Plenary Session

Complementary Lidstone Interpolation and Boundary Value Problems

Ravi P. Agarwal
University of Texas-Kingsville, U.S.A.

Abstract

We shall introduce and construct explicitly the complementary Lidstone interpolating polynomial $P_{2m}(t)$ of degree $2m$, which involves interpolating data at the odd order derivatives. For $P_{2m}(t)$ we shall provide explicit representation of the error function, best possible error inequalities, best possible criterion for the convergence of complementary Lidstone series, and a quadrature formula with best possible error bound. Then, these results will be used to establish existence and uniqueness criteria, and the convergence of Picard's, approximate Picard's, quasilinearization, and approximate quasilinearization iterative methods for the complementary Lidstone boundary value problems which consist of an $(2m+1)$th order differential equation and the complementary Lidstone boundary conditions.

Fixed Points and Finite Dimensional Invariant Subspace Properties for Semigroups

Anthony To-Ming Lau
University of Alberta

Abstract

Let S be a semigroup and $m(S)$ be the Banach space of bounded real-valued functions on S. S is called left amenable if there is a non-zero left translation invariant linear functional on $m(S)$

In this talk I shall describe Professor Takahashi's remarkable achievements in relating amenability, ergodic properties, fixed point properties for semigroups of mappings as well as some recent results on Ky Fan's finite dimensional invariant subspace property.

Complex Brain Systems

Mau-Hsiang Shih
National Taiwan Normal University, Taiwan

Abstract

We wish to construct an interneural computing machine (INCM) that orchestrates complex behavior from dynamics of neuron-like units and plasticity of anatomical circuits. Three main approaches are taken: (i) to construct a brain-wide wiring diagram which mimics anatomical structure of brains; (ii) to manipulate specific weights in circuits to understand how information flows are navigated; and (iii) to develop mathematical operator-control theory for rhythm of population dynamics.

Attractive Point and Mean Convergence Theorems for Semigroups of Mappings without Continuity

Wataru Takahashi

National Sun Yat-sen University, Taiwan;
and Tokyo Institute of Technology, Japan

Abstract

In this talk, we first introduce broad semigroups of not necessarily continuous mappings in a Hilbert space and a Banach space which contain discrete semigroups by generalized hybrid mappings and semigroups of nonexpansive mappings. Then we prove attractive point and fixed point theorems for the semigroups of not necessarily continuous mappings. Furthermore, we establish mean convergence theorems for the semigroups of not necessarily continuous mappings. Using these results, we obtain well-known and new theorems which are connected with attractive point, fixed point and mean convergence results.

Invited Session

A Version of the Periodicity Conjecture for Generalized Collatz Mappings

Shigeo Akashi
Tokyo University of Science, Japan

Abstract

Let n be a positive integer.Then, Collatz mapping is dened as the following:

$$C(n) = \begin{cases} \frac{n}{2}, & \text{if } n \text{ is even,} \\ 3n+1, & \text{if } n \text{ is odd.} \end{cases}$$

Here, Collatz conjecture is known as the problem asking if, for any positive integer n, there exists a positive integer k_n satisfying $C^{(k_n)}(n) = 1$, where $C^{(k_n)}(\cdot)$ means the k_n-time nested superposition of $C(\cdot)$.

This conjecture is named after Lothar Collatz, who rst proposed it in 1937, and several approaches to this problem, which are based on various research areas in mathematics such as number theory, probability theory and computation theory, are developed.

In this talk, we apply both the xed point theory and the theory of dynamical systems to this conjecture which remains to be solved.

Triple Hierarchical Variational Inequalities

Qamrul Hasan Ansari
Aligarh Muslim University, India

Abstract

A constrained optimization problem in which the constrained set is a solution set of another optimization problem is called a bilevel programming problem. In the last two decades, such problems have been extensively studied in the literature because of their applications in mechanics, network design, etc. If the first level problem is a variational inequality problem and the second level problem is a set of fixed points of a mapping, then the bilevel problem is called hierarchical variational inequality problem. In other words, variational inequality problem defined over the set of fixed points of a mapping is called a hierarchical variational inequality problem, also known as hierarchical fixed point problem. The signal recovery, beamforming, and power control, problems can be written in the form of a hierarchical variational inequality problem.

A variational inequality problem which has triple structure is known as triple hierarchical Variational inequality problem, that is, a variational inequality problem defined over the set of solutions of another variational inequality problem which is defined over the set of fixed points of a mapping. Because of the triple structure of the problem, it is called triple hierarchical variational inequality problem. So, a variational inequality problem defined over the set of solutions of a hierarchical variational inequality problem is called a triple hierarchical variational inequality problem (in short, THVIP).

In this talk, we give a survey on hierarchical variational inequality problems and triple hierarchical variational inequality problems.

Viscosity Approximation Methods with a Sequence of Contractions

Koji Aoyama
Chiba University, Japan

Abstract

The aim of this talk is to prove that, in an appropriate setting, every iterative sequence generated by the viscosity approximation method with a sequence of contractions is convergent whenever so is every iterative sequence generated by the Halpern type iterative method. Then we apply our results to show some convergence theorems for variational inequality problems, zero point problems, and fixed point problems.

Strong Convergence of Halpern's Type Iterations for Nonlinear Mappings

Sachiko Atsushiba
University of Yamanashi, Japan

Abstract

In this talk, we study common attractive points and Halpern's type iterations for nonlinear mappings. And we prove strong convergence theorems for nonlinear mappings. Furthermore, we also give some convergence theorems for nonlinear mappings.

Equilibrium Problems in Hadamard Manifolds

Vittorio Colao
University of Calabria, Italy

Abstract

We introduce a result about existence of equilibrium points for bifunctions in Hadamard manifolds. Applications to variational inequality, fixed point and Nash equilibrium problems are provided. Convergence of Picard iteration for firmly nonexpansive mappings along with the definition of resolvents for bifunctions in this setting is used to devise an algorithm to approximate equilibrium points.

From Symmetric Cone Optimization to Non-symmetric Cone Optimization

Jein-Shan Chen
Taiwan Normal University, Taiwan

Abstract

In this talk, I will briefly review symmetric cone optimization and then talk about recent development regarding non-symmetric cone optimization. Especially, I will focus on the structures of two types of non-symmetric cones. This talk aims to general audience, no prerequisite about optimization is required.

Infinitely Many Quasi-coincidence Polynomial Solutions for Vector-valued Polynomial Problems

Yi Chou Chen
National Army Academy, Taiwan

Abstract

Let$F : \mathbb{R} \times \mathbb{R} \to \mathbb{R}^k$ be a vector-valued polynomial function:

$$F(x, y) = (F_1, F_2, \cdots, F_k)(x, y), \quad x, y \in \mathbb{R}.$$

Each component F_i of F is a real-valued polynomial function, the degree of y of F_i is $\deg_y F_i = s_i$, and is represented by:

$$F_i(x, y) = \sum_{j=0}^{s_i} a_{i,j}(x) y^j, \quad i = 1, 2, \cdots, k,$$

where $a_{i,j}(x) \in \mathbb{R}[x]$.

In this paper, for each $F_i, i = 1, 2, \cdots, k$, we give an arbitrary polynomial $f_i(x)$ and consider a real-valued quasi-coincidence polynomial problem as the form:

$$F_i(x, y) = c_i f_i(x),$$

we aim to find all polynomial solutions $y = y(x)$, $x \in \mathbb{R}$ to satisfy the following vector valued polynomial equation:

$$(\divideontimes) \quad F(x, y(x)) = (c_1 f_1(x), c_2 f_2(x), \cdots, c_n f_k(x))$$

where $(c_1, c_2, \cdots, c_k) \in \mathbb{R}$ is a constant vector depending on the solution $y(x)$.

In this paper, we investigate the infinitely many quasi-coincidence solution set of $(\divideontimes)$ and find all solutions as the form :

$$\{-a_{i,s_i-1}(x)/s_i a_{i,s_i}(x) + \lambda p(x) : \quad \text{for all} \quad \lambda \in \mathbb{R}\}$$

for some $p(x)$ of $f_i(x)$ for any i, $1 \leq i \leq k$.

Convexity of Sets and Functions via Second-order Subdifferentials

Nguyen Huy Chieu

Vinh University, Vietnam

Abstract

Second-order subdifferentials are among prominent notions in modern variational analysis. They have been used successfully for studying the stability and sensitivity of some important class of optimization and equilibrium problems. Since the convexity of functions is closely related to the stability of optimization problems and the convexity of a set amounts to the convexity of its indicator function, the following question naturally arises: to which extent the convexity of sets and functions can be recognized by the second-order subdifferentials? The aim of this talk is to present our recent results that partially answer for this question.

Algorithms for The Mathematical Program with Generalized Equation Constraint in A Hilbert Space with Applications

Chih-Sheng Chuang

National Sun Yat-sen University, Kaohsiung, Taiwan

Abstract

In this paper, we consider the following problem in a real Hilbert space:

$$(\mathbf{MPGE})_g \text{ Find } \bar{x} \in H \text{ such that } f(\bar{x}) \leq f(x_g) \text{ and } 0 \in B(\bar{x}),$$

where $f : H \to (-\infty, \infty)$ is a function, $B : H \rightrightarrows H$ is a set-valued mapping with $B^{-1}(0) \neq \emptyset$, and $x_g \in B^{-1}(0)$ is given. Here, x_g plays the role of a guess solution of the mathematical programming with generalized equation constraint:

$$(\mathbf{MPGE}) \quad \text{Min } f(x) \quad \text{subject to } x \in H \text{ and } 0 \in B(x).$$

Further, for problem $(\mathbf{MPGE})_g$, we present two algorithms and strong convergence theorems in a Hilbert space. Besides, we also consider related problems as applications in the final section.

Viscosity Iteration Methods for Split Feasibility Probem and Mixed Equilibrium Problem in Hilbert Space

Bin-chao Deng

Tianjin University, China

Abstract

In this paper, we consider and analyze two viscosity iteration algorithm (one implicit and one explicit) for finding a the common element of solution set $MEP(F1, F2)$ of mixed equilibrium problem and set Γ of split feasibility problem in a real Hilbert space. Furthermore, we also derive the strong convergence of viscosity iteration algorithm to an element of $MEP(F1, F2) \bigcap \Gamma$ under mild assumptions.

Note on Attractive Point Sets

Sompong Dhompongsa
Chiang Mai University, Thailand

Abstract

The concept of attractive points introduced by Takahashi is considered via the Kirzbraun-Valentine theorem.

New Approaches to the Existence of Fixed Points for Caristi Type Mappings without Lower Semicontinuity Assumptions

Wei-Shih Du
Kaohsiung Normal University, Taiwan

Abstract

In this talk, some new fixed point theorem for generalized distances and Caristi type mappings without assuming that the dominated function possesses lower semicontinuity property are established. As applications of these results, we obtain some new fixed point theorems which generalize and improve the famous Banach contraction principle.

