2 < E_3 < \cdots$, for bounded V. In this paper, we apply the perturbation theory of discrete eigenvalues to prove a variety of bounds on $\sum_{j=1}^{k} E_j$.

Singular Limit of Solutions of Some Degenerate Parabolic Equations

Kin Ming Hui

Email: `makmhui@ccvax.sinica.edu.tw`

Address: Institute of Mathematics, Academia Sinica, Nankang, Taipei, 11529, Taiwan, R. O. C.

Abstract

In this talk we will discuss some of our recent results which extends a result of L. A. Caffarelli and A. Friedman on the singular limit of the porous medium equation. We will study the singular limit of solutions of equations of the form $u_t = \Delta(u^m) - A \cdot \nabla(u^q/q) - \lambda u^p$, $u > 0$, in $R^n \times (0, T)$, $u(x, 0) = u_0(x) \geq 0$ in R^n, where $u_0 \in L^1(R^n) \cap L^\infty(R^n)$ as $q \to \infty$ or $p \to \infty$ where $\lambda \geq 0$ and $A \in R^n$.

An Estimate of The Kakeya Mazimal Operator

Satoru Igari

Email: igari@math.tohoku.ac.jp

Address: Mathematical Institute, Faculty of Science Tohoku Univ. 34-31 Hiyoridai Taihakuku Sendai (982), Japan.

Abstract

Let $\mathcal{R}$ be the family of all cylinders in the Euclidean space $\mathbb{R}^d$ with height N and the bottom of diameter 2. The Kakeya maximal function is defined by $M_{\mathcal{R}}f(x) = \sup(1/|R|)\int_R |f(y)|dy$, where sup runs over R in $\mathcal{R}$ with center at x.

We shall discuss on the conjecture: There exist positive constants ε and c such that

$$\|M_{\mathcal{R}}f\|_d \leq c(\log N)^{\varepsilon}\|f\|_d$$

for all $f \in L^d(\mathbb{R}^d)$. In particular, we shall show that if $\mathcal{R}$ is restricted to a subfamily which consists of the cylinders with axes intersecting a fixed line.

Nonexistence of Monotonic Solutions of Some Third Order ODE Relevant to The Kuramoto-Sivashinsky Equation

Naoyuki Ishimura

Email: ishimura@math.hit-u.ac.jp

Address: Dept. of Mathematics, Hitotsubashi University Kunitachi, Tokyo 186-8601, Japan

Abstract

We deal with the third order ordinary differential equations (ODE) of form: $\lambda y''' + y' = f(y)$. Hence, $\lambda > 0$ is a parameter and f is a continuous function which has zeros at $\pm\alpha$ and satisfies further conditions specified in the talk. Typical examples of f includes: $f = 1 - y^2$ and/or $f = \cos y$. The former one ($\alpha = 1$) is derived from the Kuramoto-Sivashinsky equation, and the latter ($\alpha = \pi/2$) arises in a simple model for dendritic growth of needke crystals. We show that there exists no monotonis solutions with $y(\pm\infty) = \pm\alpha$ if $\lambda \geq \lambda(f)$,

where $\lambda(f)$ is a constant depending only on f. Although our results, especially in the above examples, do not give a different proof for all $\lambda > 0$, it presents a unified simple approach; the method of demonstration involves the transformation of the third order ODE into the second order equations, and the application of the maximum principle.

This is joint work with MasaAki Nakamura, Nihon University.

A Class of Banach Spaces With Weak*-Angelic Dual Unit Balls

Pawan K. Jain

Email: pkjain@himalaya.du.ac.in

Address: Dept. of Mathematics, University of Delhi, Delhi-110 007 India

Abstract

In the study of geometric properties of non-separable Banach spaces, for the last two decades, the concept of projectional resolution of the identity (in short, PRI) has played an important role. Investigations were made, on one hand, towards finding new classes of Banach spaces admitting PRI and on the other hand, to search for properties of non-separable Banach spaces in presence of PRI.

The characterization of Banach spaces with Weak*-angelic dual unit balls is an open problem.

In the present talk, after giving a brief account of the known classes of Banach spaces having with Weak*-angelic dual unit ball, the following main result has been presented:

Theorem: let E be a Banach space with a PRI $\{p_\alpha\}_{\omega \leq \alpha \leq \omega_1}$, where ω_1, denotes the first uncountable ordinal number. Then, the dual space E^* has a norming subspace V such that B_V is $\sigma(V, E)$-angelic.

As a consequence, such a space with PRI of a special type, called type I, has Weak*-angelic dual unit ball and hence also the Mazur property.

Determinantal Inequalities: Ancient History and Recent Advances

Charles R. Johnson

Email: `crjohnson@math.wm.edu`

Address: Dept. of Mathematics, The College of William and Mary P. O. Box8795 Williamsburg, VA 231878795

Abstract

After a brief review of classical inequalities due to Hadamard, Fischer, Koteljanskii, and others, we describe very recent work toward characterizing all multiplicative inequalities among principal minors in a matrix that is positive definite, an M-matrix, or totally positive. A cone theoretic approach allows complete characterization in some cases.

Analytic Functions With Negative Coefficients for Operator On Hilbert Sapce.

Santosh B. Joshi

Email: `joshisb@wces.ernet.in`

Address: Department of Mathematics, Walchand College of Engineering SANGLI 416 415,Maharashtra, India.

Abstract

Let if be a Hilbert Space on the complex field. Let A be an operator on H. For a complex analytic function f on the unit disc $U = \{z : |z| < 1\}$, we denote by $f(A)$, the operator on H defined by Riesz-Dunford Integral

$$f(A) = 1/2\pi \int_C f(z)(zI - A)^{-1} dz.$$

I is the identity operator on H, C is the positively oriented simple closed rectifiable contour lying in U and containing the spectrum of A in the its interior domain.

Let T_p denote the class of function of the form

$$f(z) = z^p - \sum_{n=1}^{\infty} a_{n+p} z^{n+p} a_{n+p} \geq 0$$

which are analytic and p-valent in U. We say that $f \in T_p$ is in $T_p(\alpha, \beta; A)$ it satisfy the condition

$$\|f'(A) - pA^{p-1}\| < \beta \|f'(A) + pA^{p-1}(1 - 2\alpha)\|, 0 \leq \alpha < 1, 0 < \beta \leq 1, p \in N.$$

A is the operator $\|A\| < 1$ and $A \neq \theta$, θ is the zero operator. We in the present paper have obtained coefficient estimates and distortion theorem for aforementioned class.

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Some Remarks About Uniformly Lipschitzian Mappings and Lipschitzian Retractions

Wieslawa J. Kaczor

Email: wkaczor@golem.umcs.lublin.pl

Address: Maria Curie-Sklodowska University, Institute of Mathematics 20-031 Lublin, Poland

Abstract

In our talk we will present a few facts and open problems about uniformly lipschitzian mappings and lipschitzian retractions.

Order Convexity and Concavity Properties in Lorentz Spaces

Anna Kaminska

Email: `kaminska@msci.memphis.edu`

Address: The University of Memphis Depart. of Math. Sciences, Memphis, TN 38152 USA

Abstract

A quasi-Banach lattice X is said to be *p-convex*,$0 < p < \infty$, respectively *q-concave*, $0 < q < \infty$, if there is a constant $K > 0$ such that

$$\left\| \left(\sum_{i=1}^{n} |x_i|^p \right)^{\frac{1}{p}} \right\| \leq K \left(\sum_{i=1}^{n} ||x_i||^p \right)^{\frac{1}{p}},$$

$$\text{respectively} \quad \left(\sum_{i=1}^{n} ||x_i||^q \right)^{\frac{1}{q}} \leq K \left\| \left(\sum_{i=1}^{n} |x_i|^q \right)^{\frac{1}{q}} \right\|$$

for every choice of vectors $x_1, \ldots , x_n \in X$. We also say that X satisfies anupper p-estimate, $0 < p < \infty$ (resp. a lower q-estimate, $0 < q < \infty$), if we restrict definition of p-convexity (resp. q-concavity) to elements $x_1, \ldots, x_n \in X$ with disjoint supports. We discuss lattice convexity and concavity in Lorentz spaces $\Lambda_{p,w}$, $0 < p < \infty$, where w is an arbitrary weight. Let $I = (0, 1]$ or $I = (0, \infty)$, and $L^0 \equiv L^0(I, |\ |)$be the set of all Lebesgue measurable functions $f : I \to \mathbb{R}_+$, where $|\ |$ denotes the Lebesgue measure on I. For $f \in L^0$we define its decreasing rearrangement as $f^*(t) = \inf\{s > 0 : d_f(s) \leq t\}, t > 0$,where $d_f(s) = |\{t : |f(t)| > s\}|$ is the distribution function of f. The Lorentz space $\Lambda_{p,w}$, $0 < p < \infty$, is a subspace of L^0 such that

$$\|f\| = \|f\|_{p,w} := \left(\int_I f^{*p} w \right)^{1/p} = \left(\int_I f^{*p}(t) w(t)\, dt \right)^{1/p} < \infty,$$

where a measurable *weight* function $w : I \to (0, \infty)$ satisfies the conditions

$$W(t) := \int_0^t w < \infty, \quad (t \in I) \quad \text{and} \quad \int_0^\infty w = \infty \quad \text{if } I = (0, \infty).$$

We show that $\Lambda_{p,w}, 0 < p < \infty$,contains an order isomorphic copy of l^p and we provide criteria for lattice convexity and concavity as well as for upper- and lower-estimates in $\Lambda_{p,w}$ in terms of $W(t) = \int_0^{tw}$, its indices and some integral conditions involving the weight w. The theorem below provides criteria for r-concavity. Let $0 < p < \infty$.

I. If $r > p$ then the following assertions are equivalent

(*i*) $\Lambda_{p,w}$ is r-concave.

(*ii*) The Hardy operator $H_{(r)}$ is bounded in $\Lambda_{p,w}$.

(*iii*) $\alpha(W) > p/r$, or equivalently $W(t)/t^{p/r+\epsilon}$ is pseudodecreasing for some $\epsilon > 0$.

