1. FOREWORD

On behalf of the Organizing Committee, we are very pleased to welcome you to the International Conference of Mathematical Sciences, ICMS, Istanbul, 2009 to be held in Istanbul (Turkey) from 4th to 10th August, 2009.

We hope that, ICMS 2009 will be one of the most beneficial scientific events, bringing together mathematicians from all over the world, and demonstrating the vital role that mathematics play in any field of science.

Welcome to our conference, Maltepe University, Istanbul!

Kemal Köymen
Chairman of the Organizing Committee

Hüseyin Çakallı
Vice-Chairman of the Organizing Committee
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3. SESSIONS

The lectures in the following parallel sessions are to be held before and after keynote speakers lectures:

1. **Qualitative Theory of Differential Equations**, (Oscillation, Boundedness and Stability), Aydın Tiryaki (żmir University, Turkey) and Mehmet Unal, (Bahçeşehir University, Turkey)

2. **Algebra**, Bedriye Melek Zeren and Temha Erkoç, (İstanbul University, Turkey)

3. **Geometry**, Bayram Şahin, (İnönü University, Turkey)

4. **Industrial Mathematics & Statistics**, Yuhlong Lio, (University of South Dakota, USA)

5. **Design Theory**, Hadi Kharaghani, (University of Lethbridge, Canada)

6. **Numerical Functional Analysis**, Allaberen Ashyraliev, (Fatih University, Turkey)

7. **Summability**, Ekrem Savaş, (İstanbul Commerce University, Turkey)

8. **The Metallic Means Family**, Vera W. de Spinadel, (University of Buenos Aires, Argentina)

9. **Optimization, Control and Neural Networks**, Alaeddin Malek, (Tarbiat Modares University, Iran)

10. **Scientific Computing and Numerical Analysis**, Sayed Hodjatollah Momeni-Masuleh, (Tarbiat Modares University, Iran)

11. **Fixed Point Theory**, Duran Türkoğlu, (Gazi University, Turkey)

12. **Topology and Abstract Analysis**, Jiling Cao, (Auckland University of Technology, New Zealand)


14. **Mathematics Education and Popularization of Mathematics**, Ahmet Şuikrœ Özdemir, (Marmara University, Turkey)

15. **Other** (none of the above but related to Mathematics), Hüseyin Çakalh, (Maltepe University, Turkey) and Ayşœ Sönmez, (İstanbul University, Turkey)
4. ACKNOWLEDGMENTS

We thank firstly William Ruckle and then all the other scientific committee members who gave suggestion on making the conference better.

We also thank Belma T. Akşit who voluntarily agreed to be involved in the conference as a local logistic organizer two weeks before the first day of the conference and spent a lot of time to keep the conference alive.

There are many people who spent a lot of time and effort to make this conference possible. We would like to thank especially to the following young colleagues who had contributed to the success of this conference in various ways:

Özkan Değer, İstanbul University, Turkey
Ayşe Sönmez, İstanbul University, Turkey
İbrahim Çanak, Adnan Menderes University, Turkey.

To speak honestly, without Özkan Değer this abstract book would have been only a dream.
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8. ABOUT MALTEPE UNIVERSITY, İSTANBUL AND TURKEY
6. KEYNOTES

The abstracts of the keynote lectures are given in the following.
Optimization with Recurrent Neural Networks: 
Recent Advances and New Perspectives

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Abstract

This talk will provide a condensed presentation of the main features of recurrent neural network models and general optimization problems. It will focus on advances that have been made by our team over recent years. First of all, it will address the linear, quadratic and nonlinear programming, monotone variational inequalities and complementarity problems. Analysis of related network dynamics based on the methodology of artificial neural network models will be proposed. After this, variant recurrent neural network models for corresponding optimization problems will be discussed and new algorithms will be presented that maintain full accuracy and efficiency. The theoretical and numerical approaches are investigated. As a direct result of this work we have founded some efficient hybrid neural network models that produce significantly better results than the previous algorithms. The talk will conclude by discussing some of the real life applications facing this research area.

References


2000 Mathematics Subject Classification. 49J20, 35E99, 47F05
Key words and phrases. Optimal control
Compact and Fredholm Operators on Some Matrix Domains of Triangles

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Abstract

We present some general results for the determination of the $\beta$-duals of triangles in $FK$ spaces and the characterisation of some classes of matrix transformations on them. Furthermore, we give a short introduction to the Hausdorff measure of noncompactness which we apply to establish necessary and sufficient conditions for compact linear operators between the matrix domains of triangles in the sets of convergent and null sequences. Finally, we give a sufficient condition for a bounded linear operator from the matrix domain of a triangle in the space of null sequences into itself to be a Fredholm operator.

2000 Mathematics Subject Classification. 46A45, 40H05

Key words and phrases. Sequence spaces, matrix transformations, Hausdorff measure of noncompactness, compact and Fredholm operators
Simulating Probability with $R$

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Abstract

We outline the role of the open-source statistical programming environment $R$ in teaching probability. Taking advantage of its powerful graphical and simulation facilities, we show how the mathematical approach can be augmented by one of experimentation. $R$ is used not only for calculation and data analysis but also to illustrate statistical concepts, to simulate distributions, and to explore by experimentation different scenarios in decision making.

References


2000 Mathematics Subject Classification.

Key words and phrases.
Uncertainty Qualification in Simulations

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Abstract

Uncertainty in simulations is due to the stochastic nature of geometric and physical parameters, the indeterminate nature of initial/boundary conditions, and the inadequacy of physical models coupled with discretization errors. These uncertainties can be classified into two types: parametric (aleatory) and model form (epistemic). Whereas probability theory can deal with parametric uncertainty, some generalization of probability theory is required to deal with the model form of uncertainty. Among the generalizations of probability theory, evidence theory is relatively well-developed. The presentation will briefly discuss some techniques based on these theories to quantify uncertainty in the context of some representative problems.
Where algebra and topology meet: a cautionary tale

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Abstract

In a sense the Kuratowski conditions reduce topology to algebra. In another sense a simple property of Banach algebras ushers in a curious topology for rings.

References

7. ABSTRACTS

The abstracts are ordered by the name of the first author.

This is not a proceedings, the abstracts in this book have been printed as submitted by the authors and the authors are responsible for the correctness of their abstracts and defending their works during their presentations at the conference.

Papers presented at the mathematical sessions of the conference can be published in the İstanbul Üniversitesi Fen Fakültesi Matematik Dergisi (University of Istanbul, Faculty of Science, Journal of Mathematics) upon a request of author/ or coauthor after reviewing process.

Some of chosen full papers presented at the mathematical sessions of the conference which can make a volume of a book which is both coherent and self-sufficient may be published by Cambridge Scholars Publishing after reviewing process.
Silver Block Intersection Graphs

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Abstract

Any maximum independent set of a graph is called a diagonal of that graph. Let \( c \) be a proper \((r + 1)\)-coloring of an \( r \)-regular graph \( G \). A vertex \( x \) in \( G \) is said to be rainbow with respect to \( c \) if every color appears in the closed neighborhood \( N[x] = N(x) \cup \{ x \} \). Given a diagonal \( I \) of \( G \), the coloring \( c \) is said to be silver with respect to \( I \) if every \( x \in I \) is rainbow with respect to \( c \). We say \( G \) is silver if it admits a silver coloring with respect to some \( I \). In [1] the following problem is asked: Find classes of silver \( r \)-regular graphs \( G \).

Here we study the class of block intersection graphs of Steiner triple systems, \( \text{STS}(v) \). Given a design \( D \), a series of block intersection graphs \( G_i \), or \( i \)-BIG, \( i = 0, \ldots, k \), can be defined in which the vertices are the blocks of \( D \), with two vertices adjacent if and only if the corresponding blocks intersect in exactly \( i \) points. Let \( D \) be an \( \text{STS}(v) \), \( G_2 \) and \( G_3 \) are empty graphs, so we consider only \( G_0 \) and \( G_1 \). \( G_0 \) is a strongly regular graph \( \text{SRG}(b, b - 3r + 2, b - 6r + 13, b - 5r + 8) \), and \( G_1 \) is an \( \text{SRG}(b, 3(r - 1), r + 2, 9) \). The aim of this talk is to characterize \( G_0 \), and \( G_1 \) for being silver.

We show that:

- For \( v = 7 \) and 9, \( G_0 \) and \( G_1 \) both are silver.
- For any \( \text{STS}(13) \) or \( \text{STS}(15) \) non of \( G_0 \) or \( G_1 \) are silver.
- Let \( D \) be an affine plane of order \( n \). Then both 0-BIG(\( D \)) and 1-BIG(\( D \)) are silver.
- For each \( w \), where \( 9 \nmid w \), we construct a Steiner triple system \( D = \text{STS}(w) \) for which, the 1-BIG(\( D \)) is silver.
- For any \( v > 9 \), 0-BIG(\( \text{STS}(v) \)) is not silver.
- If \( 9 \nmid v \) and an \( \text{STS}(v) \) which has \( \frac{v}{3} \) parallel class, then \( G_1 = 1\text{-BIG}(\text{STS}(v)) \) is not silver.
- If \( 9 \nmid (v - 1) \) and an \( \text{STS}(v) \) which contains \( \frac{v - 1}{3} \) parallel class, then \( G_1 = 1\text{-BIG}(\text{STS}(v)) \) is not silver.

References

Spectral properties of difference operator over the space $bv_p \ (1 \leq p < \infty)$

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Abstract
In this work our purpose is to find the continuous dual $bv^*_p$ of the sequence space $bv_p\ (1 \leq p < \infty)$ consisting of all sequences $(x_k)$ such that $(x_k - x_{k-1})$ in the sequence space $l_p$, to find the norm of the difference operator $\Delta$ acting on the space $bv_p$, and fine spectrum with respect to the Goldberg’s classification of the operator $\Delta$ over the space $bv_p$.

1. The space $bv_p$ has been introduced by Başar and Altay [1], where they have proved that $bv_p$ is a BK-space, and also have studied the $\alpha$, $\beta$- and $\gamma$-duals of the space $bv_p$.

Define the spaces $d_1$ and $d_q$ consisting of all sequences $a = (a_k)$ normed by

$$\|a\|_{d_1} = \sup_{k,n \in \mathbb{N}} \left| \sum_{j=k}^{n} a_j \right| < \infty$$

and

$$\|a\|_{d_q} = \left( \sum_{k} \left( \sum_{j=k}^{\infty} a_j \right)^q \right)^{1/q} < \infty, \quad (1 < q < \infty).$$

Lemma ([2], Theorem 2.3) $bv^*_1$ and $bv^*_p$ are isometrically isomorphic to $d_1$ and $d_q$ ($\frac{1}{p} + \frac{1}{q} = 1$), respectively.

2. In this part the norm of the difference operator $\Delta$ with respect to the space $bv_p$ has been found and the fine spectrum of the operator $\Delta$ has been examined.

Lemma ([2], Theorem 3.2) $\|\Delta\| = 2$.

Using Lemma 1 and Lemma 2 we have the next main theorem concerning to the spectrum $\sigma(\Delta)$ and its disjoint partitions.