α-η-Pseudomonotonicity and Equilibrium Problem in Topological Vector Spaces

A. Farajzadeh[1] and S. Plubteing[2]
[1]Razi University, Iran
[2]Naresuan University, Thailand

Abstract

In this paper we introduce a new denition of the pseudomonotonicity (we call relaxed α-η-pseudomonotone) and a general form of the dual equilibrium problem. We investigate the sufficient conditions which under them the solutions set of the generalized dual equilibrium problem and equilibrium problem are equal. Furthermore, we obtain two types of the existence results for the equilibrium and generalized dual equilibrium problems. The rst is by using the relaxed α-η-pseudomonotone and the second type without any pseudomonotonicity and any continuity. Finally we present the vector case of the quoted problems and as well as an application of the main results are presented.

Path Integrals for Dirac Equations Represented by an L^2-valued Measure

Kiyoko Furuya
Ochanomizu University, Japan

Abstract

For the case of space-dimension = 1, Ichinose [4] proved the path integral for Dirac equations are represented by a scalar measure. For the case of radial Dirac equation Ichinose [5] constructed a countably additive path space measure. The main idea is to combine his method of constructing a path space measure developed for the one-dimensional Dirac equation.

But in general, for the case of space-dimension ≥ 2, Feynman path integrals for Dirac equations are not represented by (scalar-valued) measures.(See Zastwinak[8],[9]). This is closely related to the fact that these equations are not wellposed in the space of continuous functions. In this talk, we shall prove that the path integral for Dirac equations are represented by an $L\big(L^2(\mathbb{R}^N;\mathbb{C}^{n\times n}), L^2(\mathbb{R}^N;\mathbb{C}^{n\times n})\big)$-valued measure. On Schrödinger equations, the situation is a little different: we need a *generalized* vector measure.(See Furuya [3])

References

[1] J. Diestel and J. J. Uhl, Vector Measures, Math. Surveys 15, AMS (1977).

[2] R. P. Feynman and A. R. Hibbs, Quantum Mechanics and Path Integrals, McGraw-Hill (1965).

[3] K.Furuya: Formally Self-Adjoint Schrödinger Operators with Real Measurable Potential, Journal of Nonlinear and Convex Analysis.(accepted.)

[4] T. Ichinose, Path Integrals for a Hyperbolic System of the First Order, Duke Math. J.,51 (1984), 1-36.

[5] T. Ichinose, Path integral for the radial Dirac equation. J. Math. Phys. 46 (2005), no. 2, 022103, 19 pp.

[6] Y. Kōmura and K. Furuya, Wave Equations in Nonreflexive Spaces, Lecture notes in Math.1540 (H. Komatsu(ed): Functional Analysis and Related Topics) Springer (1991) 235-238.

[7] F. Treves, Topological Vector spaces, Distributions and Kernels, Academic Press (1967).

[8] T. Zastwinak, The nonexistence of the path-space measure for Dirac equation in four space-time dimensions, J.Math.Phys.,**30**,(1989),1354-1358.

[9] T. Zastwinak, Path integrals for the Dirac equation-Some recent developments in mathmatical theory, (K.D.Elworth and J.C.Zambrini(ed)Stocastic analysis, path integration and dynamic(Warwick,1987)), Pitman Res.Notes Math.Ser.,200,Longman Sci.Thch., Harlow,(1989)243-263.

Customized PPA for Convex Optimization - Motivation and Applications

Bingsheng He

Nanjing University, China

Abstract

The mathematical form of many problems in applications can written as a linearly constrained convex optimization

$$\min\{\theta(x) \mid Ax = b,\ x \in \mathcal{X}\}.$$

The first order optimal conditions of the linearly constrained convex programming is a mixed monotone variational inequality in primal and dual variables. The proximal point algorithm (PPA) in Euclidean-norm is classical but abstract. Hence, PPA only plays an important theoretical role in optimization and it is rarely used in the practical scientific computation. In this talk, we introduce the recently developed customized PPA in G-norm (G is a positive definite matrix). In the frame of customized PPA, it is easy to construct the contraction-type methods for convex optimization with different linear constraints. In each iteration of the proposed methods, we need only to solve the proximal subproblems which have the closed-form solutions or can be efficiently solved up to a high precision. Guided by the frame of customized PPA, the alternating direction method of multipliers is modified and it becomes more efficient. Some novel applications and numerical experiments are reported.

A Fast Splitting Method Tailored for Dantzig Selector

Hongjin He

Hangzhou Dianzi University, China

Abstract

In this paper, we propose a splitting method for solving Dantzig selector problem, which was extensively studied in the literature. The proposed method is very simple in the sense that, per iteration, it only performs a projection onto a box, and does some matrix-vector productions. We prove the global convergence of the splitting method under some mild conditions. Finally, some promising numerical results demonstrate that the new method is competitive with some state-of-the-art methods recently proposed in the literature. Specifically, the proposed method is very efficient in terms of fewer iterations and less CPU time to find Dantzig selectors with high quality.

Nonsmooth Multiobjective Fractional Programming with Generalized Exponential Invexity

Shun-Chin Ho[1] **and Hang-Chin Lai**[2]

[1]Chung-Jen Junior College of Nursing
Health Sciences and Management, Taiwan and [2]National Tsing Hua University, Taiwan

Abstract

In this paper, we study nonsmooth multiobjective fractional programming problem containing local Lipschitz exponential (p, r)-invex functions with respect to η. We introduce a new concept of nonconvex functions, called exponential (p, r)-invex functions. Base on the generalized invex functions, we establish sufficient optimality conditions for a feasible point to be an efficient solution. Furthurmore, empolying optimality conditions to perform parametric type duality model and prove the duality theorems including weak duality, strong duality, and strict converse duality theorem involving exponential (p, r)-invexity assumptions. Consequently, the optimal values of the primal problem and parametric duality problem have no duality gap under the framework of exponential (p, r)-invexity.

The Split Common Null Point Problem and Strong Convergence Theorems in Hilbert Spaces

Mayumi Hojo[1,*] **and Wataru Takahashi**[2]

[1,*]Niigata University, Japan; and [2]National Sun Yat-sen University, Taiwan and Keio University and Tokyo Institute of Technology, Japan

Abstract

Based on recent works by Byrne-Censor-Gibali-Reich [C. Byrne, Y. Censor, A. Gibali and S. Reich, The split common null point problem, J. Nonlinear Convex Anal. 13 (2012), 759–775] and the authors [M. Hojo and W. Takahashi, Approximation of common solutions for monotone inclusion problems and equilibrium problems in Hilbert spaces, Nihonkai Math. J. 23 (2012), 115–134], we establish a strong convergence theorem for finding a solution of the split common null point problem of three maximal monotone mappings which is related to the split feasibility problem by Censor and Elfving [Y. Censor and T. Elfving, A multiprojection algorithm using Bregman projections in a product space, Numer. Algorithms 8 (1994), 221–239]. The solution of the split common null point problem is characterized as a unique solution of the variational inequality of a nonlinear operator. As applications, we get two new strong convergence theorems which are connected with the split feasibility problem and an equilibrium problem.

The Orthogonal Decomposition in Banach Spaces and Its Applications

Takashi Honda

Iwate University, Japan

Abstract

In this talk, we introduce an orthogonal decomposition in a Banach space which is an extension of the orthogonal complemented subspace decomposition of a Hilbert space. By using it, we can dene an orthogonal projection of a Banach space as a nonlinear retraction. We show that all contractive linear projections of a Banach space are orthogonal projections. Recently, we study nonlinear analytic methods for linear contractive semigroups in Banach spaces and apply them to the splitting theorem of Jacobs-de Leeuw-Glicksberg.

On Variable Learning Rate and Nonexpansivity in Self-organizing Maps

Mitsuhiro Hoshino

Akita Prefectural University, Japan

Abstract

In this talk, we deal with mathematical models of self-organizing maps referred to as Kohonen type algorithm. In self-organizing map models, by repeating learning, some model functions have important properties such as ordering which appears in the relation between the array of nodes and the values of nodes. These models apply to many practical and useful problems by using these properties. We investigate behavior of ordering, some closed classes of states and non-expansive learning in self-organizing maps with a one dimensional array of nodes and variable learning. We give some numerical examples in self-organizing maps with variable learning rate factor.

Strong Convergence Theorems for Zero Point Problems in a Banach Space and Its Applications

Takanori Ibaraki

Tsuruoka National College of Technology, Japan

Abstract

In this talk, we study the zero point problem in a Banach space. We first prove strong convergence theorems for resolvents of maximal monotone operators in a Banach space. Using our results, we consider some applications.

Complementarity Versus Shift Dualities

Seiichi Iwamoto, Yutaka Kimura* and Toshiharu Fujita

Kyushu University, Japan, Akita Prefectural University, Japan, and Kyushu Institute of Technology, Japan

Abstract

We consider two pairs of primal quadratic optimization problem and its dual problem. It is shown that optimal value and optimal solution of the two pairs are characterized by the Golden number.One pair has a Golden complementary duality, which consists of : (i) Golden optimal value, (ii) Golden solutions, and (iii) Golden complementarity between primal and dual optimal solutions. The other has a Golden shift duality, which consists of : (i) Golden optimal value, (ii) Golden solutions, and (iii) Golden shift between both optimal solutions.

Iterative Methods for Generalized Mixed Equilibrium Problems, Fixed Point Problems and Minimization Problems

Jong Soo Jung

Dong-A University, Korea

Abstract

In this talk, we introduce new implicit and explicit iterative schemes for finding a common element of the set of solutions of an generalized mixed equilibrium problem and the set of fixed points of a k-strictly pseudocontractive mapping in Hilbert spaces. We establish results of the strong convergence of the sequences generated by the proposed schemes to a common point of two sets, which is a solution of a certain variational inequality. As a direct consequence, we obtain the unique minimum-norm common point of two sets.

Critical Point Results for Some Singular Potential Hamiltonian System

Tacksun Jung[1] **and Q-Heung Choi**[2]

[1]Kunsan National University, Korea and [2]Inha University, Korea

Abstract

We investigate the multiple solutions for the Hamiltonian system with singular potential nonlinearity and periodic condition. We get a theorem which shows the existence of the nontrivial weak periodic solution for the Hamiltonian system with singular potential nonlinearity. We obtain this result by using variational method, critical point theory for indefinite functional.

Direct Sums of Banach Spaces with FPP Which are not Uniformly Non-square

Mikio Kato[1] **and Takayuki Tamura**[2]

[1]Shinshu University, Japan and [2]Chiba University, Japan

Abstract

It is well known that all uniformly non-square spaces have the fixed point property for nonexpansive mappings (FPP). We shall discuss direct sums of Banach spaces which have FPP, but are not uniformly non-square.

An Iterative Shrinkage Metric f-Projection Method for Finding a Common Fixed Point of two Quasi Strict f-Pseudo-contractions and Applications in Hilbert Spaces

Kasamsuk Ungchittrakool, Somyot Plubtieng, and Duangkamon Kumtaeng

Naresuan University, Thailand

Abstract

In this paper, we establish the significant inequality related to quasi strict f-pseudo contractions in the framework of Hilbert spaces. By using the ideas of metric f-projection, we propose an iterative shrinking metric f-projection method for finding a common fixed point of two quasi strict f-pseudo contractions. Moreover, we also provide some applications of the main theorem as well as other related results.