(*iv*) The weight w satisfies condition $D_{p/r}$ that is there exists $C > 0$ such that

$$\int_0^x t^{-p/q} w(t)\, dt \leq C x^{-p/q} \int_0^x w, \quad x \in I.$$

II. If $0 < r < p$ then $\Lambda_{p,w}$ is not r-concave.

Fixed Point Theory and Nonexpansive Mappings

W. A. Kirk

Email: kirk@math.uiowa.edu

Address: Dept. of Mathematics The University of Iowa Iowa City, IA 52242-1419 USA

Abstract

Fixed point theory for nonexpansive mappings (mappings with Lipschitz constant 1) possesses an intrinsic appeal arising from the fact that it constitutes a limiting case in the study of contraction mappings. There is also a utilitarian interest in the subject bacause the metric conditions on the mappings and the underlying framework are described using concepts which arise naturally in functional analysis. We present a brief overview of the major developments in the theory, corresponding roughly to its chronological development. We also discuss some new developments and open questions involving the following topics. (1) The structure of the fixed point sets. (2) The approximation of fixed points. (3) Selection theorems in hyperconvex spaces.

Disintegration Method in Fourier Analysis

Shozo Koshi

Email: `koshi@math.Sci.hokudai.ac.jp`

Address: Hokkaido Institute of Technology. Kita-ku Tonden 2-2-4-8, Sapporo Japan.

Abstract

Our talk is concerned with Fourier Analysis of non Abelian case. We shall show that disintegration method is useful to prove theorems in Fourier Analysis.

The Bochner's theorem concerning product of Riesz sets in locally compact Abelian group were considered by many authors and proved successfully.

By using disintegration method, we will show that the Bochner's theorem of non Abelian compact case is proved.

The Denjoy-Wolff theorem

Tadeusz Kuczumow

Email: `tadek@golem.umcs.lublin.pl`

Address: Institute of Mathematics University of Maria Curie-Sklodowska, 20-031 Lublin, Poland

Abstract

In the talk we will present properties of the Kobayashi distance and their applications in proofs of a few versions of the Denjoy-Wolff theorem.

On Linear Volterra Equations and Integrated Solution Families

Chung-Cheng Kuo

Email:

Address: Dept. of Math. Fu Jen Catholic U.

Abstract

In this talking we present the basic theory for a class of Volterra integral equations of convolution type in Banach spaces. We show that the existence of an α-times integrated solution family for such an equation is equivalent to its well-posedness. The result can be applied to obtain additive and multiplication perturbation theorems.

Set Optimization with Set-Valued Maps

Daishi Kuroiwa

Email: kuroiwa@cis.shimane-u.ac.jp

Address: Dept. of Mathematics and Computer Science Interdisciplinary Faculty of Science and Engineering Shimane University

Abstract

Set-valued vector optimization has been researched as generalizations of vector-valued optimization by many authors. However the ordinary criterion of solutions is not always suitable for set-valued optimization. In this presentation, some natural and valid criteria of solutions based on comparisons among set-values of the objective map are introduced. With respect to such solutions, some examples and properties are considered and observed.

C^*-Crossed Products of C^*-Algebras with the Weak Banach-Saks Property by Coactions

Masaharu Kusuda

Email: kusuda@ipcku.kansai-u.ac.jp

Address: Dept. of Mathematics, Faculty of Engineering, Kansai University Yamate-cho 3-3-35, Suita, Osaka 564-8680, Japan

Abstract

Let (A, G, α) be a C^*-dymanical system. Under some conditions, it is shown that A has the weak Banach-Saks property iff $A \times_\alpha G$ has the same property. Furthermore, we state the similar results for coaction case.

Invariantly Complmented Subalgebras in The Dual of The Fourier Algebra

Anthony To-Ming Lau

Email: tlau@math.ualberta.ca

Address: Dept. fo Mathematical Sciences, University of Alberta Edmonton, Alberta Canada T6G-2G1

Abstract

Let G be a locally compact group and $VN(G)$ be the von Neumann algebra generated by left translations on the Hilbert space $L^2(G)$. Then $VN(G)$ can be identified with the dual of the Fourier algebra $A(G)$ of G. When G is abelian, then $VN(G) \cong L^\infty(\widehat{G})$ and $A(G) \cong L^1(\widehat{G})$. In this talk, I shall discuss the problem of when a weak*-closed invariant $*$-subalgebra M of $VN(G)$ has an invariant closed complement, a separation property on G, and the relation of M with the fixed point set of a commutative semigroup of linear operators from $VN(G)$ into $VN(G)$.

Some Additive-Preserver Problems

Yan-Nei Law

Email: h9515433@hkusua.hku.hk and mhyipa@hkusua.hku.hk

Address: Dept. of Mathematics, The University of Hong Kong, Pokfulam Road, Hong Kong.

Abstract

Let sl_n be the algebra of $n \times n$ complex matrices with zero trace. Let $\mathcal{N}$ be the set of nilpotent matrices. In this talk we will characterize the group of nonsingular additive maps ϕ on sl_n such that $\phi(\mathcal{N}) = \mathcal{N}$. By this result, we also characterize the additive maps on the space of $n \times n$ complex matrices that preserve c-spectrum and outer c-spectral radius.

Subsets of ℓ_1 with The Fixed Point Property for Asymptotically Nonexpansive Mappings.

Chris Lennard

Email: lennarcj@muohio.edu & lennard+@pitt.edu

Address: Mathematics and Statistics Department University of Pittsburgh & Miami University, Ohio (visiting) Oxford, Ohio 45056, USA.

Abstract

Vector-valued Submarkov Operators and Recurrent Iterated Functions Systems

Chi-Wai Leung

Email: cwleung@math.cuhk.edu.hk

Address: Dept. of Mathematics, The Chinese University of Hong Kong, Shatin, Hong Kong

Abstract

We consider a recurrent IFS with place-dependent transition weights. We use the quasi-compact operators theory to extend the results of Fan and Lau's paper(J. Math. analysis and Appl. 231,(1999) 319–344)in the the case of recurrent IFS.

On The Complemented Subspaces of The Schreier Spaces

Denny Ho-Hon Leung

Email: matlhh@leonis.nus.sg

Address: Dept. of Math. University of Singapore, Singapore 117543

Abstract

Given a natural number n, let (e_k) be the unit vector basis of the n-th Schreier space X_n. It is shown that two subsequences of (e_k) are equivalent if and only if the subspaces they generate are isomorphic. This is used to produce a set of continuum cardinality whose elements are mutually incomparable complemented subspaces of X_n spanned by subsequences of (e_k).

Linear Operators Preserving Numerical Ranges and Radii

Chi-Kwong Li

Email: ckli@math.wm.edu

Address: Dept. of Mathematics, College of William Mary.(Williamsburg, VA23187, USA) 3669 Bridgewater Drive, Williamsburg, VA23188, USA.

Abstract

Linear operators leaving invariant various kinds of numerical ranges and numerical radii will be discussed. Examples include the decomposable numerical ranges on symmetry classes of tensors, generalized numerical ranges on block triangular matrices, normed numerical ranges associated with symmetric norms.

Some Properties Related to Nested Sequences of Balls in Banach Spaces

Borluh Lin

Email: bllin@math.uiowa.edu

Address: Dept. of Mathematics, Univ. of Iowa Iowa City, Iowa 52242 USA

Abstract

Characterizations of extreme points, weak*-weak points of continuity and weak*-denting points of the unit ball of dual Banch spaces by unbounded nested sequences of balls are given. Related geometrical properties of Banach spaces are studied.

Coincidence Theorems, Fixed Point Theorems and Equilibrium Problems

Lai-Jiu Lin

Email: maljlin@math.ncue.edu.tw

Address: Dept. of Mathematics,National Changhua University of Education, Changhua,Taiwan,50058

Abstract

In this paper,we establish some coincidence theorems from which some well known coincidence theorems and fixed point theorems are generalized.As sonsequences of our results,we establish equilibrium theorems of multimap and fuzzy mappings and concidence theorem of fuzzy mappings

Canonical Forms for Hamitonian and Symplectic Matrices and Pencils

Wen-Wei Lin

Email: TBA

Address: TBA

Abstract

We study canonical forms for Hamiltonian and symplectic matrices or pencils under equivalent transformations which keep the class invariant. In contrast to other canonical forms our forms are as close as possible to a triangular structure in the same class. We give necessary and sufficient conditions for the existence of Hamiltonian and symplectic triangular Jordan, Kronecker and Schur forms.

General KKM Theorem with Applications to

Minimax and Variational Inequalities

Y. C. Lin

Email: linyc@math.nsysu.edu.tw

Address: Dept. of Math, NSYSU

Abstract

In this talk, a general version of KKM theorem is derived by using the concept of generalized KKM mappings introduced by Chang and Zhang. By employing our general KKM theorem, we obtain a general minimax inequality which contains several existing ones as special cases. As applications of our general minimax inequality, we derive an existence result for saddle point problems under general setting. We also establish several existence results for generalized variational and generalized quasi-variational inequalities.

Some Complemented Subspace Problem

Ying-Hsiung Lin

Email:

Address: Department of Mathematics, National Changhua University of Education

Abstract

In this paper we prove the following result: Every complemented subspace of a Banach space with a shrinking symmetric basis has an unconditional basis. It follows from this result that every block basic sequence of a shrinking symmetric bases of the whole space, which spans a complemented subspace can be extended to an unconditional basis of the whole space. These two results give the partial solutions to the problems raised by J. Lindenstrauss and P. G. Casazza respectively.

On Weighted Yosida Functions

Shamil A. Makhmutov

Email: makhm@ugatu.ac.ru

Address: Ufa State Aviation Technical University K.Marx Street 12, UFA, 450000, Russia

Abstract

We study meromorphic functions on the complex plane with given growth of the spherical derivative. These functions are described in terms of normality.

Singular Limit Procedures In Reaction-Diffusion Equations

M. Mimura

Email:

Address: Dept. of Mathematics, Hiroshima Univ. 23-12 Hachihonmatsu-Minami, Higanshi-Hiroshima, Japan.

Abstract

A variety of spatio-temporal patterns have been generated by reaction-diffusion equations, although the equations seem to be quite simple. In order to understand such patterns, we use singular limit procedures and obtain reduced equations. Some of which is described new types of free boundary problems.