Theorem
1. $\sigma(\Delta) = \{ \lambda \in \mathbb{C} : |\lambda - 1| \leq 1 \};$
2. the point spectrum $\sigma_p(\Delta) = \emptyset;$
3. the continuous spectrum $\sigma_c(\Delta) = \{ \lambda \in \mathbb{C} : |\lambda - 1| = 1 \};$
4. the residual spectrum $\sigma_r(\Delta) = \{ \lambda \in \mathbb{C} : |\lambda - 1| < 1 \}.$

References

Fixed point theory for inward set-valued maps in hyperconvex metric spaces

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Abstract

Let $X$ be a compact, admissible subset of a hyperconvex metric space $M$. Suppose that $F : X \rightarrow M$ is a quasi-lower semicontinuous set-valued map with admissible values and $G : X \rightarrow X$ is a continuous, onto and quasi convex set-valued map with compact, admissible values. In addition, assume that $F$ is weakly inward with respect to $G$. Then, there exists an $x_0 \in X$, such that

$$d(G(x_0), F(x_0)) = \inf_{x \in X} d(x, F(x_0)).$$

As applications, we give some coincidence and fixed point results for weakly inward set-valued maps. Our results, generalize some well-known results in literature.

2000 Mathematics Subject Classification. 47H10, 54H25

Key words and phrases. Fixed point, best approximation, coincidence point, hyperconvex metric space
Generalized Logistic Distribution: Bayesian Estimations

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Abstract

In this paper, we consider a Bayesian approach to estimate the generalized logistic parameters. The maximum likelihood (ML) and the Bayes estimates are derived for the two unknown parameters and some survival time parameters. The Bayes estimates are derived with respect to conjugate prior for the shape parameter and, discrete prior for the scale parameter of this model. Monte Carlo simulations are presented to compare the Bayes estimates and the ML estimates of the unknown parameters and the reliability function.
About Continued Fractions Expansions of Metallic Means

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Abstract

The Metallic Mean $\sigma_{p,q}$ is the positive solution of the quadratic equation $x^2 - px - q = 0$, where $p$ and $q$ are some positive integer numbers. This family of irrational numbers was introduced by V. W. de Spinadel (1997). All of its members share common mathematical properties providing algebraic and geometric generalizations of the Golden Mean, $\phi = \frac{(1 + \sqrt{5})}{2}$ and the Silver Mean, $\theta = 1 + \sqrt{2}$. Really, both aforementioned constants are $\sigma_{1,1}$ and $\sigma_{2,1}$, the two most important of the Metallic Means.

It is well known that the simple continued fraction expansion of the Metallic Means $\sigma_{p,1}$ are periodic. We begin obtaining new better generalized periodic expansions for this Metallic subfamily. The odd powers of the Metallic Means have continued fraction expansions in terms of the certain generalized Lucas numbers. Each of this power is also some Metallic Mean. We prove that the even powers of the Metallic Means, are always the solution of a quadratic equation $x^2 - mx + 1 = 0$, where the parameter $m$ is also defined by means of another generalized Lucas numbers, and from this result, directly we achieve the generalized continued fraction expansion of this even powers.

From a simple algebraic study of the solutions of the quadratic equations of the form $x^2 - mx + 1 = 0$, we obtain some relations among them and the continued fractions of the Metallic Means $\sigma_{1,q}$ and $\sigma_{p,1}$. These particular results allow establish new relations between certain general continued fractions. Indeed, we found a recurrence relation which generates the integer powers of $\sigma_{1,q}$, and this relation leads to some curious expansions of $2^n, n = 0, 1, 2, \ldots$

We also obtain several formal expansions of the square root of the Metallic Means $\sigma_{p,1}$ and we study its convergence. Some of them involve the square roots of the complex numbers $m + 2i$ and $m - 2i$. Eventually, since the square roots of the Metallic Means $\sigma_{p,1}$ satisfy the equality $(x^2 + 1)(1 - x^{-1}) = mx/(1 + x)$, we found some fractal fractions for them. These endless fractions provide infinites sequences of rational approximations which converge to the represented square root.

2000 Mathematics Subject Classification. 26C10, 11J70, 11A51, 40A15

Key words and phrases. Generalized continued fractions, fractal fractions, Metallic Means, Golden Mean, Silver Mean.
A Theoretical And Numerical Investigation Of Heteroclinic Connection In Two-Dimensional Incompressible Flow

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Abstract

Streamline patterns and their bifurcations in two-dimensional incompressible fluid near non-simple degenerate critical points are investigated. A normal form transformation is used to simplify the differential equations of a Hamiltonian system that describes the streamlines. Bifurcations in the flow occur when parameters take certain degenerate values. When the degenerate configuration is perturbed slightly, an unfolding of the system is obtained. From this, a complete description of the bifurcations up to codimension two is given. A special flow pattern is found that in flow saddles are connected with a single heteroclinic connection near a non-simple degenerate critical point. The theory is applied to the patterns and bifurcations found numerically in the studies of Stokes flow in a double-lid-driven rectangular cavity.

References


2000 Mathematics Subject Classification. 76D, 37N10

Key words and phrases. Incompressible Viscous Fluids, Dynamical systems in fluid mechanics
Common Fixed point Theorems For Maps Under a Contractive Condition of Integral Type

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Abstract

Two common fixed point theorems for mapping of complete metric space under a general contractive inequality of integral type and satisfying minimal commutativity conditions are proved. These results extend and improve several previous results particularly Theorem 4 of Rhoades [3], Theorem 4 of Sessa [4] and results of [1-2].

References


2000 Mathematics Subject Classification. 47H10

Key words and phrases. weakly compatible maps, common fixed point, contractive condition of integral type.
An Analysis on Fourier Series Expansion

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Abstract

The present paper is involved with the analysis of Fourier coefficients with help of extension of Gauss partial sum for Fourier series. The Fourier series are specific and standard series of periodic functions which are discussed in various areas of applied mathematics. The discussed functions have period Q in which they are piecewise continuously and uniform on said period. By study on extension of the Fourier series sum on periodic functions, we are able to extend Gauss partial sum.

References


2000 Mathematics Subject Classification. 4A58, 11A25, 42A16, 42A20, 42C15

Key words and phrases. Expansion, Fourier coefficients, Gauss Partial Sum, Piecewise Continuously.
Estimation And Prediction Of Weibull Parameters From Common Percentiles With Outliers

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Abstract

In this paper, estimation of Weibull distribution shape and scale parameters is accomplished through use of symmetrically located percentiles from a sample. The process requires algebraic solution of two equations derived from the cumulative distribution function. Bayesian prediction limits for the future observations from two parameters Weibull distribution are obtained in the presence of outliers of type and with random sample size. Numerical examples are used to illustrate the procedure.

References

Optimal Control with Fuzzy Chance Constraints

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Abstract

In this paper, one of the models of optimal control problem with chance constraints is introduced, in which the parameters of constraints are fuzzy, random, or fuzzy random variables. To defuzzify the constraints, we consider possibility levels for them. The chance constraints are converted to crisp (neither fuzzy nor stochastic) constraints by chance-constrained programming approach. The classic optimal control problem with crisp constraints is solved by Pontryagin Minimum Principal and Khun-Tucker conditions. The model is illustrated by two numerical examples.

References

Chaotification Of Discrete Dynamical Systems

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Abstract

Chaos has been extensively studied within the scientific, engineering and mathematical communities as an interesting complex dynamic phenomenon. Recently, the traditional trend of understanding and analyzing chaos has evolved to a new phase of investigation: controlling and creating chaos. More specifically, when chaos is useful, it is generate intentionally. However, when chaos is harmful, it is controlled. Indeed, several studies have showed that chaos can be useful or has great potential in many disciplines such as in high-performance circuit design for telecommunication, collapse prevention of power systems or biomedical engineering applications to the human brain and heart. Therefore, creating chaos becomes a key issue in such applications where chaos is important and useful [1, 2].

In a sequence of papers, the problem of chaotification of discrete systems is addressed [3, 4, 5, 6]. In a recent paper a closed expression was provided for the controller, in terms of the system state vector and a set of specified Lyapunov exponents.

According to the stability theorems, a dynamical system is stable if and only if all its Lyapunov exponents are lower or equal to zero. If at least one is positive, the system becomes completely unstable. For this, practically all methods of chaotification are based on the change of sign of the Lyapunov exponent.

References


2000 Mathematics Subject Classification. 37D45, 65P20

Key words and phrases. Chaotification, discrete system, Lyapunov exponent
Abstract

A set $S$ of vertices in a graph $G$ is a $k$-tuple total dominating set of $G$ if every vertex of $G$ is adjacent to at least $k$ vertices in $S$. The minimum cardinality of a $k$-tuple total dominating set of $G$ is the $k$-tuple total domination number of $G$. For a graph to have a $k$-tuple total dominating set, its minimum degree is at least $k$. When $k = 1$, a $k$-tuple total domination number is the well-studied total domination number. When $k = 2$, a $k$-tuple total dominating set is called a double total dominating set and the $k$-tuple total domination number is called the double total domination number. We determine the $k$-tuple total domination number for complete multipartite graphs. Upper bounds on the $k$-tuple total domination number of general graphs are presented.

References


Fusion Frames and $g$-Frames in Hilbert Spaces and Hilbert $C^*$-Module

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Abstract

Fusion frames and $g$-frames were recently introduced as generalizations of frames. In this note we study their properties in Hilbert spaces and Hilbert $C^*$-modules and we generalize some of the known results in frame theory to fusion frames and $g$-frames. We study the behavior of these generalized frames under small perturbations. We also show that tensor product of fusion frames ($g$-frames) is a fusion frame ($g$-frame) and tensor product of resolution of identity is a resolution of identity in Hilbert spaces and Hilbert $C^*$-modules.

References


2000 Mathematics Subject Classification. 41A58, 42C15, 46L99, 47A05

Key words and phrases. Frame, fusion frame, $g$-frame, Hilbert $C^*$-module, duality, perturbation.
Options and Partial Differential Equations

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Abstract

The aim of this paper is to show how partial differential equations appear in financial models and to present briefly analytical and numerical methods used for effective computations of prices and hedging of options. In his thesis defended in 1900 in the Sorbonne, Louis Bachelier proposed a probabilistic modeling of the time evolution of the price of a share. In terms of what he calls the ‘radiation of probability’, he was able to relate the distribution of probability to the heat equation, which describes the evolution of temperature in a given media. In the first section, the reasoning of Louis Bachelier is used to bring out a relationship between the heat equation and a modeling of the evolution of share prices. In the second section, the equations satisfied by options prices are introduced. In the third section certain class of solutions to the Black, Scholes and Merton Equation are introduced.