The Choquet Integral Representation Problem for Nonlinear Functionals

Jun Kawabe

Shinshu University, Japan

Abstract

Let X be a locally compact space. Let $C_{00}(X)$ denote the space of all continuous functions on X with compact support and let $C_0(X)$ denote the space of all continuous functions on X vanishing at infinity. In [2], Sugeno et al. succeeded in proving an analogue of the Riesz type integral representation theorem in nonadditive measure theory. More precisely, they gave a direct proof of the assertion that every comonotonically additive, monotone functional on the positive cone $C_{00}^+(X)$ of $C_{00}(X)$ can be represented as the Choquet integral with respect to a nonadditive measure on X with some regularity properties. Their result gives a functional analytic characterization of the Choquet integrals and it is inevitable in order to develop nonadditive measure theory in locally compact spaces.

In this talk, firstly we will give an improvement of the above Choquet integral representation [2] of a functional I defined only on the positive cone $C_{00}^+(X)$ and $C_0^+(X)$. This has been done using the Greco theorem [1], which is the most general Daniell-Stone type integral representation theorem for functionals on function spaces. Next, we will introduce the notion of the asymptotic translatability of a functional I and reveal that this simple notion is equivalent to the Choquet integral representability of I defined on the whole spaces $C_{00}(X)$ and $C_0(X)$ with respect to a nonadditive measure on X with appropriate regularity.

This work is supported by Grant-in-Aid for Scientific Research No. 20540163, Japan Society for the Promotion of Science (JSPS).

References

[1] G.H. Greco. Sulla rappresentazione di funzionali mediante integrali, Rend. Sem. Mat. Univ. Padova , 66 (1982) 21–42.

[2] M. Sugeno, Y. Narukawa, and T. Murofushi. Choquet integral and fuzzy measures on locally compact space, Fuzzy Sets and Systems, 99 (1998) 205–211.

Existence and Mean Approximation of Fixed Points of Generalized Hybrid Non-self Mappings in Hilbert Spaces and Some Examples

Toshiharu Kawasaki

Nihon University, Japan

Abstract

Let H be a real Hilbert space and let C be a non-empty subset of H. Kocourek, Takahashi and Yao [4] defined a class of nonlinear mappings in a Hilbert space. A mapping T from C into H is said to be generalized hybrid if there exist real numbers α and β such that

$$\alpha\|Tx - Ty\|^2 + (1-\alpha)\|x - Ty\|^2 \leq \beta\|Tx - y\|^2 + (1-\beta)\|x - y\|^2$$

for any $x, y \in C$. Hojo, Takahashi and Yao [1] defined a broad class of nonlinear mappings than the class of generalized hybrid mappings. A mapping T from C into H is said to be extended hybrid if there exist real numbers α, β and γ such that

$$\begin{aligned}\alpha(1+\gamma)\|Tx - Ty\|^2 + (1-\alpha(1+\gamma))\|x - Ty\|^2 \\ \leq (\beta+\alpha\gamma)\|Tx - y\|^2 + (1-(\beta+\alpha\gamma))\|x - y\|^2 \\ -(\alpha-\beta)\gamma\|x - Tx\|^2 - \gamma\|y - Ty\|^2\end{aligned}$$

for any $x, y \in C$. Furthermore, they proved a fixed point theorem for generalized hybrid non-self mappings by using the extended hybrid mapping.

On the other hand, the author [2] defined a more broad class of nonlinear mappings in a Hilbert space which covers the class of generalized hybrid mappings and the class of extended hybrid mappings. A mapping T from C into H is said to be widely more generalized hybrid if there exist real numbers $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta$ and η such that

$$\begin{aligned}\alpha\|Tx - Ty\|^2 + \beta\|x - Ty\|^2 + \gamma\|Tx - y\|^2 + \delta\|x - y\|^2 \\ +\varepsilon\|x - Tx\|^2 + \zeta\|y - Ty\|^2 + \eta\|(x - Tx) - (y - Ty)\|^2 \leq 0\end{aligned}$$

for any $x, y \in C$.

In this talk, we show a fixed point theorem for widely more generalized hybrid non-self mappings in Hilbert spaces. Furthermore, we show mean convergence theorems of Baillon's type for widely more generalized hybrid non-self mappings in a Hilbert space.

Moreover we consider some examples of these theorems for non-self mappings.

References

[1] M. Hojo, W. Takahashi, and J.C. Yao. Weak and strong mean convergence theorems for super hybrid mappings in Hilbert spaces, *Fixed Point Theory*, 12 (2011) 113–126.

[2] T. Kawasaki and W. Takahashi. Existence and mean approximation of fixed points of generalized hybrid mappings in Hilbert spaces, *J. Nonlinear Convex Anal.*, 14 (2013) 71–87.

[3] T. Kawasaki and T. Kobayashi. Existence and mean approximation of fixed points of generalized hybrid non-self mappings in Hilbert spaces, *Scientiae Mathematicae Japonicae*, to appear.

[4] P. Kocourek, W. Takahashi, and J.C. Yao. Fixed point theorems and weak convergence theorems for generalized hybrid mappings in Hilbert spaces, *Taiwanese Journal of Mathematics*, 14 (2010) 2497–2511.

Weak Sequential Convergence in $L^1(\mu, X)$ and an Exact Version of Fatou's Lemmas

M. Ali Khan[1] **and Nobusumi Sagara**[2,*]

[1]The Johns Hopkins University, U.S.A. and [2,*]Hosei University, Japan

Abstract

The class of non-atomic finite measure spaces with the saturation property, as developed in Maharam (1942) and Hoover-Keisler (1984), is characterized by the Fatou (and Lebesgue) property of a well-dominated sequence of multifunctions taking values in a Banach space. With multifunctions reduced to functions, this Fatou characterization also extends to a variant of the closure property found in optimal control theory. The results are developed through a considered overview of the relevant literature on the exact and approximate Fatou lemma phrased in terms of Bochner integration.

A Note on Changhee Numbers and Polynomials

Dae San Kim* **and Taekyun Kim**

Kwangwoon University, Korea

Abstract

In this paper, we consider the higher-order Changhee numbers and polynomials which are derived from the fermionic p-adic integrals on $\mathbb{Z}_p$, and give some relations between higher-order Changhee polynomials and special polynomials.

Characterizations of Solution Sets of Nonconvex Semi-infinite Programs

Do Sang Kim

Pukyong National University, Korea

Abstract

In this talk, we introduce some new properties of Lagrange function associated to a nonconvex semi-infinite problem. Using Wolfe type duality, we show that under Karush-Kuhn-Tucker optimality conditions, the Lagrange function corresponding to a fixed Lagrange multiplier is constant on a subset containing the solution set of the primal problem. Moreover, corresponding to a given solution of the problem, Lagrange function is constant on the set of all Lagrange multipliers. The set of all saddle points of Lagrange function are investigated. The results are applied to give characterizations of solution set of the problem.

Split Equality Fixed Point Problem for Totally Asymptotically Nonexpansive Mappings in Hilbert Spaces

Jong Kyu Kim

Kyungnam University, Korea

Abstract

The purpose of this talk is to propose an algorithm for solving the split equality fixed point problem for totally asymptotically nonexpansive mappings in the setting of infinite-dimensional real Hilbert spaces. Under suitable conditions, we prove some strong and weak convergence theorems of the iterative scheme proposed in this paper. The results presented in the paper extend and improve the corresponding results announced by Moudafi [14], Moudafi et al.[15], and some others. As applications, we solve the split feasibility problem, null point problem, and equilibrium problem.

On the Equivalence between the Convergence of Iterative Sequences for Nonlinear Mappings in Banach Spaces

Kyung Soo Kim
Kyungnam University, Korea

Abstract

Some equivalence condition between the convergence of modified Mann, modified Ishikawa and modified three-step iterative sequences for asymptotically pseudo contractive mappings in Banach spaces are obtained.

Asymptotically Strict Quasi-pseudo-contractive Families and Their Convergence Theorems

Tae-Hwa Kim
Pukyong National University, Korea

Abstract

In this paper, we first introduce an asymptotically strict quasi-pseudo-contractive family $\mathcal{S} = \{S_n : C \to C\ ,\ n \geq 0\}$ of self-mappings defined on a closed convex subset C in a Hilbert space H, more precisely, we say that the family $\mathcal{S}$ is asymptotically κ-strict quasi-pseudo-contractive on C if the common fixed point set $F := \cap_{n=1}^{\infty} Fix(S_n) \neq \emptyset$ and there exist a constant $\kappa \in [0, 1)$ and a sequence $\{\gamma_n\}_{n=0}^{\infty}$ of nonnegative real numbers with $\lim_{n\to\infty} \gamma_n = 0$ such that

$$\|S_n x - p\|^2 \leq (1 + \gamma_n)\|x - p\|^2 + \kappa\|x - S_n x\|^2 \tag{1}$$

for all $x \in C$, $p \in F$ and all integers $n \geq 0$. When (1) holds, $\mathcal{S}$ is often said to be an asymptotically κ-strict quasi-pseudo-contractive family. Especially, when $\kappa = 0$ in (1), the family $\mathcal{S}$ is said to be *asymptotically quasi-nonexpansive*. Next we consider either the following modified Ishikawa type iteration method

$$\begin{cases} y_n = \beta_n x_n + (1 - \beta_n) S_n x_n, \\ x_{n+1} = \alpha_n y_n + (1 - \alpha_n) S_n y_n, \quad n \geq 0, \end{cases} \tag{2}$$

or the following hybrid iterative method

$$\begin{cases} x_0 \in C \text{ chosen arbitrarily}, \\ y_n = \beta_n x_n + (1 - \beta_n) S_n x_n, \\ z_n = \alpha_n y_n + (1 - \alpha_n) S_n y_n, \\ C_n = \{p \in C : \|z_n - p\|^2 \leq \|x_n - p\|^2 + (1 - \beta_n)\theta_n + (1 - \alpha_n) \\ \qquad\qquad [\theta_n(1 + (1 - \beta_n)\gamma_n) + (\kappa - \alpha_n)\|y_n - S_n y_n\|^2]\}, \\ Q_n = \{p \in C : \langle x_n - p, x_0 - x_n\rangle \geq 0\}, \\ x_{n+1} = P_{C_n \cap Q_n} x_0, \quad n \geq 0, \end{cases} \tag{3}$$

where

$$\theta_n = \gamma_n \cdot \sup\{\|x_n - p\|^2 : p \in F := \cap_{n=0}^{\infty} Fix(S_n)\},$$

and the sequences $\{\alpha_n\}_{n=0}^{\infty}$ and $\{\beta_n\}_{n=0}^{\infty}$ lie in the interval $[0, 1]$. Then we shall give the weak convergence of (2) and the strong convergence of (3) for such an asymptotically strict quasi-pseudo-contractive family $\mathcal{S} = \{S_n : C \to C, n \geq 0\}$ under some suitable conditions of control sequences $\{\gamma_n\}$, $\{\alpha_n\}$ and $\{\beta_n\}$. Some applications and examples are also added.