New Recursive Algorithm for Solving Algebraic Riccati Equation with Mall Parameter

Koichi Mizukami

Email: `mizukami@es.hkg.ac.jp`

Address: Graduate School of Engineering, Department of Electonics, Hiroshima Kokusai Gakuin University, 20-1 Nakano 6, Aki-ku ,Hiroshima, 739-0321, Japan

Abstract

In this paper we study the algebraic Riccati equation corresponding to the optimal control theory for singularly perturbed system. The construction of the controller involves solving the full-order algebraic Riccati equation with small parameter. Under control-oriented assumptions, we first provide the sufficient conditions such that full-order algebraic Riccati equation has positive semi-definite stabilizing solution. Next we propose a new recursive algorithm based on the Kleinman algorithm to solve the algebraic Riccati equation which depend on the parameter. Our new idea is to use the solutions of the reduced-order algebraic Riccati equations in order to plug the initial condition. By using the new recursive algorithm, we can obtain a required solution of the algebraic Riccati equation. Finally, in order to show the effectiveness of the proposed algorithm, numerical examples are included.

A Space of Meromorphic Mappings and Deficiencies.

Seiki Mori

Email: `mori@sci.kj.yamagata-u.ac.jp`

Address: Dept. of Mathematical Sciences, Faculty of Science, Yamagata Unicersity Kojirakawa-machi 1-4-12 Yamagata-shi, Yamagata,990-8560, Japan

Abstract

I shall introduce a distance on the space M of meromorphic mappings of C^m into $P^n(C)$, and also show that the set of meromorphic mappings (or holomolphic curves)

without deficient of hyperplanes, hypersurfaces of degree at most given positive integer (or rational moving targets) is dence in M.

Appearance of Baker Domains

Shunsuke Morosawa

Email: `morosawa@math.kochi-u.ac.jp`

Address: Dept. of Mathematics and Information Science Faculty of Science Kochi University Akebonocho 2-5-1 Kochi 780-8520 Japan

Abstract

Baker domain may exist in the case of dynamics of transcendental entire functions. On the other hand, in the case of that of rational functions, there is no Baker domain. We take sequences of polynomials converging locally uniformly to a transcendental entire function whose dynamics has Baker domains. We consider the Hausdorff convergence of the Julia sets and the Caratheodory convergence of the Fatou sets.

On Local Cohomology of Banach Algebras

Mohammad Sal Moslehian

Email: `msalm@science2.um.ac.ir`

Address: Dept. of Math., Ferdowsi Univ., P. O. Box 1159, Mashhad 91775, IRan

Abstract

We describe the Banach theory version of the algebraic local cohomology and give some examples and new directions in this area.

On Properties of Stabilization Operator Arising in Maxed Parabolic Problems

Andrey Muravnik

Email: amuravnik@mail.ru

Address: Moscow State Aviation Institute, Dept. of Differential Equations Russia 125871, Moscow, Volokolamskoe shosse 4

Abstract

We apply so-called "operator view" (proposed by V. V. Žikov in *Math. USSR Sbornik, vol. 33 (1977), No. 4, 519–537*) on the stabilization problem: we observe the operator translating the input data of a boundary-value problem (such as initial-value function, boundary-value functions, right-hand side) into the limit of the solution. Those operators generate special function spaces, which are important for example for applications in optimal control — if the initial-value function does not provide the stabilization of the solution then we need to change it, but to do it with the least outlay of energy; thus the questions about the structure of the domain of the above-mentioned operator and about the best approximation by its elements arise.

We consider mixed problems for the equation

$$\frac{\partial u}{\partial t} - \sum_{j=1}^{n} \frac{\partial}{\partial x_j}(p_j(x)\frac{\partial u}{\partial x_j}) + a(x)u = f(x)$$

in the domain $D \times (0, \infty)$, where D is a bounded domain in $\mathbf{R}^n$, $p_j \in C^1(\overline{D})$ and $p_j(x) \geq p_0 \geq 0$ in D (for $j = 1, \ldots, n$), $a \in C^1(\overline{D})$ and $a(x) \geq 0$ in D, the right-hand side and the initial-value function belong to $L_2(D)$ (and if $a(x) \equiv 0$ then in case of Neumann's boundary-value conditions their integrals along D are equal to each other) and Dirichlet's (or Neumann's) boundary-value conditions are homogeneous. Here the limit of the generalized (weak) solution $u(x, t)$ is a function $g(x)$ from $W_2^1(D)$ such that the norm $\|u(x, t) - g(x)\|_{W_2^1(D)}$ is a continuous (at least after some positive t_0) function of t and its limit (as $t \to \infty$) is equal to zero. Denote the set of such limits by G. There are the

following main results. We obtain the description of G (in terms of generalized eigenvalues and generalized eigenfunctions of the corresponding elliptic problem), prove that this set does not coincide with $\overset{0}{W}{}_2^1(D)$ ($W_2^1(D)$ in case of Neumann's conditions) but it is a dense linear (affine) manifold in that space. Moreover if we observe the corresponding elliptic problem (when the right-hand side varies) then the set of its generalized (weak) solutions coincides with G.

The proof is based on expansions of solutions with respect to generalized eigenfunctions of elliptic problems and on investigations of these series.

The Coupled Sine-Gordon Equations As Nonlinear Second Order Evolution Equations

Shin-Ichi Nakagiri

Email: nakagiri@pascal.seg.kobe-u.ac.jp

Address: Dept. of Applied Mathematics, Faculty of Engineering, Kobe Univ. Nada, Kobe, 657-8501, Japan

Abstract

We study the coupled sine-Gordon equations of the form

$$\begin{cases} \dfrac{\partial^2 y_1}{\partial t^2} + \alpha_{11}\dfrac{\partial y_1}{\partial t} + \alpha_{12}\dfrac{\partial y_2}{\partial t} - \beta_1 \triangle y_1 \\ \qquad\qquad +\gamma_1 \sin y_1 + k_{11} y_1 + k_{12} y_2 = f_1, \\ \dfrac{\partial^2 y_2}{\partial t^2} + \alpha_{21}\dfrac{\partial y_1}{\partial t} + \alpha_{22}\dfrac{\partial y_2}{\partial t} - \beta_2 \triangle y_2 \\ \qquad\qquad +\gamma_2 \sin y_2 + k_{21} y_1 + k_{22} y_2 = f_2 \end{cases} \tag{1}$$

under Dirichlet of Neumann boundary conditions. This system (1) describes the dynamics of coupled Josephson junctions driven by current sources and is known to be a system which gives rise to a chaotic behaviours of solutions (cf. Temam [3]). Here in (1) $\alpha_{ij} \in \mathbf{R}$, β_i, $\gamma_i > 0$, $k_{ij} \in \mathbf{R}$ are physical constants and f_i are forcing functions, $i, j = 1, 2$. The constants α_{ij}, k_{ij} in (1) are chosen suitably to represent the effects of coupling.

We rewrite the system (1) as the following vectorial form of second order damped

evolution equations on some Gelfand triple space (cf. [1], [2])

$$\begin{cases} \mathbf{y}'' + \alpha\mathbf{y}' + \beta\mathbf{A}\mathbf{y} + \mathbf{k}\mathbf{y} + \gamma\sin\mathbf{y} = \mathbf{f} \text{ in } (0,T), \\ \mathbf{y}(0) = \mathbf{y}_0,\ \mathbf{y}'(0) = \mathbf{y}_1. \end{cases} \tag{2}$$

Under the evolution equation setting (2), we prove the existence and uniqueness of global weak solutions of (1). for the one space dimensional case we study their numerical analysis of weak solutions based on the finite element method as in [1]. As numerical simulations using *Mathematica* we give several figures of solutions for different types of initial values, forcing functions and physical parameters.

References

[1] R. Dautray and J. L. Lions, Mathematical Analysis and Numerical Methods for Science and Technology, *Springer-Verlag*, Vol. 5, Evolution Problems, 1992.

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[3] R. Temam, Infinite-Dimensional Dynamical Systems in Mechanics and Physis, Applied Math. Sci. 68, Second edi., *Springer-Verlag*, 1997.

On Generalized Fractional Integrals

Eiichi Nakai

Email: enakai@cc.osaka-kyoiku.ac.jp

Address: Dept. of Mathematics, Osaka Kyoiku University Kashiwara, Osaka 582-8582, Japan

Abstract

We introduce generalized fractional integrals and extend the Hardy-Littlewood-Sobolev theorem to the Orlicz spases and BMO.

Effective Speed of Traveling Wavefronts in Periodic Inhomogeneous Media

Ken-Ichi Nakamura

Email: nakamura@im.uec.ac.jp

Address: Dept. of Computer Science, University of Electro-Communications 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan

Abstract

We consider a bistable reaction-diffusion equation with spatially periodic diffusion rate. In certain circumstances, we can observe a traveling-front like motion with time-periodic shape and propagation speed. We study the influence of the variable diffusion rate on the propagation speed of such a traveling front solution.

Facial Structure of Convex Sets and Applications

Komuro Naoto

Email: komuro@atson.asa.hokkyodai.ac.jp

Address: Institution: Hokkaido University of Education at Asahikawa Hokumoncho 9-chome Asahikawa 070-8621 Japan

Abstract

We deal with the facial structure of convex sets. We will define some families of the faces and consider the order relation of them. As an application, we give a new proof of a representation theorem for convex functions which take values in the spaces of measurable functions.

The best approximation by projections in Banach spaces

Toshihiko Nishishiraho

Email: `nisiraho@sci.u-ryukyu.ac.jp`

Address: Dept. of Mathematical Sciences, Univ. of the Ryukyus Nishihara, Okinawa 903-0213 Japan

Abstract

Let X be a Banach space and let $B[X]$ denote the Banach algebra of all bounded linear operators of X into itself with the usual operator norm. Let $\mathbb{Z}$ denote the set of all integers, and let $\mathfrak{P} = \{P_j : j \in \mathbb{Z}\}$ be a sequence of projection operators in $B[X]$ satisfying the following conditions:

(P-1) $\mathfrak{P}$ is orthogonal, i.e., $P_j P_n = \delta_{j,n} P_n$ for all $j, n \in \mathbb{Z}$, where $\delta_{j,n}$ denotes Kronecker's symbol.

(P-2) $\mathfrak{P}$ is fundamental, i.e., the linear spann of the set $\cup_{j\in\mathbb{Z}} P_j(X)$ is dense in X.