\textsuperscript{2000 Mathematics Subject Classification.} 91B26, 91B28

\textit{Key words and phrases.} options, partial differential equations, diffusion, Merton Equation
On Fuzzy p-ideals and fuzzy H-ideals in BCI-algebras

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Abstract

The concept of fuzzy subset and various operations on it were first introduced by Zadeh. Since then, fuzzy subsets have been applied to diverse field. The study of fuzzy subsets and their application to mathematical contexts has reached to what is now commonly called fuzzy mathematics. Fuzzy algebra is an important branch of fuzzy mathematics. The study of fuzzy algebraic structures was started with the introduction of the concept of fuzzy sub-groups in 1971 by Rosenfeld. Since then these ideas have been applied to other algebraic structures such as semigroups, rings, ideals, modules and vector spaces. In 1999, Ougen defined fuzzy subsets in BCCK-algebras and investigated some properties. In 1993, Y.B. Jun applied it in BCI-algebras. We study and give some characterizations of Fuzzy p-ideals and fuzzy H-ideals in BCI-algebras. Several interesting properties of these concepts is studied.

References

Global properties of a class of models for HIV infection of CD4$^+$ T cells and macrophages

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Abstract

In this paper, we study the global properties of a class of human immunodeficiency virus (HIV) models. The basic model is a 5-dimensional nonlinear ODEs that describes the interaction of the HIV with two target cells, CD4$^+$ T cells and macrophages. HIV model with exposed state and model with nonlinear incidence rate are also analyzed. Lyapunov functions are constructed to establish the global asymptotic stability of the uninfected and infected steady states. We have proven that if the basic reproduction number $R_0$ is less than unity, then the uninfected steady state is globally asymptotically stable. If $R_0 > 1$ (or if the infected steady state exists), then the infected steady state is globally asymptotically stable. In a control system framework, we have shown that the HIV model incorporating the effect of Highly Active AntiRetroviral Therapy (HAART) is globally asymptotically controllable to the uninfected steady state.
Application of Model Predictive Control to Dynamic Economic Dispatch with Emission

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Abstract

The emission of gaseous pollutants including $SO_2$, $NO_x$, $CO$ and $CO_2$ from fossil-fueled electric power generating plants affects the human health directly or indirectly. Therefore, the controlling of pollution in power plants has received considerable attention in recent years. The amount of emission can be reduced by formulating dynamic economic emission dispatch (DEED) problem which is a multi-objective optimization problem, where both fuel cost and emission are simultaneously minimized. The emission can also be controller by formulating an emission constrained dynamic economic dispatch (EDED) problem where the fuel cost is minimized while treating the emission as constraints. In \cite{1} a model predictive control (MPC) approach is proposed to the dynamic economic dispatch (DED) problem. It is proven that, the MPC approach provides solutions converging to the optimal solution of an extended version of the DED problem and the MPC algorithm is also robust under certain disturbances and uncertainties. In this paper we applied the MPC approach proposed in \cite{1} to DEED and EDED problems. Two examples are presented consisting of five and ten units, to show the convergence and robustness of the MPC solutions.

References


\begin{flushleft}
\textsuperscript{2000 Mathematics Subject Classification.} 93C95
\textsuperscript{Key words and phrases.} Dynamic economic dispatch, Dynamic economic emission dispatch, Multi-objective optimization, Model predictive control
\end{flushleft}
Color Gamut Computation Using Neural Networks

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Abstract

The ability to exactly reproduce all the colors presented in an original image is the chief purpose in color reproduction. The various display devices have different achievable ranges (gamuts) of colors, it is frequently the case that some colors cannot be made to match the original color exactly. A color gamut is a set of all colors of a given image or device. For an image, the color gamut is the set of all colors that are contained in it. For devices, such as monitors or printers, the color gamut is the set of all colors that any given device can display. Different devices usually have different gamuts, i.e. various classes of devices can display different sets of colors. In questions of displaying an image one usually has to consider that a monitor displays more colors than a printer. Thus in moving an image from a monitor to a printer, we need an intermediate mapping that makes it possible. The color gamut of the source device is mapped onto the color gamut of the target device by the intermediate transformation that is called gamut mapping. In this process, those colors that cannot be represented in the target altered to colors that can be represented. The gamut mapping is, thus, a fundamental one in any transfer of color images from input to output devices. A color can be seen as a point in a three dimensional color space. Thus a gamut is just a finite subset of $\mathbb{R}^3$ and a gamut mapping is a transformation between two subsets of $\mathbb{R}^3$.

We use different color space like RGB, CMYK and Lab to describe colors in an image. The three dimensional surface of the color gamut is called gamut boundary. The gamut boundary information is using for implementing color gamut mappings; therefore, it plays an important role for color gamut mappings.

In this research our focus is on image gamuts of digital images. We discuss the implication of gamut and introduce a mathematical method for describing and visualizing color gamuts. We apply a novel neural network model to solve the associated optimization problem with an image gamut, that described first by Joachin Giesen et al. (2006). The optimal solution of the corresponding constrained optimization problems gives the coefficients of a function that is used for drawing the gamut boundary. Two work examples are demonstrated to show the feasibility and efficiency of this approach. Numerical results are given.

2000 Mathematics Subject Classification. 46N10, 62M45, 90C30

Key words and phrases. Color gamut; Gamut mapping; Optimization problems; Neural networks.
The Unite Subduced Cycle Index Table of Some Molecules

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Abstract

Recently, the full non-rigid (f-NRG) groups of some molecules have been showed via new structures as direct product, semidirect product and wreath product. A subduced representation denoted by $G/\Gamma_i \downarrow G_j$ as a subgroup of the coset representation $G/\Gamma_i$ that contains only the elements associated with the elements of $G_j$. A unit subduced cycle index (USCI) is defined:

$$Z(G/\Gamma_i \downarrow G_j, s_d) = \prod_{g \in \Omega} s_d^{\Gamma_i}(v_g)$$

where $s_d^{\Gamma_i}(v_g) = |G_i|/|\Gamma_i G_ig \cap G_j|$ and $\Omega$ a transversal for the double coset decompositions concerning $G_i$ and $G_j$ for $i, j = 1, 2, \cdots, |\Omega|$. In this paper the USCI tables of some full non-rigid groups like $p$-Xylene, 1,3,5-trimethylbenzene and 1,3,5-triamino-2,4,6-trinitrobenzene are computed.

References


Key words and phrases. Wreath product, Permutation group, Full non-rigid group, USCI table, p-Xylene, hexamethylethane.
Color Reconstructions by the new Fuzzy Logic-based model

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Abstract

Many color vision systems require a first step of classifying pixels in a given image into a discrete set of color classes. Fuzzy sets are defined on the Hue, Saturation and Value components of the HSV color space and provide color descriptors to follow the human intuition of color classification according to Statistical predictions. In this paper we describe pixel color segmentation which are human perception based and useful in reconstruction too. Then, by introducing a statistical model for a psychological experiment in color naming we will estimate our results.

References

On Bayesian estimation for an M/G/1 queue with optional second service

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Abstract

In this article, we exploit the Bayesian inference and prediction for an M/G/1 queueing system with optional second reservice. In this model, a service unit attends customers arriving following a Poisson process and demanding service according to a general distribution and some of customers need to reservice with probability “p” after taking the service. First, we approximate the service and reservice time densities with a class of Erlang mixture distributions. Then, given observations of the system, we propose a Bayesian procedure based on birth-death MCMC method to estimate some performance measures. Finally, we have applied the theories in practice by providing a numerical example based on the data which have been obtained from a hospital.
On Pseudo Implicative BCK Ideals Of Pseudo-BCK Algebras

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Abstract

W.A. Dudek and Y.B. Jun gave a characterization of pseudo-BCK algebras, and provided conditions for a pseudo-BCK algebra to be ∧-semi-lattice ordered (resp. ∩-semilattice ordered). Y.B. Jun, M. Kondo and K.H. Kim, introduced the notion of positive implicative pseudo-ideals in a pseudo-BCK algebra, and then they investigated some of their properties. In this paper the notion of pseudo-BCK ideals of a pseudo-BCK algebra is introduced and some related properties are investigated. We investigate the relations between this pseudo ideals and several pseudo-BCK ideals. We give some characterization theorems of pseudo-BCK ideals in pseudo-BCK algebras.

References


2000 Mathematics Subject Classification. 06F35, 03G25

Key words and phrases. pseudo-BCK algebras, positive implicative pseudo-BCK ideals
Skew Power Series Extensions Of Principally Projective Rings

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Abstract

Let $R$ be a ring and $\alpha$ be an $\alpha$-compatible automorphism of $R$. If $R$ is skew Armendariz, then $R[[x; \alpha]]$ is right principally projective if and only if $R$ is right principally projective and any countable subset of $S_r(R)$ has a generalized countable join.

References

Entropy In IVSs

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Abstract

In this paper the concept of IVS (Indexed Variable System) will be introduced and the entropy of a local topology will be exhibited. Also some properties will be turned out.

References


2000 Mathematics Subject Classification. 74H99

Key words and phrases. indexed Identity relation, IVS, local Topology, topological Entropy.
Block Preconditioned Methods in Solution of Hyperbolic Equations

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Abstract

In this article, we compare suitable preconditioners for solving linear systems arising from the class of fourth-order approximations employed for solving hyperbolic partial differential equations, \( u_{xx}f(x,t,u,u_t) + b = \text{subject to appropriate initial and boundary conditions, where a and b are constants. } \) Numerical results show that the proposed preconditioned methods produces an accurate and oscillation free solution.
Numerical Solution Of The Two Dimensional Nonlinear Volterra Integro-Differential Equations With Separable Kernels By The Differential Transform Method

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Abstract

In this paper, we will develop the two dimensional differential transform method (DTM) for solving a class of the two dimensional linear and nonlinear Volterra integro-differential equations of the second kind. To this end we give some preliminary results of the differential transform and describe the method of this paper. We also give some examples to demonstrate accuracy of the presented method.

References


2000 Mathematics Subject Classification. 65R20

Key words and phrases. Two dimensional Volterra integro-differential equations, Differential transform.
Numerical Solution Of Two Dimensional Linear Volterra Integral Equations Of The Second Kind By The Tau Method With An Error Estimation

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Abstract

In this paper, a general form of numerical approximate solution of two dimensional linear Volterra integral equations of the second kind, which here in later TDLVIE, is discussed. It is formulated for using the operational Tau method with standard base to convert the integral part of given integral equation, to its matrix representation. A brief introduction of developments of the Tau method is given in section 1, existence and uniqueness of solution of TDLVIE is discussed in section 2, converting TDLVIE to a system of linear algebraic equations has been done in section 3 and in section 4 some numerical examples are given to demonstrate efficiency and accuracy of the presented method.

References


2000 Mathematics Subject Classification.

Key words and phrases. Two dimensional linear Volterra integral equations, Operational Tau method.
Stability Of Homotopy Perturbation Technique For An Inverse Diffusion Problem

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Abstract

The present research aims to offer a solution to one-dimensional inverse problem using the Homotopy perturbation method (HPM). In the Problem, the values of function are known in one boundary; however, the partial differential equations may be converted into a system of nonlinear ordinary differential equations by means of finite difference method and discretizing the time variable. Therefore, an approximate solution can be found at discrete times if HPM is applied. It will be demonstrated that such HPM application presents 3 advantages of rapidity, accuracy, and stability.