On Approximate Solutions for the Stochastic Differential Equations

Young-Ho Kim
Changwon National University, Korea

Abstract

In this talk, we are concerned with p-th moment of solution of the stochastic differential equations. Under non-Lipschitz condition and a weakened linear growth condition, we show the properties of the solution for the SDE with initial value. Also we shall investigate the L^p-estimates of the solution.

Iterative Methods for a Family of Mappings on a Complete Geodesic Space

Yasunori Kimura
Toho University, Japan

Abstract

The approximation of fixed point of nonlinear mappings has been investigated in various ways and related results have been applied to the other studies. In 1953, Mann [2] introduced an iterative scheme for approximating fixed points of nonexpansive mapping in a Hilbert space. Later, Reich [3] discussed this iterative scheme in a uniformly convex Banach space whose norm is Fréchet differentiable. In 1998, Takahashi and Tamura [4] considered this scheme with two nonexpansive mappings and obtained weak convergence theorems in a uniformly convex Banach space which satisfies Opial's condition or whose norm is Fréchet differentiable. On the other hand, Dhompongsa and Panyanak [1] considered this scheme in the setting of complete CAT(0) spaces and after their work, the results have been generalized to the CAT(κ) spaces with positive κ. In this talk, we consider this scheme for two quasinonexpansive mappings defined on a complete CAT(κ) spaces with $\kappa > 0$. We also deal with some recent developments related to this problem.

References

[1] S. Dhompongsa and B. Panyanak. On Δ-convergence theorems in CAT(0) spaces, *Comput. Math. Appl.*, 56(2008), no. 10, 2572–2579.

[2] W. R. Mann. Mean value methods in iteration, *Proc. Amer. Math. Soc.*, 4 (1953), 506–510.

[3] S. Reich. Weak convergence theorems for nonexpansive mappings in Banach spaces, *J. Math. Anal. Appl.* 67 (1979), 274–276.

[4] W. Takahashi and T. Tamura. Convergence theorems for a pair of nonexpansive mappings, *J. Convex Anal.*, 5 (1998), 45–56.

The Oscillation Problem Accompanying the Discontinuous-point-detecting Method

Satoshi Kodama
Tokyo University of Science, Japan

Abstract

The theory of numerical approximation methods may originate in the theory of Fourier series, because it is famous that this theory plays an important role in the theory of image and sound analysis, and that, for any numerical function $f(\cdot)$, the sequence of Fourier coecients corresponding to $f(\cdot)$ can be regarded as the compressed data. In this talk, we discuss a nonlinear theoretic criterion for discriminating functions which can be easily compressed from functions which cannot be easily compressed and a method of locating discontinuous points in the domain of a certain piecewise continuous function.

Strong Convergence Theorem for a Strongly Relatively Nonexpansive Sequence of Mappings

Fumiaki Kohsaka
Oita University, Japan

Abstract

We obtain a strong convergence theorem for a strongly relatively nonexpansive sequence of mappings in Banach spaces. Using this result, we study the problem of approximating zero points of maximal monotone operators in Banach spaces. Among other things, we obtain the following theorem: Let X be a smooth and uniformly convex Banach space, J the normalized duality mapping of X onto X^*, C a nonempty closed convex subset of X, Π_C the generalized projection of X onto C, $\{S_n\}$ a strongly relatively nonexpansive sequence of mappings of C into X such that $F = \bigcap_{n=1}^{\infty} F(S_n)$ is nonempty and $\{S_n\}$ satisfies the condition (Z), u an element of X, and $\{\alpha_n\}$ a sequence of $(0, 1]$ such that $\alpha_n \to 0$ and $\sum_{n=1}^{\infty} \alpha_n = \infty$ Then the sequence $\{x_n\}$ defined by $x_1 \in C$ and

$$x_{k+1} = \Pi_C J^{-1}(\alpha_n Ju + (1 - \alpha_n)JS_n x_n), \quad (n = 1, 2, \cdots)$$

converges strongly to $\Pi_F u$.

On Robust Convex Multiobjective Optimization

Daishi Kuroiwa[1] and Gue Myung Lee[2,*]
[1]Shimane University, Japan and [2]Pukyong National University, Korea

Abstract

The robust approach (the worst-case approach) for convex multiobjective optimization problem (UCMP) with uncertainty data is considered. Using the robust approach, we define three kinds of robust efficient solutions for an uncertain convex multiobjective optimization problem (UCMP) which consists of more than two objective functions with uncertainty data and constraint functions with uncertainty data. The purpose of this talk is to give a necessary and sufficient constraint qualification for the three kinds of robust efficient solutions for (UCMP). We give a formula for calculating the subdifferential of certain maximum function, and then we obtain results concerned with optimality conditions for the three kinds of robust efficient solutions of (UCMP). Moreover, we give examples illustrating that our main result is very useful for properly and weakly efficient robust efficient solutions for (UCMP). Finally, we give the closedness constraint qualification for (UCMP) and show that under the constraint qualification, the optimality conditions hold.

Multipliers and Invariant Operators in Banach Space Functions on LCA Group

Hang-Chin Lai
National Tsing-Hua University, Taiwan

Abstract

Let G be a LCA group, A a commutative Banach algebra, X and Y be Banach A-module. The A-module multiplier from X into Y is denoted by

$$\mathrm{Hom}_A(X, Y) = \{T \in \mathcal{L}(X, Y) \,|\, T(a \cdot x) = a \cdot T(x),\ a \in A,\ x \in X\}.$$

In this talk, we would investigate the relation between multipliers and invariant operators in Banach space value functions on LCA group. We also characterize multipliers to be function spaces. For example,

$\mathrm{Hom}_{L^1(G,A)}(C_0(G, A), C_0(G, A)) \cong M(G, A)$,

and under what conditions, one can characterize the multipliers

$\mathrm{Hom}_{C_0(G,A)}(C_0(G, X), C_0(G, X))$? - pointwise as product in the Banach algebra

$\mathrm{Hom}_{L^1(G,A)}(C_0(G,X), C_0(G,X))$? - convolution as product in the Banach algebra

Moreover,

$\mathrm{Hom}_{L^1_A}(L^1_A, L^1_X) \cong M_X$?

$\mathrm{Hom}_{L^1_A}(L^1_A, L^p_X) \cong L^p_X$?

$\mathrm{Hom}_{L^1_A}(L^1_A, C_{0,X} \cong C_{0,X}$?

We also infer some applications involving Rieffels result and R.N.P.,

(1) $\mathrm{Hom}_{L^1(G)}(L^{p'}, L^{q'}) \cong \mathrm{Hom}_{L^1(G)}(L^{p'}, L^{q'})$, where $1 \leq p, q < \infty,\ 1 < p, q \leq \infty,\ \frac{1}{p} + \frac{1}{p'} = 1$;

(2) $\mathrm{Hom}_A(X, Y^*) \cong (X \otimes_A Y)^*$. - by Rieffel.

Superstability of the Functional Equation with a Cocycle Function Related to Distance Measures

Young Whan Lee[1], Yang-Hi Lee[2], and Gwang Hui Kim[3]

[1]Daejeon University, Korea; [2]Gongju National University of Education, Korea; [3]Kangnam University, Korea

Abstract

In this paper, we obtain the superstability of the functional equations

$$f(pr, qs) + f(ps, qr) = \theta(pq, rs) f(p, q)\, f(r, s)$$

for all $p, q, r, s \in G$, where G is an Abelian group, f a functional on G^2, and θ a cocycle on G^2. This functional equation is a generalized form of the functional equation $f(pr, qs) + f(ps, qr) = f(p, q)\, f(r, s)$, which arises in the characterization of symmetrically compositive sum-form distance measures, and as a products of some multiplicative functions.

In reduction, they can be represented as exponential functional equations. Also we investigate the superstability with following functional equations:

$$\begin{aligned}
f(pr, qs) + f(ps, qr) &= \theta(pq, rs) f(p, q) g(r, s),\\
f(pr, qs) + f(ps, qr) &= \theta(pq, rs) g(p, q) f(r, s),\\
f(pr, qs) + f(ps, qr) &= \theta(pq, rs) g(p, q) g(r, s),\\
f(pr, qs) + f(ps, qr) &= \theta(pq, rs) g(p, q) h(r, s).
\end{aligned}$$

Well-posedness for Generalized Set Equilibrium Problems

Yen-Cherng Lin

China Medical University, Taiwan

Abstract

We study the well-posedness for generalized set equilibrium problems (GSEP, in short), and propose two types of well-posed concept for this problems in topological vector spaces setting. These kinds of well-posedness arise from some well-posedness in the vector settings. We also study the relationship between these well-posednesses and present several criteria for the well-posedness of (GSEP). Our results are new or include as special cases recent existing results.

On Boundary Conditions for Fixed Point Theorems of a Nonlinear Mapping in a Banach Space

Hiroko Manaka
Yokohama National University, Japan

Abstract

Let E be a smooth Banach space with a norm $\|\cdot\|$. Suppose that $V(x,y) = \|x\|^2 + \|y\|^2 - 2\langle x, Jy\rangle$ for any $x, y \in E$, where $\langle\cdot,\cdot\rangle$ stands for the duality pair and J is the normalized duality mapping. We define a nonlinear pseudo-nonexpansive mapping, so-called a V-strongly nonexpansive mapping, on E by the mapping $V(\cdot,\cdot)$.

In this talk, we first introduce the properties of this mapping and relation with some nonlinear mappings in a Hilbert space and Banach space. Next we show that this mapping is nonexpansive in a Hilbert space, but it is not necessarily nonexpansive in a Banach space, for example, L^p with $p = \frac{3}{2}$. Finally, we talk about boundary conditions for fixed point theorem of this mapping in a Banach space.

On Some Auxiliary Mappings

Giuseppe Marino
University of Calabria, Italy

Abstract

Starting by a finite family of mappings, we define the concept of procedure with Lipschitzian dependence of the coefficients. We give seven concrete examples of such procedures and prove the strong convergence of two viscosity methods.

Auxiliary Mappings and Solution of Variational Inequality Problems

Giuseppe Marino and Luigi Muglia*
University of Calabria, Italy

Abstract

Our aim is to introduce a new class of procedures, the Uniformly Asymptotically Regular-class of procedures (UAR-procedures). Then by a UAR-procedure we prove the convergence of two explicit iterative methods to the unique solution of a variational inequality problem on the set of common xed points of a family of mappings, in the setting of Hilbert spaces.

On Projections Methods in Hilbert Spaces

Shin-Ya Matsushita and Li Xu
Akita Prefectural University, Japan

Abstract

The alternating projection method is a well-known algorithm for the convex feasibility problem, and has many generalization and extension. In this talk, We discuss modified version of projection method for finding a solution of the convex feasibility problem.