(P-3) $\mathfrak{P}$ is total, i.e., if $f \in X$ and $P_j(f) = 0$ for all $j, n \in \mathbb{Z}$, then $f = 0$.

For each non-negative integer n, M_n stands for the linear spann of the set $\{P_j(X) : |j| \leq n\}$, which is a closed linear subspace of X. Let I_n denote the set of all bounded linear operators T of X into M_n such that $T(f) = f$ for all $f \in M_n$.

In this talk, we will consider the best approximation by operators of $\mathcal{I}_n$ under certain suitable conditions. Furthermore, applications are discussed for multiplier operators and convolution type operators associated with strongly continuous families of operators in $B[X]$ as well as for homogeneous Banach spaces which include the classical function spaces as particular cases.

Compactly Supported Wavelets

Igor Ya Novikov

Email: `novikov@func.vsu.ru`

Address: Dept. of Mathematics, Voronezh State University Square 1, 394693 Voronezh Russia

Abstract

The different modifications of Daubechies compactly supported wavelets will be considered. Problems of finding the optimal (with respect to time-frequency localization or smoothness) wavelets with a given support width will be reviewed.

Stochastic Calculus with Respect to Fractional Brownian Motion

David Nualart

Email: nualart@cerber.mat.ub.es

Address: Facultat de Matematiques, Univ. de Barcelona (Gran Via 585, 08007 Barcelona) Industria 29,4-2, 08037 Barcelona, Spain

Abstract

The aim of this talk is to introduce a stochastic integral with respect to the process $B_t := \int_0^t (t-s)^\alpha dW_s$, where $-1/2 < \alpha < 1/2$ and W_t is an ordinary Brownian motion. The integral is defined as the limit of the stochastic integrals with respect to the regularized processes

$$\int_0^t (t-s+\epsilon)^\alpha dW_s.$$

Sufficient integrability conditions can be deduced using the techniques of the Malliavin calculus and the notion of fractional derivative in the case $\alpha < 0$. In the case $\alpha > 0$ we can establish an Ito-type formula. We discuss the continuity of the indefinite integral and the approximation by Riemman sums. As an application we develop a stochastic calculus with respect to the fractional Brownian motion with Hurst parameter $H = 1/2 + \alpha$ and we compare this approach with other recent works in this subject.

Monotonicity and Asymptotical Stability of Travelling Waves for Some Degenerate Diffusion Equations,

Toshiko Ogiwara

Email: toshiko@math.josai.ac.jp

Address: Dept. of Mathematics, Faculty of Sciences, Josai University 1-1 Keyakidai, Sakado, Saitama 350-0295, Japan

Abstract

I am concrened with travelling waves for the degenerate diffusion equation

$$u_t = (u^m)_{xx} + f(u), \qquad x \in \mathbb{R},\ t > 0.$$

I consider travelling waves $u(x,t) = \phi(x - ct)$ whose limiting values $\lim\limits_{y\to\pm\infty} \phi(y)$ are stable zeroes of $f(u)$. My result is that the profile $\phi(y)$ of any stable travelling wave is monotone. I also talk about asymptotical stability and uniqueness (up to translation) of monotone travelling waves.

Weighted Composition Operators on the Sup-Norm Function Spaces

Shuichi Ohno

Email: ohno@nit.ac.jp

Address: Nippon Institute of Technology 4-1, Gakuendia, Miyashiro, Minami-Saitama, 345-8501 Japan

Abstract

We will characterize bounded and compact weighted composition operators on the sup-norm function spaces; the Bloch space, the little Bloch space, the Lipschitz space et all.

The results generalize the known corresponding results on multipliers and composition operators on the function spaces.

Perturbation Theory for m-Accretive Operators and Generalized Complex Ginzburg-Landau Equations

Noboru Okazawa

Email: okazawa@ma.kagu.sut.ac.jp

Address: Dept. of Mathematics, Science University of Tokyo Wakamiya-cho 26, Shinjuku-ku Tokyo, 162-8601 Japan

Abstract

Let Ω be a bounded or unbounded domain in $\mathbb{R}^N$ with compact C^2-boundary $\partial\Omega$ (including $\mathbb{R}^N$ itself). In $L^2(\Omega)$ we consider the initial-boundary value problem for the "generalized" complex Ginzburg-Landau equation:

$$\begin{cases} \dfrac{\partial u}{\partial t} + (\lambda + i\alpha)A(x,D)u + (\kappa + i\beta)g(x,|u|^2)u - \gamma u = 0 \quad \text{on} \quad \Omega \times \mathbb{R}_+, \\ \hfill u = 0 \quad \text{on} \quad \partial\Omega \times \mathbb{R}_+, \\ \hfill u(x,0) = u_0(x), \quad x \in \Omega. \end{cases} \tag{1}$$

Here u is a complex-valued unknown function, $i = \sqrt{-1}$, $\lambda > 0$, $\kappa > 0$, α, β, $\gamma \in \mathbb{R}$ are constants, $g \in C^1(\Omega \times (0,\infty); \mathbb{R})$ and $A(x,D)$ is the second order elliptic differential operator in divergence form:

$$A(x,D)u := -\sum_{j,k=1}^{N} \frac{\partial}{\partial x_k}\Big(a_{jk}(x)\frac{\partial u}{\partial x_j}\Big).$$

The purpose of this talk is to prove the global existence of unique strong solutions to (1) under condition

$$\frac{|\beta|}{\kappa} \le \frac{\sqrt{1+2\sigma}}{\sigma}$$

without any restriction on the dimension $N \geq 1$ and the constant $\sigma > 0$, where σ is an upper bound of the ratio $s(\partial g/\partial s)(x,s)/g(x,s)$. We can regard (1) as one of initial value problems for abstract evolution equations of the form

$$\frac{du}{dt} + Au = 0, \quad u(0) = u_0,$$

in $X := L^2(\Omega)$. In fact, set

$$\begin{aligned} Su &:= A(x,D)u \quad \text{for} \quad u \in D(S) := H^2(\Omega) \cap H^1_0(\Omega), \\ Bu &:= g(x,|u|^2)u \quad \text{for} \quad u \in D(B) := \{u \in X;\ g(x,|u|^2)u \in X\}. \end{aligned}$$

Then we see that

$$A := (\lambda + i\alpha)S + (\kappa + i\beta)B - \gamma \quad \text{with} \quad D(A) := D(S) \cap D(B).$$

According to the nonlinear semigroup theory we have only to show that $A+\gamma$ is m-accretive in X.

Uniqueness of Matrix Square Roots Under the Restriction of the Numerical Range

Kazuyoshi Okubo

Email: okubo@atson.sap.hokkyodai.ac.jp

Address: Mathematics Laboratory Hokkaido University of Education Ainosato 5-3 Sapporo 002-8502, Japan

Abstract

In this talk, we show that $A \in M_n(\mathbb{C})$ with $\sigma(A) \cap (\infty, 0] =$ has a unique square root $B \in M_(\mathbb{C})$ with $\sigma(B)$ in the open right half plane. Here for $X \in M_n(\mathbb{C})$, $\sigma(X)$ is the set of all eigenvalues of X. By this result we can answer an open question about the existence of a real square root with field of values in the open right half plane.

Zero Distribution of Remainders of Power Series

Yossyp Ostrovskyi (I. V. Ostrovskii)

Email: iossif@fen.bilkent.edu.tr

Address: Dept. of Mathematics, Bilkent Univ. 06533 Ankara, Turkey

Abstract

I. General results om zero distribution of sections.
Polya's theorem (1913) and its further generalizations. the final generalization by T. Ganelius (1963). The Saff-Varga "Width Conjecture" (1983) and related results. R. Jentzsch's theorem (1918) and its generalizations by G. Szego (1922), F. Carlson (1924), P. Rosenbloom (1944) and A. Dvoretzky (1950). Results of J. Buckholtz and J. Shaw (1970-2) related to zeros lying outside of the disc of convergence.

II. Special results on zero distribution of sections and remainders.
Results by G. Szego (1924), Dieudonne (1935), D. Newman–T. Rivlin (1972-6), Y. Yildirim (1991) related to sections and remainders of exponential serise. Method of A. Edrei–E. Saff–R. Varga (1983) and their results related to sections and remainders of Mittag-Leffler's and Lindelof's functions. Further results by A. Edrei (1986–91).

III. General results on zero distribution of remainders.
M. Pommiez's method (1960) based on remainder polynomials and interpolation series and his results. Results of J. Buckholtz, J. Frank and J. Shaw (1972) related to moduli of zeros of tails. Method of the author based on the value distribution theory and his results (1997–9) related to arguments of zeros of tails.

IV. Sections and remainders of power series with multiply positive coefficients.
Multiply positive sequences and related classical results. Complete characterization of totally positive sequences by Aissen-Edrei-Schoenberg-Whitney (1953). Schoenberg's problem on characterization of multiply positive sequences of fine order. Results of the author and N. Zheltukhina (1995–9) related to power series having sections or remainders with multiply positive coefficients.

Inequalities of Hardy And Carleman Type

Jain Pankaj

Email: pankajkrjain@hotmail.com

Address: Dept. of Mathematics, University of Delhi, Delhi- 110007 India

Abstract

The well known Hardy's inequality and the Carleman's inequality involve the arithmetic mean operator $Af = \frac{1}{x}\int_0^x f(t)dt$, respectively, the geometric mean operator $Gf = \exp\left(\frac{1}{x}\int_0^x \ln f(t)dt\right)$. We present a connection between the two inequalities. We also consider inequalities involving more general means e.g. power means or gini means. Some particular cases of special interest are pointed out and compared. Finally, a characterization of the weighted Carleman's inequality in two dimensions is given.

On Weakly Uniformly Convex Spaces, According to Calder

Pier Luigi Papini

Email: papini@dm.unibo.it

Address: Dept. of Mathematics, University of Bologna Piazza Porta S. Donato, 5; 40127 Bologna (Italy)

Abstract

We study a weakened notion of uniform rotundity in Banach spaces, introduced several years ago by Calder; apart from its property, we try to indicate connections with M-convex and d-convex sets. We recall that the notion studied here is satisfied by all uniformly rotund spaces, but also by many spaces whose norm is "very bad" from the geometrical point of view.