References


2000 Mathematics Subject Classification. 74G15: 74G10: 74G75: 35R30

Key words and phrases. Homotopy perturbation, Diffusion equation, Approximate solution, Inverse problem
Design and Implementation of a Secure E-learning System for the Wireless Networks

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Abstract
When the World Wide Web was launched in 1991, there was a surge of interest in the possibilities of electronic learning (or e-learning). The use of the Web as an educational medium was hailed as a harbinger of profound changes for communities, organizations and markets. By now, well over a decade later, one might expect that the concept of e-learning would be well defined and clearly differentiated from other forms of learning. Yet there is still a lack of consensus about what e-learning represents. For all the publicity it has received in recent years, e-learning remains something of an enigma, and its boundaries are far from clear. E-learning intersects numerous. In this new industry, key concepts and understandings are still emerging. Any study of the effectiveness and efficiency of e-learning therefore has to engage with multiple issues, including the role of e-learning in knowledge and learning, its contribution to competent performance, its relationship to organizational transformation and strategies for embedding e-learning into other forms of electronic interaction.

E-learning refers to the use of information and communications technology (ICT) to enhance and/or support learning in tertiary education. But this covers a wide range of systems, from students using e-mail and accessing course work on line while following a course on campus to programmer offered entirely online. E-learning can be divided into several different types. In all cases, a campus based institution is offering the courses, but using e-learning tied to the Internet or other online network to a different extent. Web-supplemented courses focus on classroom-based teaching but include elements such as putting a course outline and lecture notes on line, use of e-mail and links to online resources. Web-dependent courses require students to use the Internet for key elements of the programmed such as online discussions, assessment, or online project/ collaborative work, but without significant reduction in classroom time.

In this paper, the proposed system was presented and it divided into two parts . First one is the designer (Administrator ) part who can control on all options of the system in managing and updating all information included in the data base of the system . The second is the user part who can navigate in all environments of the system to give the required knowledge. Very important subject was selected to include it in the secure e-learning system which is (wireless networks) because it is very important topic in the computer world . The capabilities of the system are (add , delete, update, search) for data base of the system . The security was supported in the system by using the password technique. The system was designed by using Apache server , PHP, HTML, Web Page Maker , and MYSQL for data base .

References
On Some Numerical Methods For The Neutron Transport Equation In 2-D Plane Geometry

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Abstract

This paper presents an iterative method based on a self adjoint and m.accretive splitting for the numerical treatment of the steady state neutron transport equation in 2-D plane Geometry. Theoretical results show the convergence of the method. The convergence of the method is numerically illustrated and compare with the standard source iteration method on a sample problem.

2000 Mathematics Subject Classification. 65T60, 65N30, 65N22.

Key words and phrases. Neutron Transport equation, plane geometry, self adjoint operator, operator splitting, m-accretive operator, iterative methods.
A Study of the Supercritical Solution of the Stationary Negative Forced KdV Equation

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Abstract

In this paper we consider stationary Forced KdV equation with negative Forcing term. The supercritical solitary wave solutions of the stationary Forced KdV equation are obtained. In order to obtain the solutions the domain of the problem has been divided into three parts; the left, the middle and the right parts. The solution on the left and the right parts are obtained by an analytical method. The solution on the middle part is expressed in terms of Weierstrass elliptic function. We have designed computer programs using Mathematica to produce the solutions. The complete solution was found by matching the solutions of all the three parts. We have found out that there are four different solutions according to the values of the phase shift. All solutions are positive.

2000 Mathematics Subject Classification.

Key words and phrases. Stationary Forced KdV Equation; Supercritical solution.
A singular Gierer-Meinhardt system of elliptic equations in $\mathbb{R}^N$

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Abstract

In this talk, we study the existence and uniqueness of solution of the singular Gierer-Meinhardt system

\[
\begin{aligned}
-\Delta u + \alpha(x) u &= h_1(x) \frac{1}{u^s} \\
-\Delta v + \beta(x) v &= h_2(x) \frac{1}{v^r} \\
u(x), v(x) &\rightarrow 0 \text{ as } |x| \rightarrow \infty \\
u, v &> 0
\end{aligned}
\]

in $\mathbb{R}^N$ ($N \geq 3$), where $\alpha, \beta, h_1, h_2$ are given, not necessarily continuous functions, $s \in [0, 1[$ and $q, r > 0$ such that $r - s \leq 1$.

We establish the existence of the solution using Schauder’s fixed point theorem.

References


2000 Mathematics Subject Classification. 35J55, 35J65

Key words and phrases. Gierer-Meinhardt, Elliptic system, Singular, Schauder fixed point.
Fault Detection in a Complex System: A New Statistical-based Approach

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Abstract

Fault detection in stochastic dynamical systems is usually done by the generation of residuals directly reflecting the magnitude of the faults. This faults’ indicator is used to evaluate deviations created from normal operating conditions and measurements of the system. This test is almost always very difficult to implement in the multi-faults case. In this paper, we propose a new detection index based on descriptive statistics. In general, statistical data can be described as a list of subjects and their associated data. We have chosen the statistical method, namely a measure of statistical variability, which shows how the data differs. In physical systems, variability may result only from random measurement errors: instrument measurements are often not perfectly precise. One way is to assume that the quantity being measured is constant and that the variation between measurements is caused by observational errors. The coefficient of variation (CV) is a good measurement of the dispersion degree of a given data randomness. It is defined as the ratio of the standard deviation to the mean. Therefore, to assess the detection in the multi-faults case, it is preferrable to use the CV as a fault detection index.

To estimate the average CV’s for each signal and its confidential intervals (CI), we have carried out a number of numerical simulation experiments on a Three Tank System DTS-200. The CV and CI are calculated from twenty independent runs, in the same operating conditions, where a single run consists of 10240 samples for each signal.
Model Reduction of a Large Scale System Using PCA Technique

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Abstract

Most of the model reduction techniques proposed in the literature are based on the use of multivariate statistical techniques. The linear Principal Component Analysis (PCA) is one of the most known methods in data analysis. It looks for one subspace of a smaller dimension than the initial space and projects the studied data into this space with a minimum loss of information. Therefore, the obtained result is a representation of data with a reduction of dimension. To reduce calculations, in the case where the correlation matrix is large, the neural network of the PCA has been proposed. In general, neural network approaches in PCA distinguish themselves through two criteria of optimised training that are equivalent: variances maximization of data projection and quadratic error minimization of estimated data. Most approaches which use networks of multi-layer perceptron for obtaining the non-linear PCA model (NLPCA) encounter problems of optimization often non-linear such as the headache of convergence and initialization of this network type. For this reason, while combining the main curves and the Radial Basis Function Neural Networks, we propose an approach for the NLPCA with two networks of three cascading layers. The problem of training presents a linear regression in relation with the output layer weights. The algorithm which determines the number of nonlinear components to be retained in the NLPCA model is based on the accumulate variance.
Adjoint Of Sublinear Operators

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Abstract

Let \( SB(X, Y) \) be the set of the bounded sublinear operators from a Banach space \( X \) into a complete Banach lattice \( Y \). In the present paper, we will introduce the concept of adjoint sublinear operator and we show that is also sublinear operator and if \( T \) is bounded then the adjoint is ponded and Some properties as the linear case. We end this work by an application of this type of operators on Grothendieck theorem.
Generalized Einstein’s tensor for a Weyl manifold and its applications

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Abstract

A differentiable manifold having a torsion-free connection $\nabla$ and a conformal class $\mathcal{C}[g]$ of metrics which is preserved by $\nabla$ is called a Weyl manifold. The condition involved in this definition can be expressed as $\nabla g = 2(g \otimes w)$ for some 1-form $w$ [1].

It is well known that Einstein’s tensor $G$ for a Riemannian manifold defined by

$$G_{\beta\alpha} = R_{\beta\alpha} - \frac{1}{2} R g_{\beta\alpha}, \quad R_{\beta\alpha} = g^{\gamma\delta} R_{\alpha\gamma\delta}$$

where $R_{\beta\alpha}$ and $R$ respectively the Ricci tensor and the scalar curvature of the manifold, plays an important part in Einstein’s theory of gravitation as well as in proving some basic theorems in Riemannian geometry [2].

In this work, we obtain the generalized Einstein’s tensor for Weyl manifolds by using the second Bianchi identity for such manifolds obtained in [3]. Then, we deduce the following results:

(a) Any 2-dimensional Einstein-Weyl manifold has a vanishing generalized Einstein’s tensor,

(b) A Weyl manifold and its Liouville transformation have the same generalized Einstein’s tensor,

(c) If the 1-form $w$ for an Einstein-Weyl manifold is locally a gradient, then the scalar curvature of the manifold is prolonged covariant constant.

References

Tests for Trend: a Simulation Study

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Abstract

In this study we use the wavelet analysis to construct a test statistic to test for the existence of a trend in the series. We also propose a new approach for testing the presence of trend based on the periodogram of the data. Since we are also interested in the presence of a long-memory process among the data, we study the properties of our test statistics under different degrees of dependency. We compare the results when using the band periodogram test and the wavelet test with results obtained by applying the ordinary least squares (OLS) method under the same conditions.
A Note on Comparison Between Laplace and Sumudu Transforms

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Abstract

In the literature there are several works on the theory and applications of integral transforms by changing the kernel in the integral transform one can have several different transform such as Laplace, Fourier, Mellin, Hankel, to name a few, but very little on the power series transformation such as Sumudu transform, probably because it is little known, and not widely used yet. Recently, the Sumudu transform was proposed originally by Watugala see [1] and defined by

\[ F(u) = \frac{1}{u} \int_0^\infty e^{-\left(\frac{t}{u}\right)} f(t) \, dt, \]  

over the set of the functions

\[ A = \left\{ f(t) \mid \exists M, \tau_1, \tau_2 > 0, |f(t)| < Me^{-\frac{t}{\tau_j}} \text{, if } t \in (-1)^j \times [0, \infty) \right\} \]

where \( f(t) \) is a function which can be expressed as a convergent infinite series, see [2] and similarly the double Sumudu transform is defined by

\[ F(v, u) = S_2 \left[ f(t, x) ; (v, u) \right] = \frac{1}{uv} \int_0^\infty \int_0^\infty e^{-\left(\frac{t}{u} + \frac{x}{v}\right)} f(t, x) \, dt \, dx, \]

see [1], or [3]. Further this new integral transform generalized and applied by Kılıçman and Eltayeb to the linear second order partial differential equations with non-constant coefficients as well as to generalized functions, for more details see [4]. In this paper, we discuss existence of the double Sumudu transform and established some relationship between Laplace and Sumudu transforms. Further, we apply two transforms to solve the linear ordinary differential equations with non-constant coefficients, in special case, we provide some examples related to the second order differential equations having non-constant coefficients.