Nonlinear Optimization Methods for Circuit Placement

Hiroshi Miyashita
The University of Kitakyushu, Japan

Abstract

In this talk, we introduce circuit placement process in EDA (Electronic design automation) field, and consider nonlinear optimization methods used in the field. Circuit placement attracts much interest in the physical design automation of LSIs because the succeeding routing process is intensively affected by it, and finally the quality of the obtained LSI chips directly depends on them. The circuit placement works on a cell-level net list, which can be defined as a graph $\mathcal{N} = (V, E)$, where a node $v \in V$ corresponds to a cell, and an edge $e \in E$ to a net that is a subset of V . The cells are logical gates such as AND, NAND, NOR, half adder, etc., and a net e is a set of the cells that are required to be interconnected. Let $V = \{1, 2, \cdots, n\}$ be a set of cells, and the coordinates of cell i be $(x_i, y_i)(i = 1, 2, \cdots, n)$, the circuit placement problem is formulated as to determine node locations $\mathbf{x}^T = (x_1, x_2, \cdots, x_n)$, $\mathbf{y}^T = (y_1, y_2, \cdots, y_n)$ so that all the cells are located within predefined rectangular area. Here, locations of some cells are fixed in advance. As the objective function to be minimized, we use total half-perimeter wire length (HPWL) which is the sum of the half-perimeter wire length of net e denoted $\mathrm{HPWL}_e(\mathbf{x}, \mathbf{y})$ below over all nets in E.

$$\mathrm{HPWL}_e(\mathbf{x}, \mathbf{y}) = (\max\{x_i | i \in e\} - \min\{x_i | i \in e\}) + (\max\{y_i | i \in e\} - \min\{y_i | i \in e\}),$$

which indicates half-perimeter wire length of net e is half perimeter of the minimum rectangle enclosing all the cells in e. Since the objective function above is not differentiable, untill now, some kinds of approximate functions have been used. One way is to use quadratic objective functions as approximated wire length, where every net e is decomposed into some nets of type $\{i, j\}$. The other way is to approximate max and min functions by a known formula as

$$\begin{aligned}\mathrm{HPWL}_e(\mathbf{x}, \mathbf{y}) = t &\left(\log(\sum_{i \in e} e^{x_i/t}) + \log(\sum_{i \in e} e^{-x_i/t}) \right) \\ &+ t \left(\log(\sum_{i \in e} e^{y_i/t}) + \log(\sum_{i \in e} e^{-y_i/t}) \right),\end{aligned}$$

where $t > 0$ is a smoothing parameter. Even if, these kinds of objective functions are used, placement result is estimated by HPWL. Therefore, other nonlinear optimization methods are expected to be used directly to minimize HPWL. For example, subgradient methods and its extensions to projected subgradient method seem to be applicable to circuit placement because max function satisfies the Lipschitz condition $|\max(\mathbf{x}) - \max(\mathbf{y})| \leq \|\mathbf{x} - \mathbf{y}\|_2$, where $\max(\mathbf{x}) = \max\{x_i | i = 1, 2, \cdots, n\}$ for $\mathbf{x}^T = (x_1, x_2, \cdots, x_n)$.

Compact Matrix Operators between Some Sequence Spaces

M. Mursaleen
Aligarh Muslim University, India

Abstract

We shall write w for the set of all complex sequences $x = (x_k)_{k=0}^{\infty}$. Let ℓ_∞, c and c_0 denote the sets of all bounded, convergent and null sequences respectively. We write $\ell_p := \{x \in w : \sum_{k=0}^{\infty} |x_k|^p < \infty\}$ for $1 \leq p < \infty$.

Throughout this paper, the matrices are infinite matrices of complex numbers. If A is an infinite matrix with complex entries $a_{nk}(n, k \in \mathbb{N})$, then we write $A = (a_{nk})$ instead of $A = (a_{nk})_{n,k=0}^{\infty}$. Also, we write A_n for the sequence in the n^th row of A, i.e., $A_n = (a_{nk})_{n,k=0}^{\infty}$ for every $n \in \mathbb{N}$. In addition, if $x = (x_k) \in w$, then we define the A-transform of x as the sequence $Ax = (A_n(x))_{n=0}^{\infty}$, where

$$A_n(x) = \sum_{k=0}^{\infty} a_{nk} x_k; \quad (n \in \mathbb{N})$$

provided the series on the right converges for each $n \in \mathbb{N}$.

In this paper, we obtain estimates for the norms of the bounded linear operators L_A defined by the matrix classes $(\ell_p^\lambda, Y)(1 \leq p < \infty)$, where $Y = c_0, c, \ell_\infty$ and ℓ_1. We also find conditions to obtain the corresponding subclasses of compact matrix operators by using the Hausdorff measure of noncompactness.

Tripled Fixed Point Theorems for Generalized Contractive Mappings in Partially Ordered G-Metric Spaces

Jamnian Nantadilok
Lampang Rajabhat University, Thailand

Abstract

In this paper, we prove some tripled coincidence point and tripled fixed point theorems for nonlinear contractive mappings having the mixed g-monotone property in partially ordered G-metric spaces. The results on fixed point theorems are generalisations of the recent results of Borinde and Borcut [2], Aydi and Karapinar [1].

References

[1] H. Aydi and E. Karapinar. Triple fixed point in ordered metric spaces. Bull. Math. Anal. Appl., 4(1), 197-207(2012).

[2] V. Berinde and M. Borcut. Triple fixed point theorems for contractive type mappings in partially ordered metric spaces, Nonlinear Anal., 74 (15), 4889-4897(2011)

Some Fixed Point Theorems for a Class of Fuzzy Mappings

Somboon Niyom and Narin Petrot
Nakhon Sawan Rajabhat University, Thailand

Abstract

In this work, we study the fixed point theorems for fuzzy mappings in a complete metric space are present. Some existence theorems are showed and, by the technical prove, some iterative algorithms for finding a fixed point are also obtained. As the concept of fuzzy mapping is a generalization of multivalued mapping, our results can be viewed as an extension and improvement of the previously known results.

On the Signature of Area Form on the Polygon Space

Haruko Nishi
Josai University, Japan

Abstract

The space of Euckudean polygons with prescribed exterior angles in the Eulidean plane up to similarities can be regarded as a subspace of the moduli space $\mathcal{C}$ of Euclidean cone structures on the 2-sphere with prescribed cone angles. When the curvature of the cone points are all positive, the signature of the area form on the local parametrisation of a cone strucrue has type $(1, n-3)$ which leads a hyperbolic structure on the moduli space $\mathcal{C}$ ([3]). We will discuss the signature of the area form in general case in terms of the cone angles which generalise the result of the Euclidean polygon space in [1] .

References

[1] C. Bavard and É. Ghys, *Polygones du plan et polyèdres hyperboliques*, Geom. Dedicata **43** (1992), no. 2, 207–224.

[2] H. Nishi, *On the signature of area form on polygon space*, Josai Math.Monogr. 6 (2013), 147–150.

[3] W. Thurston : *Shapes of polyhedra and triangulations of the sphere*, Geom. Topol. Monogr. **1** (1998), 511–549.

On a Monotone Function and the Triangle Inequality in Normed Linear Spaces

Tomoyoshi Ohwada
Shizuoka University, Japan

Abstract

The (generalized) triangle inequality is one of the most fundamental and extensively used inequalities in analysis and other fields of mathematics. This inequality has attracted the attention of a number of authors, and many interesting refinements and reverse inequalities of it have been obtained.

In this talk, we would like to introduce some of the most recent results concerning the triangle inequality on a normed linear space by using a monotone function.

Fixed Point Theorems on a Space of Fuzzy Sets Induced by a class of $\mathcal{R}$-Functions

Narin Petrot and Warut Saksirikun
Naresuan University, Thailand

Abstract

By using the concept of a class of functions, called $\mathcal{R}$-functions, we improve some fixed point theorems on a space of fuzzy sets, under the supremum metric. Also, some interesting cases will be discussed.

Higher Order Operators in Divergence form Elliptic in the Sense of Garding's Inequality and Applications

Mahmoud Qafsaoui
Institut Supérieur de l'Aéronautique and de l'Espace, France

Abstract

We study some elliptic and parabolic results of a class of higher order operators with nonsmooth coefficients, elliptic in the sense of Gårding's inequality : $\exists \lambda_0 > 0$ and $\lambda_1 > 0$, $\forall u \in H^m(\mathbb{R}^n)$,

$$Re\left(\int_{\mathbb{R}^n} \sum_{|\alpha|=|\beta|=m} a_{\alpha\beta}(x) D^\beta u(x) \overline{D^\alpha u(x)} dx\right) \geq \lambda_1 \int_{\mathbb{R}^n} |\nabla^m u|^2 dx - \lambda_0 \int_{\mathbb{R}^n} |u|^2 dx$$

where $a_{\alpha\beta} \in L^\infty(\mathbb{R}^n, \mathbb{C})$ are independent of time. As applications, we derive:
(1) Gaussian estimates for the heat kernel of the homogeneous operators

$$L_0 = (-1)^m \sum_{|\alpha|=|\beta|=m} D^\alpha (a_{\alpha\beta} D^\beta)$$

under an elliptic condition.
(2) A Caccioppoli inequality for inhomogeneous operators associated to L_0.
(3) Large time asymptotic behavior, in L^p $(1 \leq p \leq \infty)$, of higher derivatives $D^\gamma u(t)$ of solutions of the nonlinear equation :

$$\begin{cases} u_t + (\Delta^m A \Delta^m) u = a.\nabla^\theta(\psi(u)) \text{ on } \mathbb{R}^n \times (0, \infty), \\ u(0) = u_0 \in L^1(\mathbb{R}^n), \end{cases}$$

where ψ is a nonlinearity function.

Symmetry Breaking of Solutions of Elliptic Differential Equations

Slawomir Rybicki
Nicolaus Copernicus University, Poland

Abstract

We are going to consider elliptic differential equations on domains with symmetries of the group $SO(n)$. The aim of my talk is formulate necessary and sufficient conditions for the existence of symmetry-breaking phenomenon of solutions of elliptic PDEs. In other words we are going to study the existence of nonradial solutions in a neighborhood of radial ones. We will apply the techniques of equivariant bifurcation theory.

James Constant of Two Dimensional Lorentz Sequence Spaces

Kichi-Suke Saito
Niigata University, Japan

Abstract

Let $J(X)$ denote the James constant of a Banach space X. Then, for a Banach space X and its dual X^*, it is known that $J(X) \neq J(X^*)$ in general. Let $1 \leq q < \infty$ and $0 < \omega < 1$, we consider the following 2-dimensional Lorentz sequence space $d^{(2)}(\omega, q)$ which is $\mathbb{R}^2$ with the norm

$$\|(x, y)\|_{\omega,q} = (x^{*q} + \omega y^{*q})^{1/q},$$

where (x^*, y^*) is the non-increasing rearrangement of $(|x|, |y|)$, that is, $x^* \geq y^*$.

In [1], is computed in the case where $2 \leq q < \infty$. It is an open problem to compute it in the case where $1 \leq q < 2$. After the results in [2, 6], we completely calculated $J(d^{(2)}(\omega, q))$ for all $1 \leq q < 2$ in [4] and the James constant $J(d^{(2)}(\omega, q))^*$ of its dual space in [3].

In this talk, we show that $J(d^{(2)}(\omega, q)) = J(d^{(2)}(\omega, q)^*)$ for all $1 \leq q < \infty$ and all $0 < \omega < 1$. Finally, we remark the James constant of $J(d^{(2)}(\omega, q))$.