Fixed Point and Non-Retract Theorems Classical Circular Tours

Sehie Park

Email: shpark@math.snu.ac.kr

Address: Dept. of Mathematics, Seoul National Univ. Hyundai Apls 207-505, Gaepo-Dung, Seoul, Korea

Abstract

It is well-known that Brouwer fixed point theorem has numerous equivalent formulations in various fields of Mathematics such as topology, nonlinear analysis, equilibrium theory in economics, game theory, and others. In this survey, we collect such formulations closely related to Euclidean spaces or n-simplexes or n-balls.

In Section 2, we introduce three classical results — the Brouwer theorem, the Sperner lemma, and the Knaster-Kuratowski-Mazurkiewicz (simply, KKM) theorem: and we give a simple proof of the Brouwer theorem based on a particular form of the KKM theorem. Actually these statements in Section 2 are all equivalent to each other, and hence we would have our first calssical circular tour.

Section 3 deals with fixed point theorem, intermediate value theorems, various non-retract theorems, and the non-contractibility of a sphere. We will deduce one after another by giving transparent proofs. This would be our second classical circular tour which starts and ends with the Brouwer theorem.

Equivalence Relation and Bilinear Representation for Derivative Nonlinear Schrödinger Type Equations

Oktay K. Pashaev

Email: pashaev@math.sinica.edu.tw

Address: Joint Institute for Nuclear Research, Dubna (Moscow), 141980, Russian Federation

and

Institute of Mathematics, Academia Sinica, Taipei 11529, Taiwan

Abstract

Using reciprocity relations we mapped the problem of derivative nonlinear Schrodinger equation(DNLS) under the influence of quantum potential to integrable version of the derivative reaction-diffusion system (DRD). Bilinear representations for DNLS and DRD are found. Via Hirota method, one chiral dissipaton solution is constructed and related to a black hole in a constant curvature Λ spacetime with only one event horizon (chiral horizon). Some more applications will also be presented.

On some commutative and noncommutative Riesz transforms

Francoise Piquard

Email: `piquard@u-cergy.fr`

Address: Departement de Mathematiques Universite de Cergy-Pontoise, avenue Adolphe Chauvin 95302 Cergy-Pontoise Cedex

Abstract

We define Riesz transforms on Lp(M) where M is a Fock Von Neumann algebra, and show that they are bounded independantly of n, for finite p bigger than 1. This is a generalization of the well known gaussian setting on Rn; this includes the Von Neumann algebras spanned by n Walsh functions, or n fermions, or n free semicircular variables, or the Von Neumann algebra of the free product of n copies of the group with two elements.

Isometries and Contractive Projections In Orlicz Spaces

Beata Randrianantoanina

Email: randrib@muohio.edu

Address: Miami University Oxford, Ohio 45056, USA

Abstract

We will dicuss the form of (not necessarilly surjective) isometries in nonatomic Orlicz spaces and we will present recent results about the form of contractive projections and contractively complemented subspaces of complex and real sequence Orlicz spaces.

Non-Reflexive Subspaces of $K(H)$

Narcisse Randrianantoanina

Email: randrin@muohio.edu

Address: Miami University Oxford, Ohio 45056, USA

Abstract

Let H be a Hilbert space. Every non-reflexive subspace of $K(H)$ contains an asymptotically isometric copy of c_0. This, along with a result of Besbes, shows that a subspace of $K(H)$ has the fixed point property if and only if it is reflexive.

Some Results About Qp and Bp Spaces

Luis Manuel Tovar Sanchez

Email: jadde@math.cinvestav.mx

Address: Escuela superior de Fisica y Matematicas del IPN Mexico Coban 562 Depto. 2 COL. Valle Del Typeyac, Mexico D.F. 07740

Abstract

I present a set of results involving relations between Qp and Bp spaces, for complex functions as well the quaternionic generalization of Qp and Bp i.e. for hyperholomorphic functions defined on the three real dimensional unit ball.

Magic Squares

Kaliaperumal Sankar

Email: `shankar1978@mailcity.com`

Address: Sri Venkateswara College of Engineering, Sriperumbudur-602105 Tamilnadu India

Abstract

INTRODUCTION

There are many mathematical techniques that have helped mankind to find a way to solve the practical problems. One among them is the Concept of Magic Squares. This concept has been much fancied in the field of Cargo loading of Ships, Missile loading of the aircraft and in many more areas.

The concept is based on the idea of arranging equal weightage of goods on all sides in all possible directions. Traditionally for a particular matrix only a fixed value of goods can be loaded. This is because of the major practical difficulty of finding the starting value goods to be loaded on the primary element of the Magic Square.

Here in this paper we have given a possible solution to find the Starting value of goods for the primary element so that the matrix can be loaded with the desired amount more than some minimum value, which depends on the size of the matrix.

THEORY

$\swarrow$ Primary element

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

The minimum value of the total goods loaded in 5x5 matrix is 65. So, it is not possible to have a value less than 65, as we can't have a negatively loaded unit.

18	25	2	9	16
24	6	8	15	17
5	7	14	21	23
11	13	20	22	4
12	19	26	3	10

The total load value of the above magic square is 70. Here the increment value is maintained but the primary element value is kept as 2, which can be arrived as follows

$$((70 - 65)/5) + 1 = 2$$

where

- 70 the new Total load value that is required
- 65 the minimum total load value
- 5 is the size of the matrix
- 1 is the value of primary element for the minimum total value.

So, the value of the primary element for the total load value of 100 is 8.

Generally for finding the primary element value for any total load value we have the simple formula as

$$\text{Primary element} = ((x - a)/n) + 1 = (x - a + n)/n$$

The following table gives the minimum value of the total load:

n	A	$Y_i = a/n$	First Diff.	Second Diff.
3	15	5		
5	65	13	8	
7	175	25	12	4
9	369	41	16	4

From the table above,

$$Y_2 = 5 + (4 * 2) = Y_1 + (4 * 2)$$

Similarly,

$$Y_3 = Y_1 + (4 * 5) = Y_1 + (4 * (2 + 3))$$
$$Y_4 = Y_1 + (4 * (2 + 3 + 4))$$

Therefore, we can generalize it as

$$Y_i = 5 + (4 * (2 + 3 + \ldots + i)), \text{ where } i = (n - 1)/2$$

We know that $Y_i = (a/n)$, therefore,

$$a = Y_i * n$$

We know that,

$$\begin{aligned}
\text{Primary element value} &= (x - a + n)/n \\
&= x - [(5 + (4 * (2 + 3 + \ldots + (n - 1)/2))) * n] + n/n \\
&= x - [(4 + (4 * (2 + 3 + \ldots + (n - 1)/2))) * n]/n \\
&= x - [1 + 2 + 3 + \ldots + (n - 1)/2] * 4 * n/n \\
&= x - [((n - 1)/4) * ((n + 1)/2)] * 4 * n/n \\
&= (2 * x) - [n * (n - 1) * (n + 1)]/(2 * n) \\
&= (2 * x) - [n * (n^2 - 1)]/(2 * n)
\end{aligned}$$

Using the above formula let us find the Total load value of 1781 in 13×13 matrix.

$$X = 1781$$
$$N = 13$$

Therefore, Primary element = 53

145	160	175	190	205	220	53	68	83	98	113	128	143
159	174	189	204	219	65	67	82	97	112	127	142	144
173	188	203	218	64	66	81	96	111	126	141	156	158
187	202	217	63	78	80	95	110	125	140	155	157	172
201	216	62	77	79	94	109	124	139	154	169	171	186
215	61	76	91	93	108	123	138	153	168	170	185	200
60	75	90	92	107	122	137	152	167	182	184	199	214
74	89	104	106	121	136	151	166	181	183	198	213	59
88	103	105	120	135	150	165	180	195	197	212	58	73
102	117	119	134	149	164	179	194	196	211	57	72	87
116	118	133	148	163	178	193	208	210	56	71	86	101
130	132	147	162	177	192	207	209	55	70	85	100	115
131	146	161	176	191	206	221	54	69	84	99	114	129

Let us consider the case where x is not divisible by n.

$$X = 503$$
$$N = 5$$

Let us consider x to be 500 at present, therefore

$$\text{Primary element value} = ((2*500) - (5*24))/(2*5)$$
$$= 88$$

104	111	88	95	102	$\longrightarrow 500$
110	92	94	101	103	
91	93	100	107	109	
97	99	106	108	90	
98	105	112	89	96	

Rearranging the above magic square we have

110	93	106	89	102	$\longrightarrow 500$
91	99	**112**	95	103	
97	105	88	101	**109**	
98	**111**	94	107	90	
104	92	100	**108**	96	

In these five spots if we add 3, we will get Total load value of 503

113	93	106	89	102	$\longrightarrow 503$
91	99	**115**	95	103	
97	105	88	101	**112**	
98	**114**	94	107	90	
104	92	100	**111**	96	

Thus the problem of Odd Magic Squares is solved.

EVEN MAGIC SQUARES:

For a $n \times n$, even magic square the total load value will be a multiple of n/2 and not a multiple of n

1	15	14	4	$\longrightarrow 34$
12	6	7	9	
8	10	11	5	
13	3	2	16	

From the above Total load value (34), we conclude that it is divisible by 2, and not divisible by 4. Now let us find the magic square with Total load value 103, which is not divisible by 4. So, first let us find a magic square with Total load value 102, which is divisible by 2, and not divisible by 4.

$$\text{Primary element} = ((2*102) - (4*15))/(2*4)$$
$$= 18.$$

18	32	31	21	$\longrightarrow 102$
29	23	24	26	
25	27	28	22	
30	20	19	33	

Rearranging the above magic square we have

25	28	**31**	18	$\longrightarrow 102$
30	19	24	29	
20	**33**	26	23	
27	22	21	**32**	

In these four spots if we add 1 we will get a total load value of 103.

25	28	**32**	18	$\longrightarrow 103$
31	19	24	29	
20	**34**	26	23	
27	22	21	33	

35	1	6	26	19	24	$\longrightarrow 111$
3	32	7	21	23	25	
31	9	2	22	27	20	
8	28	33	17	10	15	
30	5	34	12	14	16	
4	36	29	13	18	11	

The above Total load value si divisible by 3 but not divisible by 6. Now let us find a magic square for a sum of 200, which is neither divisible by 6 nor 3.