References


2000 Mathematics Subject Classification.35G15, 44A85,44A35.
Key words and phrases. Integral transforms, Sumudu transform, convolution
Some Properties in Nonsmooth Analysis of Perturbation Function in Vector Optimization

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Abstract

We consider in this paper the following vector optimization problem

\[ \text{max } f(x) = (f_1(x), \ldots, f_k(x)), \]

subject to \( g_i(x) \leq y_i, i = 1, \ldots, m, \)

\( h_j(x) = y_j, j = m + 1, \ldots, p, \)

where \( f: \mathbb{R}^n \rightarrow \mathbb{R}^k, \) each \( g_i: \mathbb{R}^n \rightarrow \mathbb{R}, \) each \( h_j: \mathbb{R}^n \rightarrow \mathbb{R}, \) the variables \( y \in \mathbb{R}^p \) are perturbations near \( \bar{y} = 0. \) For each \( y, \)

the set of feasible solutions is

\[ S(y) = \{ x \in \mathbb{R}^n : g_i(x) \leq y_i, h_j(x) \leq y_j, i = 1, \ldots, m, j = m + 1, \ldots, p \}. \]

We assume that the objective and constraint functions of the problem (1) are smooth. The solution concepts for (1) that we will be concerned with is the notion of an ideal maximal (or strongly efficient) point.

Our main aim in this paper is to investigate some properties in nonsmooth analysis of perturbation function (or marginal function).

References


2000 Mathematics Subject Classification. 78M50

Key words and phrases. Vector optimization, Nonsmooth analysis, Perturbation function
Prediction In A Trivariate Normal Distribution Via A Linear Combination Of Order Statistics

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Abstract

In this paper, by considering a trivariate normal distribution, we derive the exact joint distribution of one variable and a linear combination of order statistics from the other two variables. We show that this joint distribution is a mixture of unified bivariate skew-normal distributions. This mixture enables us to predict the variable based on a linear combination of order statistics from the other two variables. We finally illustrate the usefulness of these results by using a real-life data.

2000 Mathematics Subject Classification: 62H05, 62H10, 62E10, 62E15

Key words and phrases. Skew-normal distribution; Unified multivariate skew-normal distribution; Order Statistics
Solving Capacitated Vehicle Routing Problem with a Rank-based Ant Colony System

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Abstract

This study considers the application of Ant Colony Optimization (ACO) to the Capacitated Vehicle Routing Problem (CVRP), in which customers of known demand are supplied by a homogeneous fleet of vehicles from a single depot. Vehicles are subject to a weight limit, and each customer must be assigned exactly once to a vehicle. We use a combination of Ant Colony System with Rank based Ant System hybridized with saving heuristic and local search methods to solve CVRPs. Numerical experiments indicate that the proposed approach is competitive with other ACO algorithms, Simulated Annealing (SA) and Genetic Algorithm (GA). We also introduce a new best solution with route structure for CVRP instance G-n262-k25.

References


2000 Mathematics Subject Classification. 90C27, 90B06, 68T27, 90C59

Key words and phrases. Vehicle Routing Problem, Ant Colony Optimization, Local search, Saving heuristic
The Effects Of Web Supported Instruction And Use Of Instructional Materials On Students’ Mathematics Anxieties, Attitudes And Achievements

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Abstract

The purpose of this study is to investigate the effects of web supported instruction and use of instructional materials on primary education students’ mathematics anxieties, attitudes and achievements. In line with this purpose, the effects of web supported instruction and use of instructional materials on anxiety, attitude and achievement were investigated in groups matched in terms of mathematics achievement, mathematics anxieties, mathematics attitudes, computer attitudes and gender. Being of an experimental nature, this study was conducted with total of 90 students at the Mehmet Akif Ersoy Primary School located in the Sultanbeyli town of the Istanbul province. The Mathematics Achievement Test, Mathematics Anxiety Scale, Mathematics Attitude Scale, Computer Attitude Scale and Personal Information Form, are the instruments used for data collection. All the instruments were tested for validity and reliability. Following the matching activities carried out with these instruments, application activities were performed and the Mathematics Achievement Test, Mathematics Anxiety Scale and Mathematics Attitude Scale were re-applied as the post-test, and the hypotheses were tested. Then, for the purpose of testing the permanency of the applications, the aforementioned tests were re-applied eight weeks later, and data obtained at three different times were compared with each other.

Two of the total of fifteen hypotheses in the study were rejected and thirteen were adopted as a result of their statistical investigation. As a result of the hypotheses tests, it was concluded that both web supported instruction and use of instructional materials have significant and permanent effect on anxiety and achievement. However, it was also seen that the different teaching environments in the study had no significant effect on student’s mathematics attitudes.
The Effect Of Teaching With The Mathematics Activity Based On Purdue Model On The Achievement Of Non-Gifted Students

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Abstract

The purpose of this study- by introducing Purdue 3-stage model which is used in training of gifted students- was to design example activity about "Informed Consumer Arithmetic" lesson at 7th grade non-gifted students in our country and to investigate the effects of this activity to the mathematics achievement of these students.

The universe of the study was formed of the students who studied at 7th grade in Primary schools in Fatih district of Istanbul and the sample of the study formed of 22 students who were in 7-B and 7-C classes in a Primary School in Fatih district. In this study, we used pre-final test model with a control group. The study has been made by researcher for 8 weeks. The lesson has been made by using the activity based on Purdue model on the experimental group and by using the activities related to the lesson in National Education Curriculum on the control group.

After being applied the pre-test to two classes, the data obtained were analyzed by using appropriate tests, there was seen that there wasn’t a significant difference between the averages of two groups and by random testing groups was determined as "control" and "experimental". The final test was the same with pre-test. The pre-final tests belong to experimental and control group were analyzed by using t-test. As a result, which way is the best has been discussed.
Developing ASAB Cryptology Technique with Irrational Numbers Perspective

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Abstract

Cryptography (or cryptology) is the science of information security and also the practice and study of hiding information. The word is derived from the Greek kryptos, meaning hidden. Cryptography’s aim is to construct schemes or protocols that can still accomplish certain tasks even in the presence of an adversary. In modern times cryptography is considered a branch of both mathematics and computer science, and is affiliated closely with information theory, computer security and engineering. It is based on some specific areas of mathematics, including number theory, linear algebra, and algebraic structures. As a result, it is considered as a main branch of both mathematics and computer science. It is used in applications present in technologically advanced societies; examples include the security of ATM cards, computer passwords and electronic commerce which all depend on cryptography.

This study develops ASAB cryptology technique (presented by authors at Proceedings of the Third International Conference on Modeling, Simulation and Applied Optimization’09) with the last ideas and perspectives. The new developed technique, which we called "ASAB-2" (Initial of the names of authors), is based on infinite and periodical continued fractions with irrational numbers.

2000 Mathematics Subject Classification. 11J70

Key words and phrases. Number theory, continued fractions, infinite continued fractions, irrational numbers, cryptology, ASAB-2, ASAB-2 technique
The Effects of The Lessons Plans Prepared on The Multiple Intelligence Approach to Mathematical Achivement

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Abstract

The acceptance of the multiple intelligence approach to mathematics teaching by today’s mathematics teachers is a positive step for those who are in search of new approaches towards the teaching of mathematics. In the present study, the main aim is to investigate the effects of the lessons plans prepared based on the multiple intelligences approach. The study uses a pretest-posttest design. The pretest scores were used to verify that the levels of knowledge of the two groups of students are equal prior to the intervention. At the end of the intervention a post test was delivered to both groups whose content covered all the subjects that were taught during this period. Other data collection instruments are: multiple intelligences inventory, mathematics achievement tests, personal information inventory and mathematics attitude inventory. The experimental group received teaching based on the lesson plans based on the multiple intelligence approach and the control group was taught with the traditional method by their own teachers. Data were analyzed using the SPSS 10.00 computer software. The correlation in between mathematics achievement and attitude towards mathematics was investigated. Multiple regression results of achievement -attitude were also investigated. The findings indicate that in the experimental group there is an increase in the achievement levels and there is a significant positive improvement in their retention levels and attitudes towards mathematics.
An analytical approach to the fractional foam drainage equation

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Abstract

In this study, we used the variational iteration method and the homotopy perturbation method to give a rational approximation solutions of the foam drainage equation with time- and space- fractional derivatives. The fractional derivatives are described in the Caputo sense. Numerical examples are given to demonstrate the effectiveness of the present methods. Results show that the proposed schemes are very effective and convenient for solving linear and nonlinear fractional differential equations with high accuracy.
2-Edge Connected Subgraph Problem, Complete Description

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Abstract

Our work focus on node weighted 2-edge connected subgraph problem defined by Baiou [7]. Given a graph $G = (V, E)$, a node $r \in V$ and cost (weight) function on nodes and edges, the $r$-2-edge connected subgraph problem consists on finding a 2-edge connected subgraph in $G$ containing $r$ whose total cost (weight) on both nodes and edges is minimized. We study a class of graphs for which the polytope associated to the $r$-2-edge connected subgraph problem is completely described by the trivial inequalities and the inequalities so called generalized cut inequalities. After that, we investigate a class of valid inequalities given by Baiou and Correa in the case of cordless multi-cycle graphs.
Fuglede-Putnam Theorem For \((p, k)\)-Quasihyponormal And Class \((Y)\) Operators

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Abstract

Let \(A\) and \(B\) be normal operators on a complex separable Hilbert space \(H\). The equation \(AX = XB\) implies \(A^*X = XB^*\) for some operator \(X\) on \(H\) is known as the familiar Fuglede-Putnam theorem. An operator \(A \in B(H)\) is said to be log-hyponormal if \(A\) is invertible and \(\log(A^*A) \geq \log(AA^*)\), class \((Y)\) if there exist \(\alpha \geq 1\) and \(k_\alpha > 0\) such that \(|AA^* - A^*A|^{\alpha} \leq k_\alpha^2 (A - \lambda)^* (A - \lambda)\) for all \(\lambda \in \mathbb{C}\), dominant if \(\text{ran}(A - \lambda) \subseteq \text{ran}(A - \lambda)^*\) for all \(\lambda \in \sigma(A)\) where \(\sigma(A)\) denotes the spectrum of \(A\). \(A\) is called \((p, k)\)-quasihyponormal if \(A^*k((AA^*)^p - (AA^*)^p)A^k \geq 0\), \(k \in \mathbb{N}\), \(0 < p \leq 1\).

In this talk, we’ll give an extension of Fuglede-Putnam’s result to the case when either 1) \(A\) is log-hyponormal operator and \(B^*\) is a class \((Y)\) operator 2) \(A\) is \((p, k)\)-quasihyponormal operator with \(\ker A \subseteq \ker A^*\) and \(B^*\) is dominant. Other results are also given.

References

A Certain Subclass Of P-Valently Analytic Functions
Of Bazilević Type

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Abstract

Using extended Ruscheweyh [2] derivatives we define a new subclass $M(n, p, \alpha, \beta)$ of $p$-valently analytic functions which are of Bazilević [1] type. A function $f$ which is $p$-valently analytic is said to be in the subclass $M(n, p, \alpha, \beta)$ if it satisfies

$$\text{Re} \left( \frac{pD^{n+p}f(z)}{D^{n+p-1}f(z)} \left( \frac{D^{n+p-1}f(z)}{z^p} \right)^\alpha \right) > \beta$$

where $z \in U, U = \{z : |z| < 1\}, \alpha > 0$ and $0 \leq \beta < p$. $D^{n+p}f(z)$ and $D^{n+p-1}f(z)$ are extensions of the familiar operator $D^n f(z)$ of Ruscheweyh Derivatives [2], $n \in N_0 = N \cup \{0\}$. These operators were considered by Sekine, Owa and Obradovic [3]. We find some sufficient conditions and angular properties for functions belonging to the subclass $M(n, p, \alpha, \beta)$.