This talk is a joint work with Ken-Ichi Mitani and Ryotaro Tanaka.

References

[1] M. Kato, L. Maligranda, On James and Jordan-von Neumann constants of Lorentz sequence spaces, J. Math. Anal. Appl. 258 (2001) 457-465.

[2] K.-I. Mitani, K.-S. Saito, The James constant of absolute norms on R2, J. Nonlinear Convex Anal. 4 (2003) 399-410.

[3] K.-I. Mitani and K.-S. Saito, Dual of two dimensional Lorentz sequence spaces, Nonlinear Anal., 71(2009), 5238-5247.

[4] K.-I. Mitani, K.-S. Saito, T. Suzuki, On the calculation of the James constant of Lorentz sequence spaces, J. Math. Anal. Appl. 343 (2008) 310-314.

[5] Kichi-Suke Saito, Naoto Komuro, Ken-Ichi Mitani, How to calculatw James constants of Banach spaces, to appear in Proceedings of the Fourth International Symposium on Banach and Function Spaces 2012.

[6] T. Suzuki, A. Yamano, M. Kato, The James constant of 2-dimensional Lorentz sequence spaces, Bull. Kyushu Inst. Technol. Pure Appl. Math. 53 (2006) 15-24.

An application to the image recovery problem of Halpern iteration on a CAT(1) space

Kenzi Satô

Tamagawa University, Japan

Abstract

The following theorem is an application of [1]:

Theorem. Let X be a complete CAT(1) space such that $d(v, v') < \pi/2$ for every $v, v' \in X$. Let $\{C_0, C_1, \cdots, C_{m-1}\}$ be a finite family of closed convex subsets of X such that $C = C_0 \cap C_1 \cap \cdots \cap C_{m-1} \neq \emptyset$. Let $\{\alpha_n\} \subset]0, 1[$ such that $\lim_{n\to\infty} \alpha_n = 0$ and $\sum_{n=0}^{\infty} \alpha_n = \infty$, and let $\{\beta_0, \beta_1, \cdots, \beta_{m-2}\} \subset]0, 1[$. For given points $u, x_0 \in X$, let $\{x_n\}$ be the sequence in X generated by

$$x_{n+1} = \alpha_n u \oplus (1-\alpha_n)\left(\beta_0 P_{C_0} x_n \oplus (1-\beta_0)(\beta_1 P_{C_1} x_n \oplus (1-\beta_1)\left(\cdots\right.\right.$$
$$\left.\left.\cdots(\beta_{m-3} P_{C_{m-3}} x_n \oplus (1-\beta_{m-3})\left(\beta_{m-2} P_{C_{m-2}} x_n \oplus (1-\beta_{m-2}) P_{C_{m-1}} x_n\right)\right)\cdots\right)\right)$$

for $n \in \mathbb{N}$. Suppose that one of the following conditions holds:

- $\sup_{v,v'\in X} d(v, v') < \pi/2$;
- $d(u, P_C u) < \pi/4$ and $d(u, P_C u) + d(x_0, P_C u) < \pi/2$;
- $\sum_{n=0}^{\infty} \alpha_n^2 = \infty$.

Then $\{x_n\}$ converges to $P_C u \in C_0 \cap C_1 \cap \cdots \cap C_{m-1}$.

References

[1] Y. Kimura and K. Satô. Halpern iteration for strongly quasinonexpansive mappings on a geodesic space with curvature bounded above by one, *Fixed Point Theory and Applications*, 2013 (2013), 14 pages.

A Modified Mixed Ishikawa Iteration for Two Asymptotically Quasipseudo-contractive Type Nonself-maps

Huimin Shi and Yuanheng Wang*

Zhejiang Normal University, China

Abstract

A new modified mixed Ishikawa iterative sequence with error for common fixed points of two asymptotically quasi pseudo-contractive type nonself-mappings is introduced. By the clever use of the iterative format, under suitable conditions, some strong convergence theorems are proved. The results in this paper improve and generalize the existing results.

Uniqueness of Positive Radial Solutions of $\Delta u + g(r)u + h(r)u^p = 0$ and Its Applications

Naoki Shioji

Yokohama National University, Japan

Abstract

In this talk, we consider the problem

$$\begin{cases} u_{rr} + \dfrac{n-1}{r} u_r + g(r)u + h(r)u^p = 0, \quad 0 < r < R, \\ u(0) \in (0, \infty), \quad u(R) = 0, \end{cases} \tag{4}$$

where $p > 1$, $n \geq 2$, $R \in (0, \infty]$, $g \in C^1((0, \infty))$ and $h \in C^3((0, \infty))$. If $R = \infty$, $u(R) = 0$ means $u(r) \to 0$ as $r \to \infty$. By introducing a new generalized Pohožaev identity, we give a uniqueness result of the positive solutions of (4), and we show some examples to which our uniqueness theorem is applicable. We also study annular domain or exterior domain cases.

Bounds on Locating total Domination Number of the Cartesian Product Graphs

Moo Young Sohn
Changwon National University, Korea

Abstract

The location of monitoring devices, such as surveillance camera or fire alarms, to safeguard a system serves as a motivation for this work. The problem of placing monitoring devices in system in such a way that every site in the system (including the monitors themselves) is adjacent to a monitor site can be modeled by total domination in graphs. Applications where it is also important that if there is a problem at a facility, its location can be uniquely identified by the set of monitors, can be modeled by a combination of total-domination and locating sets. Let $G = (V, E)$ be a simple graph without isolated vertices. A total dominating set S in a graph $G = (V, E)$ is a locating-total dominating set of G if for every pair of distinct vertices u and v in $V - S$, $N(u)$ cap S is not equal to $N(v)$ cap S. The minimum cardinality of a locating-total dominating set is the locating-total domination number. In this talk, we study upper bounds and lower bounds of locating total domination numbers of the Cartesian product of two cycles and the Cartesian product of cycles and paths.

Some Families of λ-Generalized Hurwitz-Lerch Zeta Functions

H.M. Srivastava
University of Victoria, Canada

Abstract

The main purpose of this talk is to introduce and investigate the various properties of some novel families of the λ-generalized Hurwitz-Lerch zeta functions. We aim first at presenting here many potentially useful results involving some of these λ-generalized Hurwitz-Lerch zeta functions including (for example) their partial differential equations, new series and Mellin-Barnes type contour integral representations (which are associated with Fox's H-function) and several other summation formulas involving them. We then propose to discuss their potential application in Number Theory by appropriately constructing a presumably new continuous analogue of Lippert's Hurwitz measure and also consider some other statistical applications of these families of the λ-generalized Hurwitz-Lerch zeta functions in probability distribution theory.

Distances in Experience Space of Naturalistic Decision Making

Meng Su* **and Xiaocong Fan**
The Behrend College, The Penn State University, U.S.A.

Abstract

A model of naturalistic decision making in Artificial Intelligence is based on the supposition that in complex situations human experts usually make decisions on the recognition of similarities between the current decision situation and previous decision experiences which can be represented by labels and feature vectors. These vectors formed a massive and high dimensional space which is called Experience Space. The similarity is usually measured by Euclidean distance. The recent development of diffusion geometry provides a natural framework to study the clustering and labeling of these high-dimensional experience data. The results can lead to the accurate decision making. We have shown that the diffusion distance is significantly more effective than Euclidean distance in multi-scale recognition of similar experiences. In this work, the properties of diffusion distance and the related commute time distance are discussed to illustrate their better performance than using traditional Euclidean distance. We also investigate two approaches to the computation of diffusion distance and its extensions: Spectrum based and Probability-Matching based. Specifically, by 'Spectrum based' approach we refer to the one derived in terms of the eigenvalues/eigenvectors of the normalized diffusion

matrix. We use the term Probability-Matching to refer to the use of various probability distances, where the original L2 diffusion distance is treated as a special case. Our preliminary result indicates that the performance of using L_2 diffusion distance at least is tied with the use of "Spectrum based" distance. Furthermore, when spectrum based approach is applied, we have to use the embedding and extending techniques for labeling new experience data , while such re-computation is not necessary for the Probability-Matching approached distance. A numerical example is tested for the comparison of the different approaches.

Coupled Coincidence Point Theorems and Fixed Point Theorems of Some Nonlinear Mappings on a Metric Space with a Graph

Suthep Suantai

Chiangmai University Chiangmai, Thailand

Abstract

In this talk, we prove some fixed point theorems for some nonlinear mappings in a metric space with a graph and discuss coupled coincidence point theorems for new types of mixed monotone multivalued mappings in partially ordered metric spaces. Moreover, we also discuss coupled coincidence point theorems for mixed graph-preserving multi-valued mappings on a metric space with a graph.

Fixed Point Theorems for Chatterjea Mappings

Tomonari Suzuki

Kyushu Institute of Technology, Japan

Abstract

In 1972, Chatterjea proved the following:

Theorem [Chatterjea [1]] Let T_1 and T_2 be mappings on a complete metric space (X, d). Assume that there exist $\alpha \in (0, 1/2)$ such that

$$d(T_1x, T_2y) \leq \alpha\, d(T_1x, y) + \alpha\, d(x, T_2y)$$

for $x, y \in X$. Then T_1 and T_2 have a unique common fixed point.

Kohsaka and Takahashi proved the following:

Theorem [Kohsaka and Takahashi [2]] Let E be a strictly convex, smooth and reflexive Banach space E; and let C be a bounded, closed and convex subset of E. Let T be a *nonspreading mapping* on C, that is,

$$\phi(Tx, Ty) + \phi(Ty, Tx) \leq \phi(Tx, y) + \phi(Ty, x) \tag{5}$$

for all $x, y \in C$, where $\phi(x, y) = \|x\|^2 - 2\langle x, Jy\rangle + \|y\|^2$. Then T has a fixed point.

We note that in the case where E is Hilbertian, (5) is equivalent to

$$2\,\|Tx - Ty\|^2 \leq \|Tx - y\|^2 + \|x - Ty\|^2. \tag{6}$$

Inspired by the above, the following condition is introduced:

Definition[[3]] Let T be a mapping on a subset C of a Banach space E and let η be a continuous, strictly increasing function from $[0, \infty)$ into itself with $\eta(0) = 0$. Then T is call a *Chatterjea mapping* with η if

$$2\,\eta\big(\|Tx - Ty\|\big) \leq \eta\big(\|Tx - y\|\big) + \eta\big(\|x - Ty\|\big) \tag{7}$$

for all $x, y \in C$.

We will talk about fixed point theorems for Chatterjea mappings.

References

[1] S. K. Chatterjea, *Fixed-point theorems*, C. R. Acad. Bulgare Sci., 25 (1972), 727–730. MR 0324493

[2] F. Kohsaka and W. Takahashi, *Fixed point theorems for a class of nonlinear mappings related to maximal monotone operators in Banach spaces*, Arch. Math. (Basel), 91 (2008), 166–177. MR2430800

[3] T. Suzuki, *Fixed point theorems for a new nonlinear mapping similar to a nonspreading mapping*, submitted.