Let us split 200 as (159 + 41).

$$\text{Primary element} = ((2*159) - (6*35))/12$$
$$= 9$$

43	9	14	34	27	32	$\longrightarrow 159$
11	40	15	29	**31**	33	
39	**17**	10	30	35	28	
16	36	41	25	18	**23**	
38	13	**42**	20	22	24	
12	4	37	**21**	26	19	

Now if we add 41 to these red spots, we will get a total load value of 200.

84	9	14	34	27	32	$\longrightarrow 159$
11	40	15	29	**72**	33	
39	**58**	10	30	35	28	
16	36	41	25	18	**64**	
38	13	**83**	20	22	24	
12	4	37	**62**	26	19	

CONCLUSION:

Using the above formula and method I can find MAGIC SQUARES of any order for any sum.The above formula and method is completely my own thesis and it is not Copied from anywhere.

Recent Analysis of Brownian Fractals

Naru-Rueih Shieh

Email: shiehnr@math.ntu.edu.tw

Address: Dept. of Mathematics National Taiwan Univ

Abstract

In this talk, we report some recent results concerning fractal analysis of some canonical measures associated with Brownian zeros, trails and intersections. The following aspects are discussed:

(1) Average densities for Brownian occupation and intersection measures.

(2) Multifractal structures of Brownain local time measure.

(3) Multifractal properties of Brownain substitutions.

Existence of Periodic Solutions Under Saddle Point Type Conditions

Naoki Shioji

Email: shioji@math.sci.ynu.ac.jp

Address: Dept. of Mathematics Faculty of Engineering Yokohama National University, Tokiwadai, Hodogaya-ku Yokohama 240-8501, Japan

Abstract

Let H be a Hilbert space, let A be a maximal monotone subset of $H \times H$, let $f : [0,T] \times V \to H$ be a function, where V is a suitable subset of H, and let $h \in L^1(0,T;H)$. We study the existence of T-periodic solution for the equation

$$u'(t) + Au(t) \ni f(t, u(t)) + h(t) \quad \text{for } 0 \le t \le T. \tag{1}$$

To get the existence of periodic solutions, it is usually assumed that $A - f$ is coercive, or $A - f$ is the derivative of a functional on H and $A - f$ satisfies a saddle point type condition.

In this talk, we study the case that $A-f$ is not coercive and $A-f$ is not the derivative of a functional but $A - f$ satisfies some kind of saddle point type condition. Our typical result is the following:

Theorem 1. *Let $(V, \|\cdot\|)$ be a Hilbert space which is compactly imbedded into a Hilbert space $(H, |\cdot|)$ with an inner product $\langle\cdot,\cdot\rangle$ and let L be the canonical isomorphism from V onto its topological dual $(V^*, \|\cdot\|_*)$. Let $A : D(A) \to H$ be a single-valued, maximal monotone operator such that $0 \in D(A)$, $D(A)$ is a dense subset of V and*

$$\langle Ax - Ay, x - y\rangle \ge \omega\|x - y\|^2 \quad \textit{and} \quad \|Ax\|_* \le c(\|x\| + 1)$$

for every $x, y \in D(A)$, where ω and c are some positive constants. Let $T > 0$ and let f be a mapping from $[0,T] \times V$ into H such that $f(t,\cdot)$ is continuous for almost every $t \in (0,T)$, $f(\cdot, x)$ is strongly measurable for every $x \in V$ and

$$|f(t,x)| \le a_1\|x\|^{2-\rho} + a_2(t) \quad \textit{for almost every } t \in (0,T) \textit{ and for every } x \in V,$$

where ρ is some constant with $0 < \rho < 2$, a_1 is some positive constant and a_2 is some function in $L^1(0,T;\mathbb{R}_+)$. Assume that there exist a finite dimensional subspace H_1 of H and $b \in L^1(0,T;\mathbb{R}_+)$ such that

$$H_1 \subset D(L \cap (H \times H)), \qquad LH_1 \subset H_1$$

and for every $x \in D(A)$,

$$\langle Ax - f(t,x), x - 2Px\rangle \ge \omega\|x\|^2 - b(t) \quad \textit{for almost every } t \in (0,T),$$

where P is the orthogonal projection from H onto H_1. Then for every $g \in L^2(0,T;H)$, there exists $\delta > 0$ such that for every $h \in L^1(0,T;H)$ with $\int_0^T |h(t) - g(t)|\, dt \le \delta$, there exists at least one T-periodic integral solution of (1). Further, if $A0 = 0$, $f(\cdot,0) \equiv 0$ and there exist a finite dimensional subspace H_2 of H and $\varepsilon > 0$ such that

$$H_2 \subset D(L \cap (H \times H)), \qquad LH_2 \subset H_2,$$

for every $x \in D(A)$ with $|x| \leq \varepsilon$,

$$\langle Ax - f(t,x), x - 2Qx \rangle \geq \omega \|x\|^2 \quad \textit{for almost every } t \in (0,T),$$

where Q is the orthogonal projection from H onto H_2, and $\dim H_2 - \dim H_1$ is odd, then there exists $\delta > 0$ such that for every $h \in L^1(0,T;H)$ with $\int_0^T |h(t)|\,dt \leq \delta$, there exists at least two T-periodic integral solution of (1).

To be annouced

A. H. Siddiqi

Email:

Address: Dept. of Mathematical Sci. KFUPM. Dhahran 31261, Saudi Arabia.

Abstract

Dynamics of composite entire functions

A. P. Singh

Email:

Address: Dept. of Mathematics, Univ. of Jammu Jammu-180 004 India

Abstract

Let f be a transcendental entire function and f^n denote the n-th iterate of f. A component U of $F(f)$, the Fatou set of f, is said to be wandering if $U_n \cap U_m = \emptyset$ for

$n \neq m$, where U_n denotes the component of $F(f)$ which contains $f^n(U)$. In this paper we show several composite entire functions which do not have wandering domain and show the equality of Julia sets of certain commuting entire functions.

Positive Solutions of Diffusive Logistic Equations

Kazuaki Taira

Email: taira@math.tsukuba.ac.jp

Address: Institute of Mathematics, University of Tsukuba 1-1-1 Tennodai, Tsukuba 305-8571, JAPAN

Abstract

The purpose of this talk is to prove an existence and uniqueness theorem of positive solutions of diffusive logistic equations with indefinite weights which model population dynamics in environments with strong spatial heterogeneity. We prove that the most favorable situations will occur if there is a relatively large favorable region (with good resources and without crowding effects) located some distance away from the boundary of the enviroment. Moreover we discuss the stability properties of positive steady states.

Approximating Fixed Points and Convex Minimization Problems

Wataru Takahashi

Email: wataru@is.titech.ac.jp

Address: Dept. of Mathematics and Computing Sciences, Tokyo Institute of Technology Ohokayama, Megura-ku, Tpkyo 152-8552, Japan

Abstract

Let C be a nonempty closed convex subset of a real Hilbert space H and let $f : H \to (-\infty, \infty]$ be a proper convex lower semicontinuous function. Consider a convex minimization problem:

$$\min\{f(x) : x \in C\} = \alpha.$$

The number α is called an *optimal value*, C is called an *admissible set* and $M = \{y \in C : f(y) = \alpha\}$ is called an *optimal set*. Next, define a function $g : H \to (-\infty, \infty]$ as follows:

$$g(x) = \begin{cases} f(x), & x \in C, \\ \infty, & x \notin C. \end{cases}$$

Then, g is a proper lower semicontinuous convex function of H into $(-\infty, \infty]$. So, we consider the convex minimization problem:

$$\min\{g(x) : x \in H\}, \tag{$*$}$$

where g is a proper lower semicontinuous convex function of H into $(-\infty, \infty]$. For such a g, we can define a multivalued operator ∂g on H by

$$\partial g(x) = \{x^* \in H : g(y) \geq g(x) + (x^*, y - x), y \in H\}$$

for all $x \in H$. Such a ∂g is said to be the *subdifferential* of g. An operator $A \subset H \times H$ is *accretive*, if for $(x_1, y_1), (x_2, y_2) \in A$,

$$(x_1 - x_2, y_1 - y_2) \geq 0.$$

If A is accretive, we can define, for each positive λ, the resolvent $J_\lambda : R(I + \lambda A) \to D(A)$ by $J_\lambda = (I + \lambda A)^{-1}$. We know that J_λ is a nonexpansive mapping. An accretive operator $A \subset H \times H$ is called *m-accretive*, if $R(I + \lambda A) = H$ for all $\lambda > 0$. If $g : H \to (-\infty, \infty]$ is a proper lower semicontinuous convex function, then ∂g is an m-accretive operator.

We know that one method for solving $(*)$ is the *proximal point algorithm* first introduced by Martinet [5]. The proximal point algorithm is based on the notion of resolvent J_λ, i.e.,

$$J_\lambda x = \arg\min\left\{g(z) + \frac{1}{2\lambda}\|z - x\|^2 : z \in H\right\},$$

introduced by Moreau[6]. The proximal point algorithm is an iterative procedure, which starts at a point $x_1 \in H$, and generates recursively a sequence $\{x_n\}$ of points $x_{n+1} = J_{\lambda_n} x_n$, where $\{\lambda_n\}$ is a sequence of positive numbers, see, for instance, Rockafellar[7]. Let $\{g_1, g_2, \ldots, g_n\}$ be a finite family of proper lower semicontinuous convex functions of a Hilbert space H into $(-\infty, \infty]$. The problem is to find a solution of the finite convex inequality system, i.e., to find such a point $x \in C$ that

$$C = \{x \in H : g_i(x) \leq 0, i = 1, 2, \ldots, n\}.$$

Such a problem is called the *feasibility problem*.

On the other hand, Halpern[1] and Mann[4] introduced the following iterative schemes to approximate a fixed point of a nonexpansive mapping T of H into itself:

$$x_{n+1} = \alpha_n x + (1-\alpha_n)Tx_n \quad \text{for } n \geq 1$$

and

$$x_{n+1} = \alpha_n x_n + (1-\alpha_n)Tx_n \quad \text{for } n \geq 1,$$

respectovely, where $x_1 = x \in H$ and $\{\alpha_n\}$ is a sequence in $[0,1]$.