References


2000 Mathematics Subject Classification. primary:30C45 secondaries:30C55

Key words and phrases. Analytic functions, Ruscheweyh derivatives, Bazilević type

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A new form to Newton-Padé approximants

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Abstract

M.B. Balk proved an assertion about uniform convergence of Padé approximants. Newton- Padé (or multipoint Padé) approximants solve more general interpolation problems than Padé approximants. Usually Newton- Padé approximants have only nominators in Newton form. We propose to use Newton form for the denominators also. Using that special form of Newton- Padé approximants Balk’s method was extended to the case of more general rational interpolation functions.

References

Minimizing Makespan in a Two-Machine Stochastic Flowshop

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Abstract

The two-machine flowshop scheduling problem is usually addressed where processing times are assumed to be deterministic for which Johnson’s algorithm can be used to solve the problem. For many scheduling environments, the assumption of deterministic processing times is not valid. Hence, the random variation in processing times has to be taken into account while searching for a solution. Some researchers addressed the flowshop problem where job processing times follow certain probability distributions. For some scheduling environments, it is hard to obtain exact probability distributions for random processing times, and therefore assuming a specific probability distribution is not realistic. Usually, solutions obtained after assuming a certain probability distribution are not even close to the optimal solution. It has been observed that, although the exact probability distribution of job processing times may not be known, upper and lower bounds on job processing times are easy to obtain in many cases. Hence, this information on the bounds of job processing times should be utilized in finding a solution for the scheduling problem. In this paper, we address the two-machine flowshop scheduling problem of minimizing makespan where jobs have random processing times which are bounded between a lower and an upper bound. The probability distributions of job processing times within intervals are not known. The only known information about job processing times are the lower and upper bounds. The decision about a solution of the problem has to be made based on those bounds. Different heuristics using the bounds are proposed, and the proposed heuristics are compared by using simulation. The simulation results have shown that the proposed heuristics perform well with an overall average error of less than one and half percent for all heuristics. One of the heuristics performs as the best with an overall average percentage error of less than one percent.
Minimizing Average Job Completion Time in a Two-Stage Assembly Flowshop with Setup Times

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Abstract

The two-stage assembly flowshop problem consist of two stages where there are \( m \) machines at the first stage while there is only a single assembly machine at the second stage. There are \( n \) jobs to be scheduled and each job has \( m+1 \) operations. For each job, the first \( m \) operations are conducted at the first stage by \( m \) machines in parallel and a final operation in the second stage by the assembly machine. The last operation at the second stage may start only after all \( m \) operations at the first stage are completed. The two-stage assembly scheduling problem has many applications in industry, and hence, has received an increasing attention of researchers recently. We address the two-stage assembly scheduling problem with the objective of minimizing average job completion time. This objective is particularly important in real life situations where reducing inventory or holding cost is of primary concern. Setup times are treated as separate from processing times. This problem is NP-hard since its special case, when setup times are ignored and \( m = 1 \) (which is a regular two-machine flowshop problem), is NP-hard. Therefore, we present a dominance relation and present three heuristics. The heuristics are evaluated based on randomly generated data. One of the proposed heuristics is known to be the best heuristic for the case of zero setup times while another heuristic is known to perform well for such problems. A new version of the latter heuristic is proposed and shown to perform much better than the other two heuristics.

2000 Mathematics Subject Classification.

Key words and phrases. Scheduling, flowshop, average completion time, heuristic, dominance relation.
Polytopes of majorization and g-majorization

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Abstract

Let $M_n$ and $M_{n,m}$ be the vector spaces of all $n \times n$ and $n \times m$ matrices respectively with entries in the field of real numbers. A nonnegative (or not necessarily nonnegative) matrix $R \in M_m$ is called row stochastic (or g-row stochastic) if $Re = e$ where $e = (1, \ldots, 1)^t \in M_{m,1}$. For matrices $A, B \in M_{n,m}$, it is said that $A$ is majorized (or g-majorized) by $B$ from right if there exists a row stochastic (or g-row stochastic) matrix $R \in M_m$ such that $A = BR$. The polytopes of majorization and g-majorization for given matrices $A, B \in M_{n,m}$ denoted by $P(A \prec B)$ and $P(A \prec g B)$ respectively and defined as the following convex sets:

\[ P(A \prec B) := \{ R : R \text{ is a row stochastic matrix and } A = BR \}, \]
\[ P(A \prec g B) := \{ R : \text{ and } R \text{ is a g-row stochastic matrix and } A = BR \}. \]

In this paper, we investigate some properties of polytopes of majorization and g-majorization for some special types of matrices $A, B \in M_{n,m}$. Also we will find the dimension of the linear vector spaces generated by $P(A \prec B)$ or $P(A \prec g B)$.

References


Generalization of Clark’s derivation and subdifferential

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Abstract

In this talk, we first introduce some new concepts of nonsmooth analysis for locally convex topological vector spaces and then by using these definition we obtain some results. Moreover we generalizes Lebourg’s mean value theorem to locally convex spaces.

References

Triangle matrix and infinite linear systems of differential equations

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Abstract

In this work we deal with the solvability of infinite systems of differential equations of the form

\[ X'(t) = TX(t) + B \]

where \( T \) is one of the well known triangles \( \Delta(\lambda), C(\lambda) \), or the weighted mean matrix \( \mathbb{N}_q \) and \( B \) is a given infinite column matrix \( \begin{pmatrix} b_1, b_2, \ldots, b_n, \ldots \end{pmatrix} \). We use Matlab to represent our solutions.

2000 Mathematics Subject Classification.

Key words and phrases. Infinite linear systems of differential equations, systems of linear equations, Laplace operator.
An Operational Method for Solving Non-linear Volterra Integro-Differential Equations

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Abstract

In this paper we will develop a new method to find a numerical solution for the general form of the Non Linear Volterra Integro-Differential Equations (NVE). To this end, we will present our method based on the matrix form of the (NVE). The corresponding unknown coefficients of our method have been determined by using the computational aspects of matrices. Finally the accuracy of the method has been verified by presenting some numerical computation.

References


2000 Mathematics Subject Classification. 65R20
Key words and phrases.Volterra Integro-Differential Equations, Matrix Forms, Numerical Solutions


The existence of the optimal control of systems with quadratic quantity criterium.

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Abstract

Consider optimal control problem in $\mathbb{R}^n$ with quadratic in control quality criterium:

$$\frac{dx}{dt} = f(x, t)B(t)u$$  \hspace{1cm} (1)

$$x(s) = y$$

$$I(s, y, u) = \phi(t, x(t)) + \int_s^T [\Psi(t, x(t)) + (N(t)u(t), u(t))] dt \rightarrow \inf$$  \hspace{1cm} (2)

Here $t \in [0, T], x \in \mathbb{R}^n, Q^0 = (0, T) \times \mathbb{R}^n, Q$ is bounded sub domain of $Q^0$ with the boundary $\partial Q$. We assume that:

1) The functions $\phi(t, x)$ and $\Psi(t, x)$ are nonnegative, smooth in their arguments in $\bar{Q}$, moreover, $\frac{\partial \phi}{\partial x}$ is Lipshitz in $x$ in $\bar{Q}$ ($\bar{Q}$ is the closure of $Q$)

2) $f(t, x)$ is smooth in $\bar{Q}$ and $\frac{\partial f}{\partial x}$ is Lipshitz in $x$ in $Q$.

3) $n \times m$ is dimensional matrix $B(t)$ is smooth in $t$ in $\bar{Q}$.

4) $m \times m$ is dimensional matrix $N(t)$ is positive definite in $\bar{Q}$, and smooth in $t$

The bellman’s equation of the problem (1), (2) is

$$\frac{\partial V}{\partial t} + \left( f(t, x), \frac{\partial V}{\partial t} \right) + \Psi(t, x) - \frac{1}{4} \left( B(t)N^{-1}(t)B + (N(t)u(t), u(t)) \right) \frac{\partial V}{\partial t} \frac{\partial V}{\partial t} = 0$$

With the boundary condition. THEOREM 1. If the hyper surface $\partial Q$ is correctly embedded into $\mathbb{R}^{n+1}$, and the conditions (1)-(4) hold, then the boundary value problem (7), (8) has the unique solution in $Q$, which is continuous together with it’s partial derivative up to the second order.
Differentiation in a new viewpoint

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Abstract

In the theory of functions the domain of the differentiable functions needs to be locally connected and the derivative of a single variable function with variable x, for a particular value of x is a number given by the
\[
\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}
\]
Provided that this limit exists. This definition requires the values of the function f for all of the elements of its domain which are sufficiently near the point x. Here we introduce a new generalized form of the derivative definition in which the values of at most countably many points of the domain of the function near the x, i.e., the elements of a sequence which approaches to x, is needed, the situation which is hold with connivance in the region of all of sciences. Moreover this definition is done in such a way that all of the theorems of this theory are valid yet. First we generalized the concept of continuity of functions and show the validity of all of the theorems of this section of calculus and then use of them for extending the basic theory.

References


2000 Mathematics Subject Classification. 35E15, 58C05, 26A06, 28A10.
Key words and phrases. Intermediate value Theorem, Sard’s Theorem, Taylor’s theorem, measure.
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On common Periodic Points Conjecture, History and Some Related Questions

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Abstract

From 1954 to 1969 there was a rather well known conjecture, namely the common fixed point conjecture, that if \( f \) and \( g \) are continuous functions from the closed unit interval to itself which commute, meaning \( f(g(x)) = g(f(x)) \), then they have a common fixed point. In [2] and [3], W.M. Boyce and J.P. Huneke answered this question independently by the construction of a pair of commuting continuous functions which have no fixed point in common. This conjecture led us to introduce the common periodic point conjecture (see [1]) which reads as:

Conjecture. If \( f \) and \( g \) are continuous functions from \([0, 1]\) to itself which commute (i.e. \( f(g(x)) = g(f(x)) \)), then they must have a common periodic point.

In fact we conjectured that typically commuting continuous self-maps of closed intervals do not share a periodic point.

In this talk we give the history of this conjecture as well as some related results and some open questions.

References


Optimization of the EDM process with multiple performance characteristics based on the orthogonal array and grey relational analysis method

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Abstract

This paper describes application of the grey relational analysis with Taguchi methods to optimize the electrical discharge machining process with multiple performance characteristics. An orthogonal array, grey relational generating, grey relational coefficient, grey relational grade and grey relational graph analysis of variance are applied to study the performance characteristics of the machining process. In this paper, levels of machining parameters including pulse on time, discharge current, discharge voltage, and duty factor are optimized with respect to multiple performance characteristics including material removal rate, electrode wear ratio, and surface roughness. Experimental results show that this approach can help to optimize the electrical discharge machining process with multiple process responses.
Group Theory on Some Chemical Nanostructures

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Abstract

Shinsaku Fujita, to enumerate isomers of molecules introduced some definitions like maturity and the Q-conjugacy character table of a finite group. In this paper at first, we provide a new simple method to specify how a given finite group with big symmetry and complicated structure is maturated or unmaturated, then, to verify our derived theorem some useful nanostructures are considered.