Generalization of Knežević-Miljanović's Theorem to a Class of Fractional Differential Equations

Masashi Toyoda

Tamagawa University, Japan

Abstract

In [2], Knežević-Miljanović considered the Cauchy problem

$$\begin{cases} u''(t) = P(t)t^a u(t)^\sigma, \ t \in (0,1], \\ \lim_{t\to 0+} u(t) = 0, \ u'(0) = \lambda, \end{cases} \tag{8}$$

where P is continuous, $a, \sigma, \lambda \in \mathbf{R}$ with $\sigma < 0$ and $\lambda > 0$. She proves that if P satisfies some condition, then the problem (8) has a solution. In this talk, we consider a generalization of Knežević-Miljanović's theorem to a class of fractional differential equations. This is a joint work of Professor Toshiharu Kawasaki.

References

[1] T. Kawasaki and M. Toyoda, *Existence of positive solution for the Cauchy problem for an ordinary differential equation*, Nonlinear Mathematics for Uncertainly and its Applications, Advances in Intelligent and Soft Computing, 100, Springer-Verlag, Berlin and New York, 2011, 435–441.

[2] J. Knežević-Miljanović, *On the Cauchy problem for an Emden-Fowler equation*, Differential Equations, 45(2009), 267–270.

Convergence of σ-Fields, Convex Sets and Operator Algebras

Makoto Tsukada

Toho University, Japan

Abstract

In 1984 (cf.[1]), I proved the convergence of metric projections by means of the Moscow limit of closed convex sets. It was inspired by martingale convergence theorems in probability theory and I perceived it when I was trying to generalize it for noncommutative probability theory.

References

[1] M. Tsukada, Convergence of best approximations in a smooth Banach space, J. Approximation Theory, Vol.40, No.4 (1984), pp.301-309.

Demi-closedness and Some Projection Methods

Yukio Takeuchi
Takahashi Institute for Nonlinear Analysis, Japan

Abstract

Let C be a closed convex subset of a Hilbert space H, A be a mapping of C into H. It is known as the variational inequality problem to find $x \in VI(C, A)$, where

$$VI(C, A) = \{x \in C : \langle y - x, Ax \rangle \geq 0, \quad \text{for all } y \in C\}.$$

For each $a > 0$, let V_a and U_a be self-mapping on C defined by

$$V_a x = P_C(I - aA)x, \; U_a x = P_C(I - aAV_a)x, \quad \text{for} \quad x \in C,$$

where P_C is the metric projection of H onto C, I is the identity mapping on C.

Let S be a nonexpansive self-mapping on C and assume $F(S) \cap VI(C, A) \neq \emptyset$.

(1) Let A be an α-inverse-strongly-monotone mapping of C into H. Let $\{\alpha_n\} \subset [a, b] \subset (0, 2\alpha)$ and let $\{x_n\}$, $\{y_n\}$ be sequences defined by $x_1 \in C$,

$$y_n = V_{a_n} x_n, \quad x_{n+1} = \alpha_n S V_{a_n} x_n + (1 - \alpha_n)x_n, \quad \text{for } n \in N.$$

(2) Let A be a monotone and k-Lipschitz continuous mapping of C into H. Let $\{a_n\} \subset [a, b] \subset (0, 1/k)$ and let $\{x_n\}$, $\{y_n\}$ and $\{z_n\}$ be sequences defined by $x_1 \in C$ and

$$y_n = V_{a_n} x_n, \quad z_n = U_{a_n} x_n, \quad x_{n+1} = \alpha_n S U_{a_n} x_n + (1 - \alpha_n)x_n, \quad \text{for } n \in N.$$

In this talk, we deal with the followings:

(a) Demi-closedness for some mappings.

(b) Properties of projection methods for some variational inequality problems.

(c) Extensions of (1) and (2).

Unification Result of Fan-Takahashi and Ricceri Theorems

Yutaka Saito, Tamaki Tanaka*, Syuuji Yamada
Niigata University, Japan

Abstract

In Functional Analysis, Nonlinear Analysis, Convex Analysis as well as Optimization, there are many inequality theorems related to minimality or maximality have been studied. Fan-Takahashi inequality theorem (see [1] in 1972 and [2] in 1976) is one of important theorems in the areas above with many applications to other mathematical areas. Then, in [3], Ricceri proposed a reasonable substitute of assumptions for Fan-Takahashi inequality on a real-valued function, that is, he showed the same conclusion on the inequality under deferent assumption which contains a certain mutually exclusive condition to the assumption of Fan-Takahashi theorem in [2].

The aim of this paper is to observe the two theorems above and to obtain a unified theorem to cover them, that is, each of the classical ones is a corollary of the theorem. Through this study, we would like to propose any possibility of other types of results on Fan-Takahashi inequality.

References

[1] K. Fan, *A minimax inequality and its applications*, Inequalities III (Proc. Third Sympos., Univ. California, Los Angeles, Calif., 1969; dedicated to the memory of Theodore S. Motzkin), O. Shisha (ed.), Academic Press, New York, 1972, 103–113.

[2] W. Takahashi, *Nonlinear Variational Inequalities and Fixed Point Theorems*, J. Math. Soc. Japan, 28, 1976, 168–181.

[3] B. Ricceri, *Existence Theorems for Nonlinear Problems*, Rend. Accad. Naz. Sci. XL Mem. Mat. (5), 11, 1987, 77–99.

Hölder Continuity of the Solution Maps to Parametric Generalized Vector Quasiequilibrium Problems

Rabian Wangkeeree*, Rattanaporn Wangkeeree, Pakkapon Preechasilp
Naresuan University, Thailand

Abstract

In this talk, by using a nonlinear scalarization technique, we obtain sufficient conditions for Hölder continuity of the solution mapping for a parametric generalized multivalued vector quasiequilibrium problem. Applications in quasivariational inequalities, vector quasioptimization and traffic network problems are provided as examples for others in various optimization-related problems.

An Iterative Shrinkage Metric f-Projection Method for Finding a Common Fixed Point of two Quasi Strict f-Pseudo-contractions and Applications in Hilbert Spaces

Kasamsuk Ungchittrakool, Somyot Plubtieng, and Duangkamon Kumtaeng
Naresuan University, Thailand

Abstract

In this paper, we establish the significant inequality related to quasi strict f-pseudo contractions in the framework of Hilbert spaces. By using the ideas of metric f-projection, we propose an iterative shrinking metric f-projection method for finding a common fixed point of two quasi strict f-pseudo contractions. Moreover, we also provide some applications of the main theorem as well as other related results.

Lyapunov Type Inequalities for $2M$-th Order Equations under Various Boundary Conditions

Kohtaro Watanabe
Hashirimizu Yokosuka, Japan

Abstract

In this talk, we generalizes the well known Lyapunov-type inequalities for second-order linear differential equations to certain $2M$-th order linear differential equations:

$$(-1)^M u^{(2M)}(x) - r(x)u(x) = 0, \quad (-s \leq x \leq s)$$

under various boundary conditions. The usage of the best constant of some kind of a Sobolev inequality makes clarify the process for obtaining the result.

Approximate Solutions for Continuous-Time Quadratic Fractional Programming Problems

Ching-Feng Wen
Kaohsiung Medical University, Taiwan

Abstract

In this talk we pay our attention to an important application of infinite-dimensional nonlinear programming: the quadratic fractional optimal control problem with linear state constraints. Such problems are called the *continuous-time quadratic programming problems* (CQFP). Let $L^\infty([0,T],\mathbb{R}^p)$ be the space of all essentially bounded measurable functions from

$[0,T]$ into $\mathbb{R}^p$, where $[0,T]$ is a time space and $T>0$ is fixed. Let $C([0,T],\mathbb{R}^p)$ be the space of all continuous functions from $[0,T]$ into $\mathbb{R}^p$. The formulation of (CQFP) is defined as follows:

$$\begin{aligned} \text{(CQFP)} \quad \text{maximize} \quad & \frac{\mu+\int_0^T \left\{1/2\,\mathbf{x}(t)^\top D(t)\,\mathbf{x}(t)+\mathbf{f}(t)^\top \mathbf{x}(t)\right\} dt}{\xi+\int_0^T \left\{1/2\,\mathbf{x}(t)^\top E(t)\,\mathbf{x}(t)+\mathbf{h}(t)^\top \mathbf{x}(t)\right\} dt} \\ \text{subject to} \quad & B\mathbf{x}(t)\le \mathbf{g}(t)+\int_0^t K\mathbf{x}(s)ds \text{ for all } t\in[0,T] \\ & \mathbf{x}(t)\in L^\infty([0,T],\mathbb{R}^q_+), \end{aligned}$$

where

- $\mathbf{x}(t)$ is the decision variable, $T>0$ is a given time horizon, and the superscript "$^\top$" denotes the transpose operation of matrices.
- B and K are $p\times q$ matrices, $\mathbf{g}\in C([0,T],\mathbb{R}^p_+)$ and $\mathbb{R}^p_+=\{(x_1,\cdots,x_p)^\top : x_i\ge 0 \text{ for } i=1,\cdots,p\}$.
- $D(t)=[\,d_{ij}(t)\,]_{q\times q}$ is a symmetric negative semi-definite matrix with $d_{ij}(t)\in C([0,T],\mathbb{R})$, $\mathbf{f}\in C([0,T],\mathbb{R}^q)$ and $\mu\in\mathbb{R}_+$; $E(t)=[\,e_{ij}(t)\,]_{q\times q}$ is a symmetric positive semi-definite matrix with $e_{ij}(t)\in C([0,T],\mathbb{R})$, $\mathbf{h}\in C([0,T],\mathbb{R}^q_+)$ and $\xi>0$.

A hybrid of the parametric method and discretization approach is proposed for (CQFP). This approach leads to an approximation algorithm that solves the problem (CQFP) to any required accuracy. The analysis also shows that we can predetermine the size of discretization such that the accuracy of the corresponding approximate solution can be controlled within the predefined error tolerance. Hence, the trade-off between the quality of the results and the simplification of the problem can be controlled by the decision maker. Moreover, we prove the convergence of the searched sequence of approximate solutions to the problem (CQFP).

Approximating Common Solution of Variational Inequalities and Fixed Point Problems for Nonlinear Operators with Applications

Uamporn Witthayarat and Poom Kumam

King Mongkut's University of Technology, Thailand

Abstract

In this talk, we will propose the study on iterative algorithms involving fixed point problems together with equilibrium problems and variational inequalities which play the most important role to solve many practical problems in sciences and other applied sciences. Furthermore, we also present its convergence theorems and applications in the last part. Our results improve and extend the results of many others in the literature.