In this talk, motivated by their iterative methods for approximations of fixed points, we first prove weak and strong convergence theorems for resolvents of accretive operators in Banach spaces. Next, we prove weak and strong convergence theorems for finite or infinite families of nonexpansive mappings in Banach spaces. Finally, using these results, we consider the convex minimization problem of finding a minimizer of a proper lower semicontinuous convex function and the feasibility problem by convex combinations of nonexpansive retractions. For example, we prove the following theorems:

Theorem *Let H be a Hilbert space and let $A \subset H \times H$ be an m-accretive operator. Let $x \in H$ and let $\{x_n\}$ be a sequence defined by $x_1 = x$ and*

$$x_{n+1} = \alpha_n x + (1-\alpha_n)J_{r_n}x_n \quad \textit{for } n \geq 1,$$

where $\{\alpha_n\} \subset [0,1]$ and $\{r_n\} \subset (0,\infty)$ satisfy $\lim_{n\to\infty} \alpha_n = 0$, $\sum_{n=1}^{\infty} \alpha_n = \infty$ and $\lim_{n\to\infty} r_n = \infty$. If $A^{-1}0 \neq \phi$, then $\{x_n\}$ converges strongly to $Px \in A^{-1}0$, where P is the metric projection of H onto $A^{-1}0$.

Theorem *Let H be a Hilbert space and let $f : H \to (-\infty,\infty]$ be a lower semicontinuous proper convex function. Let $x \in H$ and let $\{x_n\}$ be a sequence defined by $x_1 = x$ and*

$$\begin{aligned} x_{n+1} &= \alpha_n x + (1-\alpha_n)J_{r_n}x_n \quad \textit{for } n \geq 1, \\ J_{r_n}x_n &= \arg\min \left\{ f(z) + \frac{1}{2r_n}\|z - x_n\|^2 : z \in H \right\}, \end{aligned}$$

where $\{\alpha_n\} \subset [0,1]$ and $\{r_n\} \subset (0,\infty)$ satisfy $\lim_{n\to\infty} \alpha_n = 0$, $\sum_{n=1}^{\infty} \alpha_n = \infty$ and $\lim_{n\to\infty} r_n = \infty$. If $(\partial f)^{-1}0 \neq \phi$, then $\{x_n\}$ converges strongly to $v \in H$, which is the minimizer of f nearest to x. Further

$$f(x_{n+1}) - f(v) \leq \alpha_n(f(x) - f(v)) + \frac{1-\alpha_n}{r_n}\|J_{r_n}x_n - v\|\|J_{r_n}x_n - x_n\|.$$

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Local C-cosine Families and Local n-times Integrated Cosine Families

Toshiharu Takenaka

Email: `takenaka@isc.chubu.ac.jp`

Address: Chubu University 1200 Matsumoto-cho Kasugai 487-8501 Japan

Abstract

We state the abstract Cauchy problem related to a C-cosine family and a local n-times integrated cosine family. We also state the relationship between a local n-times integrated cosine family and a local C-cosine family. Here we use slightly different definitions of them.

On Matrices Whose Numerical Ranges Have Circular or Weak Circular Symmetry

Bit-Shun Tam

Email: tam@math.tku.edu.tw

Address: Dept. of Math, Tamkang Univ. 151, Ying-Chuan Road Tamsui, Taipei Hsien 25137 Taiwan, Republic of China

Abstract

In a previous paper, among other equivalent conditions, it is proved that a square complex matrix A is permultationally similar to a block-shift matrix if and only if for any complex matrix B with the same zero pattern as A, $W(B)$, the numerical range of B, is a circular disk centered at the origin. In this paper, we add a long list of further new equivalent conditions. The corresponding result for the numerical range of a square complex matrix to be invariant under a rotation about the origin through an angle of $2\pi/m$, where $m \geq 2$ is a given positive integer, is also proved. Many interesting by-products are obtained. In particular, on the numerical range of a square nonnegative matrix A, the following unexpected results are established: (i) when the undirected graph of A is connected, if $W(A)$ is a circular disk centered at the origin, then so is $W(B)$, for any complex matrix B with the same zero pattern as A; (ii) when A is irreducible, if λ is an eigenvalue in the peripheral spectrum of A that lies on the boundary of $W(A)$, then λ is a sharp point of $W(A)$. We also obtain results on the numerical range of an irreducible square nonnegative matrix, which strengthen or clarify the work of Issos, and Nylen and Tam on this topic. Open questions are posed at the end,

Numerical Ranges and Lie Groups

Tin-Yau Tam

Email: `tamtiny@mail.auburn.edu`

Address: Dept. of Mathematics, Auburn University 218 Parker Hall Auburn University, Auburn, AL 36830 USA

Abstract

An account of the recent development of the study of numerical range associated with compact Lie groups and real simple Lie algebras is given. The formulations serve as unified generalizations of many different ranges. Some questions are given.

A Dynamic Programming with Fractional Loss Function

Kensuke Tanaka

Email:

Address: Dept. of Information and Electronics, Niigata Institute of Technology Teraodai 1-1-8, Niigata 950-21, Japan

Abstract

We often need to think the dynamic programming models with fractional loss functions in many economic problems.

At first, we give the formulations of a dynamic programming with a parameter function (DP_θ) and a dynamic fractional programming (DFP). Then, we establish the relationship of the optimal value functions between (DP_θ) and (DFP). It is proved that, if an optimal policy exists in (DFP), this policy is optimal in (DP_{θ^*}) and, if an optimal policy exists in (DP_{θ^*}), this policy is optimal in (DFP), where θ^* is the optimal value function of (DFP). Further, we shall show that, if each action space on each stage is compact metric space and a parameter function, θ is positive, there exists an optimal policy in (DP_θ).

Graphic Computation of Payoff Functions for Multicriteria Games

Tamaki Tanaka

Email: sltana@cc.hirosaki-u.ac.jp

Address: Dept. of Mathematical System Sciences, Hirosaki Univ. Hirosaki, 036-8561, Japan

Abstract

Saddle point theorem in usual game theory says: a real-valued payoff function possesses a saddle point if and only if the minimax value and the maximin value of the function are coincident; and that minimax theorems say: the minimax and maximin values are coincident under certain conditions. These facts are valid based on the total ordering of R, but if we consider more general partial orderings on vector spaces then what kind of results on minimax and maximin of a multiobjective payoff with multiple noncomparable criteria are obtained?

This question is concerned with several areas of mathematics and multicriteria decision analysis; in order to answer the question, we adopt the concepts of "cone extreme point" and "non-dominated solution," which have been proposed by Dr. P. L. Yu. Under suitable conditions, we observe that vector-valued minimax theorems and saddle point problems are closely connected with each other, whose results are similar to standard ones for scalar games.

On the other hand, multicriteria games, or games with a vector payoffs, have been studied aggressively. Up to now, several kinds of concept of strategy for such multicriteria games are proposed and analyzed by many researchers, but equilibrium strategies and/or optimal strategies do not always exist and the analysis for optimality is not so easy as the case of scalar game. The reason is based on

(i) multicriteria situation; and

(ii) the difficulty of presentation for graphs (graphic images) of multiobjective payoff functions.

The aim of this paper is to show a general theory on vector-valued minimax and to give structure information for the graph of a payoff function in two-person zero-sum matrix game with two 2×2 matrices by using computational program on computer in order to verify the theory. As a result, some classification on matrices for such multicriteria matrix game is presented. Moreover, a computer software is demonstrated to draw the graph of a payoff function.

On Baire-1 Functions

Wee Kee Tang

Email: `wktang@nie.edu.sg`

Address: National Institute of Education, Nayang Technological University 469 Bukit Timah Road Singapore 259756

Abstract

An equivalent definition of Baire-1 functions in terms of $\epsilon - \delta$ is given. Using this definition, we showed that the quasi-uniform limit of a sequence of Baire-1 functions is Baire-1.

Traveling Curved Fronts In the Generalized Mean Curvature Flow

Masaharu Taniguchi

Email: `taniguti@is.titech.ac.jp`

Address: Dept. of Mathematical and Computing Sciences Tokyo Institute of Technology O-okayama, Meguro-ku, Tokyo 152-8552, Japan

Abstract

This paper is concerned with a curve $\Gamma(t)$ in $\mathbb{R}^2$ that satisfies

$$V = H + k \tag{1}$$

where V is the normal velocity of $\Gamma(t)$, H is the mean curvature and k is a given positive constant. This equation describes the motion of curves forced by curve shortening effect and the effect of growth with constant speed. It describes the motion of interfaces of the Allen-Cahn equation in some singular limit.

If the curve $\Gamma(t)$ is represented by the graph of $y = u(x,t)$, then u satisfies the equation

$$u_t = \frac{u_{xx}}{1+u_x^2} + k\sqrt{1+u_x^2}. \tag{2}$$

Here we will give the following theorems. For $c > k$, there exists a solution $u(x,t) = \varphi(x) + ct$ of (2) with $\varphi(0) = 0$ and $\varphi_x(0) = 0$. This solution is denoted by $\varphi(x;c)$. All the traveling curves $\Gamma(t)$ of (1) can be given by the graph of the suitable rotation of $y = \varphi(x - x_0; c) + ct + y_0$. Next we consider the stability of this traveling curved front. The stability of $y = \varphi(x) + ct$ depends on the function space of given perturbations. The traveling curved front $u(x,t) = \varphi(x;c) + ct$ of (2) is not asymptotically stable in BU where BU is the space of all uniformly bounded functions. The main assertion is the asymptotic stability of traveling curved fronts globally in space. If $\psi(x)$ converges to $p_\pm$ as $x \to \pm\infty$, then there exist x_0^* and y_0^* such that $u(x,t) - (\varphi(x - x_0^*; c) + ct + y_0^*)$ converges to 0 as $t \to \infty$ where $u(x,t)$ is a solution to (2) with the initial data $u(x,0) = \varphi(x;c) + \psi(x)$.