References

Well-Posedness of Basset Difference Equations

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Abstract

The stable difference scheme for the approximate solution of the initial value problem

\[
\frac{du(t)}{dt} + D_t^\alpha u(t) + Au(t) = f(t), \quad 0 < t < 1, \quad u(0) = 0 \tag{1}
\]

for the fractional differential equation in a Banach space \( E \) with the strongly positive operator \( A \) is presented. The well-posedness of the difference scheme in difference analogues of spaces of smooth functions is established. In practice, the coercive stability estimates for the solution of difference schemes for the fractional parabolic equation with nonlocal boundary conditions in space variable and the multidimensional fractional parabolic equation with Dirichlet condition in space variables and the 2m-th order multidimensional fractional parabolic equation are obtained.

References


2000 Mathematics Subject Classification. 65N12, 65M12

Key words and phrases. fractional parabolic equation, Basset problems, well-posedness, coercive stability, difference scheme
A Note On Fractional Schrödinger Differential And Difference Equations

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Abstract

The initial value problem for the fractional differential equation
\[
\begin{aligned}
\frac{i}{t} \frac{du}{dt} + Au + \int_0^t a(s) D^{1/2} u(s) \, ds &= f(t), \quad 0 < t < 1, \\
u(0) &= 0
\end{aligned}
\]  

in a Hilbert space with a self adjoint positive definite operator $A$ is considered. The stability estimates for the solution of this problem and its first derivative under the condition $|a(s)| < M_1 s^{1/2}$ are established. In practice, the mixed problems for one dimensional fractional Schrödinger differential equation with nonlocal boundary conditions in space variable and multidimensional fractional Schrödinger differential equation with Dirichlet condition in space variables are considered. The stability estimates for the solution and first order of derivative of the solution of these problems are obtained. The first order of accuracy difference scheme for the approximate solution of this initial value problem is presented. The stability estimate for the solution of this difference scheme and its first order of difference derivative are established. The application of this abstract result to the mixed problems considered above is presented. The stability estimates for the solution and first order of difference derivative of the solution of these difference schemes for these problems are obtained.

References


\begin{center}
2000 Mathematics Subject Classification. 65J10, 65M06, 26A33
\end{center}

\begin{center}
Key words and phrases. fractional Schrödinger equation, difference scheme, stability.
\end{center}
On The Numerical Solution Of Parabolic Stochastic Differential Equation

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Abstract

We are interested in studying the stable difference schemes for the approximate solutions of the nonlocal boundary value problem for parabolic stochastic differential equation

\[ du(t) + Au(t)dt = f(t)dt, \quad (0 \leq t \leq T), \quad u(0) = u(T) + \varphi \omega_T \]

in a Hilbert space \( H \) with self-adjoint positive definite operator \( A \). Here, \( W_t \) is a standard Wiener process given on the probability space \( (\Omega; F, P) \).

In the present paper the first and second orders of accuracy difference schemes for approximately solving this nonlocal boundary value problem are presented. The convergence estimates for the solution of these difference schemes are established. A numerical method is proposed for solving the stochastic parabolic partial differential equation with nonlocal boundary condition. The first and second order of accuracy difference schemes are presented. A procedure of modified Gauss elimination method is used for solving these difference schemes in the case of a one-dimensional stochastic parabolic partial differential equation. The method is illustrated by numerical examples.

References


2000 Mathematics Subject Classification.

Key words and phrases: Stochastic parabolic equation, Difference scheme, Convergence.
On the parabolic inverse problem with an unknown source function

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Abstract

Let \( \Omega \) be the unit open cube in the \( n \)-dimensional Euclidean space \( \mathbb{R}^n \) (\( 0 < x_k < 1, 1 \leq k \leq n \)) with boundary \( \mathbb{S} = \Omega \cup S \). In \([0,1] \times \Omega \) we consider the mixed boundary value problem for the multidimensional parabolic equation

\[
\begin{align*}
\frac{\partial v(t, x)}{\partial t} - \sum_{r=1}^{n} \frac{\partial}{\partial x_r} (\alpha_r(x) \frac{\partial v(t, x)}{\partial x_r}) &= f(t, x) + p(x), \\
v(0, x) &= \varphi(x), v(1, x) = \psi(x), x \in \Omega, \\
v(t, x) &= 0, x \in S,
\end{align*}
\]

where \( \alpha_r(x) (x \in \Omega) \), \( \varphi(x), \psi(x) (x \in \mathbb{S}) \) and \( f(t, x) (t \in (0,1), x \in \Omega) \) are given smooth functions and \( \alpha_r(x) \geq a > 0 \). The first and second orders of accuracy stable difference schemes for the approximate solution of (1) are presented. Stability, almost coercive stability and coercive stability estimates are obtained. Numerical techniques are developed and algorithms are tested on an example.

References


2000 Mathematics Subject Classification. 34K29, 35K35, 65N12

Key words and phrases. Inverse problems, parabolic equations, stability
Wave Approach in Dynamical Discrete-Continuous Systems

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Abstract

The paper deals with the dynamics of discrete-continuous systems consisting of elastic elements connected by means of rigid bodies. They belong to a certain class of discrete-continuous systems, namely to those where the motion of elastic elements with a constant cross-section is described by means of the classical wave equation, [1-3]. The discussed systems can be longitudinally or torsionally deformed. In the discussion a wave method using the solution of the d’Alembert type is applied, what leads to solving equations with a retarded argument.

After a short description of the approach applied, detailed considerations are done for two nonlinear discrete-continuous systems. The first one consists of three noncoaxial rods longitudinally deformed, two rigid bodies and a local nonlinearity having characteristics of a hard type as well as of a soft type. In systems with a hard type characteristic amplitudes jumps are observed while in systems with a soft type characteristic solutions amplitudes can diverge to infinity. The second one is a multi-mass system torsionally deformed with rigid bodies having variable mass moments of inertia. Local nonlinearities and variable inertia in such systems are justified by engineering solutions in many machines and mechanisms. Moreover, it is shown that in linear cases analytical solutions can be derived in the form of series consisting of exponential functions and polynomials.

References


2000 Mathematics Subject Classification. 34C20, 34C25, 93C10
Key words and phrases. dynamical systems, waves, discrete-continuous models, nonlinear oscillations
Introduction to a method for solving a kind of Integrals

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Abstract

Some kinds of integrals have a special way for solving. These are mostly applicated integrals. we can find some discovered methods for these integrals. But when you do not have an unique way for solving an integral, finding an answer for this kind is usually with hardnesses. In this paper we present a new method for solving a kind of applicated integrals by introducing a table which its name is "table of coefficients". This table let us find answer of a specific kind of integrals. This method can decrease errors in our usual calculates in finding an answer of integrals.

2000 Mathematics Subject Classification. 
Key words and phrases. Polynomial integrals, specific table, table of coefficients, sequence of coefficients.
Simulation in Math and Its Effects On Education

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Abstract

Different ways of problem solving let us experiment them and choose the best way for the best education. Our researches show that simulating and making partners for problems can provide better solutions than the other ways for students. Presenting new models of simulating and new partners will encourage students for better thinking and finding the best path for receiving the answer. At this paper, the Results of this experiment has been presented.

2000 Mathematics Subject Classification.

Key words and phrases: Simulation, partnership education, Simulated models, answer recycling.
Introduction to a Sequence in Natural Numbers With Logical Properties

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Abstract

Today, mathematical science in computer is a very basic course in math. the base of the computer science is on Logical operating. All of the functions which has been defined for Digital computing are depending on logical mathematics. At this paper we introduce a new sequence with logical properties. By this sequence, we can define new functions with logical elements. Some properties are useful for designing new models of circuits with interesting and unique applications. The best property of this sequence is easy learning for interested students in basic computer science. This sequence can produce logical unique codes for each state.

2000 Mathematics Subject Classification.
Key words and phrases. binary sequence, binary coding, logical pyramid, code of sequence.
A new non-linear optimization of parameters in Michaelis-Menten kinetics

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Abstract

A new non-linear optimization of parameters in Michaelis-Menten equation has been developed. This method is based on special mathematical form of Michaelis-Menten equation and finding best fitting line of R versus S/ (S +K_m). By trying to tend the intercept to zero, the proper K_m will be obtained. At the founded K_m, the slope is equal to V_m. In this method a non-linear, two-parameter optimization is changed into finding a root of non-linear equation. Generated data set is used to introduce this new method. Data set from literature is used to illustrate accuracy of this technique in comparison with linearization methods. Results show that accuracy of the mentioned method is better than Lineweaver-Burk, Eddie and Hanes methods.
The search method based on soft computing for linear cryptanalysis of block ciphers

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Abstract
Optimization, combinatorial and in general modeling methods are the concepts in applied mathematics which if considered alone and purely they can not be used in solving real problems. The better establishing a relation with other fields the more applications can be gained. In this article two kinds of optimization methods which have a lot of applications in cryptography will be proposed: The first one is dealing with the advantages of using high performance Genetic Algorithm in comparison to some analytic methods in cryptanalysis of block ciphers and the second one is a model represented by a weighted graph which must be optimized by some soft computing methods because of its high complexity. At the end of this article some other useful applications of these ideas along with a practical done example on a block cipher will be represented.

2000 Mathematics Subject Classification.
Key words and phrases.
A Survey on Search Methods Based on Soft Computing for Cryptanalysis of Block Ciphers

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Abstract

In this paper, a survey on the applications of soft computing in cryptanalysis of block ciphers along with some case studies is presented. The nature of cryptanalysis problems is involved with huge search domain which is a key point in providing the security of primitives. Regarding to this property, tracing analytic solutions will frustrate the attacker due to complexity theory. We propose two kinds of optimization models which have a lot of applications in cryptography: The first one is dealing with a high performance Genetic Algorithm in comparison to some analytic methods in cryptanalysis of block ciphers and the second one is a model represented by a weighted graph which must be optimized by some soft computing methods because of its high complexity. We will show the results gained by suggested methods in finding the differential and linear characteristics of a well-known block cipher. The cost of time, memory, and data complexity of the proposed method in comparison to analytic methods validates the priority of them.
2-orthogonal polynomials and linear “2–generalized”
birth and death processes

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Abstract

We show that the linear “2–generalized” birth and death processes (i.e. the processes defined from two death rates and one birth rate) could be generated by the 2-orthogonal polynomials sets. In particular, we give a characterization of these processes when their related 2-orthogonal polynomials are Sheffer-Meixner type. Also, we show that in one particular case, it is possible to give an integral representation of the measures of orthogonality. In the general case, we give the integral equations satisfied by the measures of orthogonality.