Non-Hermitian Extension of Uncertainty Relation

Kenjiro Yanagi

Yamaguchi University, Japan

Abstract

In quantum mechanics a physical state is represented by density operator ρ and an observable is represented by hermitian operator H. Then the expectation $E_\rho(H)$ is given by $Tr[\rho H]$ and the variance $V_\rho(H)$ is given by $Tr[\rho H^2]-(Tr[\rho H])^2$. The uncertainty relation is obtained by Heisenberg as follows:

$$V_\rho(A)\cdot V_\rho(B)\ge \frac{1}{4}|Tr[\rho[A,B]]|^2$$

for self-adjoint operators A,B and density operator ρ, where $[A,B]=AB-BA$. The refined uncertainty relation is obtained by Schrödinger as follows:

$$V_\rho(A)\cdot V_\rho(B)-|\mathrm{Re}\{Cov_\rho(A,B)\}|^2\ge \frac{1}{4}|Tr[\rho[A,B]]|^2$$

for self-adjoint operators A, B abd density operator ρ, where $Cov_\rho(A,B) = Tr[\rho A_0 B_0]$. Here $A_0 = A - Tr[\rho A]I$ and $B_0 = B - Tr[\rho B]I$.
In this talk we don't assume that an observable is hermitian. Then we study corresponding uncertainty relation for non-hermitian observable. Also we show that it is adequate to give the corresponding variance as follow:

$$|V_\rho|(H) = \frac{1}{2}Tr[\rho H_0 H_0^*] + \frac{1}{2}Tr[\rho H_0^* H_0].,$$

where $H_0 = H - Tr[\rho H]I$.

General System of Split Monotonic Variational Inclusion Problem with Applications

Zenn-Tsun Yu[1] and Lai-Jiu Lin[2]

[1]Nan Kai University of Technology, Taiwan and [2]National Changhua University of Education, Taiwan

Abstract

In this paper, we apply the convergence theorem of the multiply sets split feasibility problem to study the convergence theorems of the following problems: The split feasibility problem; the general system of split monotonic variational inclusion problem; the general system of split equilibrium problem; the system of split equilibrium problem; the split multiply equilibrium problem; the split equilibrium problem; the general system of split variational inequality problem; the system of split variational inequality problem; the split variational inequality problem; the mathematical programming with fixed point, zero points and split systems of variational constraints and the quadratic programming with fixed point, zero points and split systems of variational inequalities constraints. We establish iteration processes and prove strong convergence theorems of these problems.

Hierarchical Problems and Mathematical Programming with Split Monotone Variational Inclusion Constraints

Zenn-Tsun Yu[1] and Lai-Jiu Lin[2]

[1]Nan Kai University of Technology, Taiwan and [2]National Changhua University of Education, Taiwan

Abstract

In this paper, we first establish strong convergence theorems for hierarchical problems, equivalent relation between split monotone variational inclusions and fixed point problem. As applications of our results, we study the solution of the semi-multiple split monotone variational inclusion problems, mathematical programming with fixed point and split monotone variational inclusions constraints, mathematical programming with fixed point and split variational inequalities constraints, mathematical programming with semimultiple split variational inequalities constraints, mathematical programming with multiple split equilibrium variational inequality constraints, mathematical programming with multiple split equilibrium constraints, quadratic programming with fixed point and split monotone variational inclusion constraints, minimum norm solution of fixed point and split monotone variational inclusion problem. Our results improve recent results of this tuples of problem and will have many applications in optimization theory , mathematics and many fields of science.

G-Risk: A New Methodology for Measuring Risk

George Xianzhi Yuan
Tongji University, China

Abstract

In this talk, based on the concept of G-Risk concept from the nonlinear expectation theory, combining with the case study for the gold markets, we will show how to use G-risk concept to develop a new methodology in measuring Risk in financial markets. This new methodology will not only overcome the shortage of the traditional Value at Risk (VaR) such as the coherence, sub-additional properties, but also show how the G-risk method allows for adaptivity due to the sensitivity of financial markets in the practice.

Convergence Analysis of the Jacobi Pseudo-Spectral Method for the Second Order Volterra Integro-Differential Equations

Xiao-yong Zhang
Shanghai Maritime University, China

Abstract

The Jacobi pseudo-spectral Galerkin method for the second order Volterra integro-differential equations of the second kind is proposed in this paper. We provide a rigorous error analysis for the proposed method, which indicates that the numerical errors (in the $L^2_{\omega_{\alpha,\beta}}$-norm and the L^∞-norm) will decay exponentially provided that the source function is sufficiently smooth. Numerical examples are given to illustrate the theoretical results.

Piecewise Linear Vector Optimization Problems in Banach Spaces

Xi Yin Zheng[1] and Kun-Fu Ng[2]
[1]Yunnan University, China and [2]Chinese University of Hong Kong, Hong Kong

Abstract

In general Banach spaces, we consider a vector optimization problem (PLVOP) in which the objective is a mapping whose graph is the union of finitely many polyhedra. We provide the structure of the weak Pareto solution set, Pareto solution set, weak Pareto optimal value set and Pareto optimal value set of (PLVOP). We also study the weak sharp minima for (PLVOP).

Contributed Session

Fixed Point Results in Modular Spaces

Afrah A.N. Abdou and Mohamed A. Khamsi

Abstract

The notion of a modular metric on an arbitrary set and the corresponding modular spaces, generalizing classical modulars over linear spaces like Orlicz spaces, were recently introduced. In this paper we investigate the existence of fixed points of modular contractive mappings in modular metric spaces. These are related to the successive approximations of fixed points (via orbits) which converge to the fixed points in the modular sense, which is weaker than the metric convergence.

Generalized f-Vector Equilibrium Problem

Mohammad Akram
Aligarh Muslim University, India

Abstract

In this paper, we consider a generalized f-vector equilibrium problem and prove some existence results in the setting of Hausdorff topological vector spaces and reflexive Banach spaces. Our results extend and improve some known results in the literature. Some examples are given.

On a Fixed Point Theorem in G-mudular Metric Spaces in the Sense of Ciric

Clement Boateng Ampadu
Boston, U.S.A.

Abstract

Let X be a non-empty set, and $G_{[0,\infty]} : X \times X \times X \to [0, \infty)$ be a mapping. In this talk we introduce a notion of G-Modular metric spaces in the sense of Chistaykov [Modular metric spaces I: basic concepts, Nonlinear Analysis, vol. 74, pp. 1-14, 2010], and use it to prove a fixed point theorem for quasi contractive mappings in the sense of Ciric.

Common Fixed Point Theorems in Fuzzy Metric Spaces Satisfying E.A Property

Vishal Gupta[1], Naveen Mani[1] and Naveen Gulati[2]
[1]Maharishi Markandeshwar University, India, and [2] S.D.(P.G.) college, India

Abstract

Fixed point theory is very important in mathematics and has wide no of applications in various branches of applied sciences, Engineering many others. Several authors established fixed point theorems for various mappings in different metric and Fuzzy metric spaces. In this paper, we prove some common fixed point theorems for four self maps satisfying generalized contractive condition. Some applications are given in the support of our result.

Exponential Attractor for Non-autonomous Strongly Damped Wave Equations

Hongyan Li
Shanghai University of Engineering Science, China

Abstract

In this paper we study the existence of an exponential attractor for strongly damped wave equations with a time-dependent driving force. To this end, the uniform Holder continuity is established to the variation of the process in the phase apace. In a certain parameter region, the exponential attractor is a uniformly exponentially attracting time-dependent set in the phase apace, and is finite-dimensional no matter how complex the dependence of the external forces on time is. On this basis, we also obtained the existence of the infinite-dimensional uniform exponential attractor for the system.

Common Fixed Point Results in Uniformly Convex Metric Spaces

Narawadee Nanan
Chiang Mai University, Thailand

Abstract

We obtain some common fixed point results in uniformly convex metric spaces. Our results improve and extend some results of Laowang and Panyanak [W. Laowang and B. Panyanak, A note on common fixed point results in uniformly convex hyperbolic spaces, J. Math. 2013(2013), Article ID 503731, 5 pp] and Itoh and W. Takahashi [S. Itoh and W. Takahashi, The common fixed point theory of singlevalued mappings and multivalued mappings, Pacific J. Math. 79(1978), 493-508].

Remark on Coincidence and Common Fixed Point for Noncompact Maps

Anita Tomar
Government Degree College Dakpathar, India

Abstract

Jungck introduced compatibility for a pair of maps in fixed point consideration. Thereafter number of weaker forms of this notion has been obtained. Coincidence and common fixed point for noncompatible maps is proved in this paper and it is pointed out that weak compatibility still remain the minimum condition for the existence of common fixed point of contractive type maps.

On Certain Convergence of Hybrid Pair of Mappings in CAT(0) Spaces

Izhar Uddin and Mohammad Imdad
Aligarh Muslim University, India

Abstract

In 2010 Sokhuma and Kaewkhao [Fixed Point Theory Appl. 2010, Art. ID 618767, 9 pp.] introduced a modied Ishikawa iteration scheme for a pair of single valued and multivalued nonexpansive mappings in Banach spaces and proved some convergence theorems. In this paper, we study about the convergence of modied Ishikawa iteration process for a pair of single valued and multivalued generalized nonexpansive mappings in CAT(0) spaces which enable us to enlarge the class of mappings as well class of spaces. In this process, we generalize some result of Sokhuma and Kaewkhao [Fixed Point Theory Appl. 2010, Art. ID 618767, 9 pp.], Akkasriworn et al. [Int. Journal of Math. Analysis, Vol. 6, 2012, no. 19, 923-932] and Izhar Uddin et al. [to be appear in Bull. Malays. Math. Sci. Soc.].

The Effectiveness of Detrended Fluctuation Analysis Method on Two Kinds of Fractal Sequences

Danying Xie, Li Wan, and Yongqiang Zhu
Guangzhou University, China

Abstract

Used of the fractional Brownian motion and fractional Gaussian noise sequence, the Detrended Fluctuation Analysis(DFA) applied to estimate the Hurst exponent to verify the stability and dependability of the method by changing the data length and regression trend order. The result shows that the Hurst exponent estimate is stable and efficient with the length of data for fractional Brownian motion and fractional Gaussian noise sequence. The influence to the Hurst exponent is not obvious when the regression trend order is changed, and the estimate accuracy is improved with the increasing of Hurst exponent value.

The Supporting Hyperplane and an Alternative to Solutions of Variational Inequalities

Hong-Kun Xu[1] and Huu Quang Nguyen[1,2,*]
[1]National Sun Yat-sen University, Taiwan and [1,2,*]Vinh University, Vietnam

Abstract

A theorem of supporting hyperplanes for a class of convex level sets in a Hilbert space is obtained. As an application of this result, we prove an alternative theorem on solutions of variational inequalities defined on convex level sets. Two examples are given to demonstrate the usefulness and advantages of our alternative theorem.

Quasi-Slater and Farkas-Minkowski Qualifications for Semi-infinite Programming with Applications

Xiaopeng Zhao
Zhejiang University, China

Abstract

The well-known Farkas-Minkowski (FM) type qualification plays an important role in linear semi-infinite programming, and has been extensively developed by many authors in establishing optimality conditions, duality and stability for semi-infinite programming. In this paper, we introduce the concept of quasi Slater condition for semi-infinite convex inequality system and present that the Slater type conditions imply the FM qualification under some appropriate continuity assumption of the set-valued mapping $i \mapsto f_i(x)$. Applying these relationships, we establish dual characterizations, both asymptotic and nonasymptotic, for set containment problems and provide some sufficient conditions for ensuring the strong Lagrangian duality and Farkas lemma.