On Value Distribution of Algebroid Functions

Kazuya Tohge

Email: tohge@t.kanazawa-u.ac.jp

Address: Faculty of Technology, Kanazawa University kodatsuno 2-40-20, Kanazawa 920-8667 Japan

Abstract

In this talk, we consider the value distribution of algebroid functions, especially an extension of the second fundamental theorem and its application. In the value distribution theory of meromorphic functions, it is well known that an exceptional value in the sense of Nevanlinna does not mean an exceptional value in the sense of Picard. In general, this is still true in the case of algebroid functions. In 1970, K. Niino and M. Ozawa obtained a striking result such that for some special cases the existence of certain Nevanlinna deficiencies implies the existence of Picard exceptional values. A typical one of this kind is the following: *Let $f(z)$ be a two-valued entire transcendental algebroid function defined by an irreducible equation*

$$F(z,f) \equiv f^2 + A_1(z)f + A_2(z) = 0,$$

where A_1 and A_2 are entire functions, and let a_1, a_2 and a_3 be three different finite values satisfying the condition on their Nevanlinna deficiencies

$$\delta(a_1, f) + \delta(a_2, f) + \delta(a_3, f) > 2.$$

Then at least one of the a_n is an exceptional value in the sense of Picard. There have been given a lot of its generalizations by Niino and Ozawa themselves, N. Toda, J. Noguchi and so on, in the 1970's. We will review these results and try to understand the nature of this phenomenon.

Some Families of Ordinary and Partial fractional Differentegral Equations

S. T. Tu

Email: sttu@math.cycu.edu.tw

Address: Dept. of Mathematics, Chung Yuan Christian University, Chung-Li 32023, Taiwan, R.O.C

Abstract

Making use of the theory of fractional calculus (that is, derivatives and integrals of any real or complex order), the authors derive particular solutions of certain families of ordinary and partial fractional differintegral equations. Relevant connections of the results presented here with those obtained in several earlier works are also mentioned.

A Minimax Method for Semilinear Elliptic Equations

S. Y. Tzeng

Email: Sytzeng@math.ncue.edu.tw

Address:

Abstract

We show the existence of positive solutions using a minimax approach for semilinear elliptic equations.

Pick function which is defined implicitly and operator inequality

Mitsuru Uchiyama

Email: uchiyama@fukuoka-edu.ac.jp

Address: Dept. of Mathematics, Fukuoka Univ. of Education Munakata, Fukuoka, 811-4192, Japan

Abstract

We will find Pick functions which defined implicitly; this lead us to an extension of Lowner-Heinz inequality. Moreover, we will give extensions of Furuta inequality and exponential-type inequality by Ando.

James' Theorem And Numerical Radius Attaining Operators

Maria Dolores Acosta Vigil

Email: dacosta@goliat.ugr.es

Address: Universidad De Granada Facultad De Ciencias Dept. Analisis Matematico 18071 GRANADA (SPAIN)

Abstract

The classical James' Theorem states that reflexive Banach spaces are those Banach spaces satisfying that any bounded and linear functional attains its norm. We give an appropriate version of this result by considering the numerical radius of an operator instead of the norm. We showed that a Banach space is reflexive if it satisfies that all the (bounded and linear) operators on it attain their numerical radii. However, every infinite-dimensional space can be renormed so that there is a rank-one operator not attaining its numerical radius. This result was first proved for spaces having a Schauder basis (see Bull. London Math. Soc. 31(1999), 67–74).

The Lyapunov-Sylvester Equations and Asymptotic Behaviour of Differential Equations

P. Q. Vu

Email: `qvu@math.ohiou.edu`

Address: Dept. of Mathematics, Ohio Univ. Athens, OH 45701, USA

Abstract

We establish relationship between the asymptotic behaviour of solutions of differential equations $u'(t) = Au(t) + f(t)$ and the solvability of an operator equation of Lyapunov-Sylvester form: $AX - XB = C$. Applications to difference equations, periodic equations and to some nonlinear equations are also given.

Semilinear Elliptic Equations in Unbounded Domains

H. C. Wang

Email: hwang@math.nthu.edu.tw

Address: Dept. of Math, Tsing Hua U.

Abstract

We survey some analytic techniques which were used to prove the existence of semilinear elliptic equations.

Inverse Backscattering In Even Dimensions

J. N. Wang

Email: jnwang@math1.math.ncku.edu.tw

Address: Dept. of Mathematics National Cheng Kung University Tainan, Taiwan.

Abstract

This talk is to discuss the generic uniqueness the inverse backscattering problem for the Schrödinger equation in even dimensions. Our result is obtained through the study of a modified backscattering map. We use the wave equation approach here and extend Melrose and Uhlmann's method to even dimensions.

Global Structure in Von Neumann Algebra Theory

Carl Winslow

Email: cawi@dlh.dk

Address: Dept. of Mathematics Royal Danish School of Ed. Studies Emdrupvej 115 B 2400 Copenhagen NV Denmark

Abstract

The Effros-Maréchal topology on the space of von Neumann algebras acting on a fixed Hilbert space was defined by Uffe Haagerup and the speaker in 1997. Subsequent studies indicate that this is indeed the correct framework for a global study of von Neumann algebras. I shall present the basics and some later developments in this area, including some surprising relations with old conjectures by Connes and Kirchberg.

On weak Brownian motions of arbitrary order

Ching-Tang Wu

Email: `wu@mathematik.hu-berlin.de`

Address: Dept. of Financial and Actuarial Math, Technische Univ. Wien Wiendner Hauptstr. 8-10 /1075, 1040- Vienna, Austria

Abstract

We shows the existence, for any $k \in \mathbb{N}$, of processes which have the same k-marginals as Brownian motion, although they are not Brownain motions. For $k = 4$, this proves a conjecture of Stoyanov. The law $\mathbb{P}$ of such a "weak Brownian motion of order k" can be constructed to be equivalent to Wiener measure $\mathbb{P}$ on $C[0,1]$. On the other hand, there are weak Brownian motions of arbitrary order whose law is singular to Wiener measure.

To be annouced

J. Q. Wu

Email: wujiongqi@263.net

Address: Dept. of Mathematics, Zhangzhou Normal Univ. 363000 Zhangzhou, Fujian

Abstract

A New Characterization of Normal Functions

Hasi Wulan

Email: wulan@public.hh.nm.cn

Address: Dept. of Mathematics Inner Mongolia Normal University Hohhot 010022, P. R. China

Abstract

A new characterization of normal meromorphic functions is given by investigating a nondecreasing function. Our contribution contains some earlier results about normal functions. We also consider the corresponding results for Bloch and spherical Bloch functions.

The Real Part of an Outer Function and the Parametrization of a Helson-Szego Weight

Takanori Yamamoto

Email: yamatk@hucc.hokudai.ac.jp

Address: Dept. of Mathematics Hokkai-Gakuen University, Sapporo 062-8605, Japan

Abstract

(This is a joint work with Prof. Takahiko Nakazi.) Suppose F is a nonzero function in the Hardy space H^1. We study the set of outer functions f satisfying $|F| \leq Ref$ a.e. on the unit circle T. When F is a strongly outer function in H^1 and C is a positive constant, we describe the set of outer functions f satisfying $|F| \leq CRef$ and $|1/F| \leq CRe1/f$ a.e. on T. Suppose W is a Helson-Szego weight. As an application, we parametrize real valued functions v such that $logW - Hv \in L^\infty$ and $\|v\| \leq \pi/2$ where Hv is the Hilbert transform of v.

On value distribution theory and its applications to complex dynamics.

Chun-Chen Yang

Email: `mayang@uxmail.ust.hk`

Address: Dept. of Mathematics, The Hong Kong Univ. of Science and Technology
Kowloon, Hong Kong

Abstract

In this talk the speaker will report the latest developments of value distribution theory and its applications to complex dynamics, based on the results obtained mainly by the speaker and his co-workers.

Canonical Forms Related with Radial Soluions of Semilinear Elliptic Equations and its Applications

Shoji Yotsutani

Email: `shoji@math.ryukoku.ac.jp`

Address: Dept. of Applied Mathematics and Informatics, Ryukoku University Seta, Otsu, Shiga 520-2149 Japan

Abstract

It often happens that the radial solutions play the fundamental role to investigate the structure of solutions in semilinear elliptic equations.

It has been investigated that the problems are studied one by one according to the problem, even if nonlinear terms and the boundary conditions are slightly different. However, it is becoming to be clear that a class of equations which are apparently different has a similar structure.

We show that the boundary value problems which satisfy radial solutions are reduced to canonical forms after suitable change of variables. We show structure theorems to the canonical forms to equations with power nonlinearities and various boundary conditions.

By virtue of this fact, we can understand known results systematically, make clear unknown structure of various equations, and precisely investigate the structure.

At the same time, we can clarify the meaning of the Kelvin transformation and the Rellich-Pohozaev identity which plays the fundamental role in the analysis of solutions of elliptic equations.

As applications, we treat the third boundary problem of Brezis-Nirenberg's equation, the structure of radial solutions including all solutions with singularity at $r = 0$ and $r = \infty$ of Matukuma's equation, and equations whose coefficient has the singularity at the boundary.

The study of KKM Theory and some applications

George Yuan

Email: `xzy@maths.uq.edu.au`

Address: Dept. of Mathematics, Univ. of Queensland Brisbane, Australia 4072

Abstract

In this talk, I wil report some recent progresses on the study of KKM theory and applications in Fixed point Theory, Mathematical Economics and Game theory.

Almost-Flat Locally-Finite Tilings of Spheres In Banach Spaces

Clemente Zanco

Email: zanco@mat.unimi.it

Address: Dipartimento di Matematica Universita' degli Studi di Milano Via C. Saldini, 50 20133 Milano Mi Italy

Abstract

For positive epsilon, a subset of the unit sphere of a Banach space is said to be epsilon-flat provided its image under some single-valued selection of the duality mapping has diameter less than epsilon. Connections are established between existence, for each positive epsilon, of epsilon-flat locally-finite tilings of the unit sphere and smoothness properties of the space, as well as between existence of countable such tilings and separability of the dual space.

Complex Lineally Convex Analysis

Yuri Zelinskii

Email: zel@imath.kiev.ua

Address: Institute of mathemetics Tereshchenkivska, 3 Kyiv, Ukraine 252601

Abstract

The lecture will be based on my book "Multivalued applications in analysis, Kyiv, 1993/in Russian" and on some new results in lineally convex analysis

A Class of Implicit Variational Inequalities with Applications to Nash Limitations Equilibrium Problem

Cong-jun Zhang

Email:

Address: Dept. of Mathematics, Huaibei Coal Teacher's College Huaibei 235000, P. R. China

Abstract

The purpose of this paper is to study a class of implicit variational inequalities. Compactness conditions on domain of definition are weakened. As applications. We utilize our results to study Nash limitations equilibrium problem in economic mathematics.