References

A New Approach To Numerical Algorithms

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Abstract

The problem of computing eigenvalues, eigenvectors and invariant subspaces is always present in areas as diverse as Engineering, Physics, Computer Science and Mathematics. Considering the importance of these problems in many practical applications, it is not surprising that has been and continues to be the subject of intense research. We developed a new Lanczos algorithm on the Grassmann manifold. This work comes in the wake of the article by A. Edelman, T. A. Arias and S. T. Smith, The geometry of algorithms with orthogonality constraints, where they presented a new conjugate gradient algorithm on the Grassmann and Stiefel manifolds. These manifolds which are based on orthogonality constraints, yields penetrating insight into many numerical algorithms of linear algebra. They have developed an approach to numerical algorithms involving orthogonality constraints. As the Lanczos method and the method of conjugate gradients are closely related, and one of the main problems of the Lanczos method is the loss of orthogonality, arose the idea of checking whether it would be possible to get a Lanczos algorithm on the Grassmann manifold.

References

Using Moodle As A Tool For Learning And Developing Math Skills

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Abstract

MatActiva is a Mathematics project based on the platform Moodle, which is being developed in the Institute of Accounting and Administration of Porto - ISCAP. The main objective of this project is to motivate students, encourage them to overcome theirs difficulties through an auto-study, giving them more confidence and making students keen on Mathematics. The adequacy of the courses to the Bologna process has created new challenges, such as the management of hours per class, and also the methods and types of activities proposed. MatActiva provides a variety of materials, which include theoretical notes, multiple choice tests that can be done online and automatically provide quantitative results and the feedback for each question when the student misses, forum of doubts moderated by the teachers that are responsible for the project, challenges, etc. As ISCAP receives many students through the ERASMUS program, the MatActiva also includes a range of materials in English. This project wishes to be a real advantage in teaching/learning of mathematics at higher education level.

2000 Mathematics Subject Classification. 97-XX; 97U70; 97D40; 97B40
Key words and phrases. Mathematics Education; Educational material and media; Educational technology; Moodle.
Comparison of speeds of convergence in some families of summability methods for functions

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Abstract

Speeds of convergence in certain family of summability methods for functions are compared in the talk. The results introduced here extend the results proved in [1] for "matrix case" to "integral case" and are partly published in [2].

1. Let us denote by $X$ the set of all functions $x = x(u)$ defined for $u \geq 0$, bounded and measurable by Lebesgue on every finite interval $[0, u_0]$. Suppose that $A$ is a transformation of functions $x = x(u)$ (or, in particular, of sequences $x = (x_n)$) into functions $Ax = y = y(u) \in X$. If the limit $\lim_{u \to \infty} y(u) = s$ exists then we say that $x = x(u)$ is convergent to $s$ with respect to the summability method $A$, and write $x(u) \to s(A)$.

One of the basic notions in our talk is the notion of speed of convergence. Let $\lambda = \lambda(u)$ be a positive function from $X$ such that $\lambda(u) \to \infty$ as $u \to \infty$. We say that a function $x = x(u)$ is convergent to $s$ with speed $\lambda$ if the finite limit $\lim_{u \to \infty} \lambda(u) [x(u) - s]$ exists. We say that $x$ is convergent with speed $\lambda$ with respect to the summability method $A$ if the function $Ax = y = y(u) \in X$ is convergent with speed $\lambda$.

2. We discuss a Riesz-type family $\{A_\alpha\}$ of summability methods $A_\alpha$ where $\alpha > \alpha_0$ and $\alpha_0$ is some fixed number and which transform functions $x = x(u)$ into functions $A_\alpha x = y_\alpha(u)$. This family is defined with the help of relation $A_\beta = C_{\gamma, \beta} \circ A_{\gamma}$ ($\beta > \gamma > \alpha_0$), where $C_{\gamma, \beta}$ is certain integral transformation (see e.g. [2]). For example, the Riesz methods $(R, \alpha)$ and certain generalized Nörlund methods $(N, p_n(u), q(u))$ form Riesz-type families.

It is important to be able to compare the speed of convergence of $x = x(u)$ with respect to different methods in family $\{A_\alpha\}$. For a given speed $\lambda = \lambda(u)$ and a fixed number $\gamma > \alpha_0$ the speeds $\lambda_\beta = \lambda_\beta(u)$ and $\lambda_\delta = \lambda_\delta(u)$ can be found (see [2]) such that for all $\beta > \delta > \gamma$ the next implications are true:

$$\lambda(u) [y_\beta(u) - s] \to t \implies \lambda_\beta(u) [y_\beta(u) - s] \to t,$$

$$\lambda(u) [y_\delta(u) - s] = O(1), \quad \lambda_\beta(u) [y_\beta(u) - s] \to t \implies \lambda_\delta(u) [y_\delta(u) - s] \to t.$$

References


2000 Mathematics Subject Classification. 40C10, 40C15, 40G05, 40G10.

Key words and phrases. summability methods for functions, speed of convergence, Riesz methods, generalized integral Nörlund methods, Borel-type methods.
On families of generalized Nörlund matrices as bounded operators on $l_p$

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Abstract

Let $l_p$ $(p \geq 1)$ be the Banach space of all complex sequences $x = (x_n)$ ($n \in \mathbb{N}_0$), and let $B(l_p)$ be the Banach algebra of all bounded linear operators on $l_p$. Any operator from $B(l_p)$ can be represented in form of a matrix $A = (a_{nk})$ ($n, k \in \mathbb{N}_0$) but, of course, not any matrix is in $B(l_p)$. The question how to characterize the matrices in $B(l_p)$ (by means of conditions that are not difficult to apply) has been discussed in a number of papers. Different types of conditions (mostly sufficient) for $A$ to be in $B(l_p)$ in general and, in particular, for Nörlund, Riesz and Hausdorff matrices has been proved, also the estimates for norms $\|A\|_p$ has been found (see e.g. [1] for references).

We consider certain generalized Nörlund matrices $A = (a_{nk}) = (N, p_n, q_n)$, defined with the help of two non-negative sequences $(p_n)$ and $(q_n)$ (such that $p_0, q_0 > 0$ and $r_n = \sum_{k=0}^{n} p_{n-k} q_k \neq 0$ for any $n \in \mathbb{N}_0$) as follows:

$$a_{nk} = \begin{cases} 
    p_{n-k} q_k/r_n & \text{if } 0 \leq k \leq n, \\
    0 & \text{if } k > n.
\end{cases}$$

In this paper we find some sufficient conditions for generalized Nörlund matrices $A = (N, p_n, q_n)$ to be in $B(l_p)$, and calculate the evaluates for norms $\|A\|_p$. These sufficient conditions base on paper [1] and on construction of matrices. As a result, we come to certain families of generalized Nörlund matrices

$$A_\alpha = (N, p_\alpha^\alpha, q_n)$$

where $\alpha$ is a continuous or discrete parameter (see e.g. [2]).

References

Some Notes On Improvement Of Convergence By Regular Matrices

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Abstract

We consider some aspects of convergence acceleration by regular matrices \( M = (m_{nk}) \) with real or complex entries. Classically a matrix \( M \) is called accelerating the convergence if the relation

\[
\left| \sum_k m_{nk} x_k - \lim_n \sum_k m_{nk} x_k \right| \rightarrow 0 \quad \text{for} \quad n \rightarrow \infty
\]

holds for every convergent sequence \( x = (x_n) \). Besides the classical concept of comparing and estimating the speeds of convergence of sequences and series we use weakened criterion, called improvement of convergence ([1]). As an application regular matrices are used for increasing the order of approximation of Fourier expansions and Zygmund means of Fourier expansions in certain Banach spaces.

References

The Almost Everywhere Convergence Of The
Fourier-Laplace Series

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Abstract

In this paper we study the almost everywhere convergence of the spectral expansions related to the self-adjoint extension of the Laplace-Beltrami operator on the unit sphere. The sufficient conditions for summability of the Fourier-Laplace series is obtained. We have established the positive results on the almost everywhere convergence of Fourier-Laplace series by Riesz means of critical order $\frac{N-1}{2}$. The more general properties and representation in terms of eigenfunction expansion of the Laplace-Beltrami operator is used. We have constructed different method for investigating the convergence problems of Fourier-Laplace series, which based on the theory of spectral decompositions property of self-adjoint Laplace-Beltrami operator on unit sphere.

References


2000 Mathematics Subject Classification. 35P10, 42B05
Key words and phrases. Fourier-Laplace series, Operator Laplace-Beltrami, Almost everywhere convergence

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A New Approach to Quantile Regression

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Abstract

In this paper, we present a new approach to the quantile regression context that combine classical quantile regression approach given by Koenker and Bassett (1978) which estimates quantiles by specialized linear programming techniques, with expectile regression given by Efron (1991) and Newey and Powell (1987) which is very much related to the classical quantile regression. We try to compare these three methods. It is known that the quantiles also coincide with the maximum likelihood solution of the location parameter in a class of asymmetric distribution. In this regard, we present a new class of asymmetric distributions and investigate the properties and asymptotic behavior of maximum likelihood estimators of the parameters.

References

Exponential family and special entropy relation

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Abstract
In this article, we derive Taneja’s entropy formula for exponential family so that the derived formula by Menendez (2000) is a special case of it. We will obtain proper Taneja’s entropy formulas for Gamma, Beta and Normal distributions. At last we will review the asymptotic distribution of \( H_T(\hat{\theta}) - H_T(\theta) \) in regular exponential models. Let \( x, \beta, P_\theta, \theta \in \Theta \) be a statistical space where \( \Theta \) is an open subset of \( \mathbb{R}^m \). We consider that there exist p.d.f. \( f_\theta(x) \) for the distribution \( P_\theta \) with respect to a \( \sigma \)-finite measure \( \mu \). In 1975 Taneja introduced the generalized entropy as follows:

\[
H_T(\theta) = -2^{r-1} \int f_\theta(x) \log f_\theta(x) \, d\mu(x)
\]

which by taking \( r = 1 \), Shannon’s entropy is obtained. Salicru et al. [2] defined \( (h, \varphi) \)-entropy associated to \( f_\theta(x) \) as follows:

\[
H^\varphi_h(f_\theta(x)) = h \left( \int \varphi(f_\theta(x)) \, d\mu(x) \right)
\]

where either \( \varphi : [0, \infty) \to \mathbb{R} \) is concave and \( h : \mathbb{R} \to \mathbb{R} \) is an increasing and concave or \( \varphi \) is convex and \( h \) is a decreasing and concave. Furthermore we assume that \( h \) and \( \varphi \) are in \( C^3 \) (functions with continuous third derivatives). If we put \( \varphi(x) = x^r \log x \) and \( h(x) = -2^{r-1}x \) then the Taneja’s entropy formula is obtained. The exponential family of \( k \)-parameter distribution is:

\[
f_\theta(x) = \exp \left\{ \sum_{j=1}^k T_j(x) \theta_j - b(\theta) - R(x) \right\}
\]

(1)

Theorem: Let \( f_\theta(x) \) be a density of the form [1] with \( R(x) = 0 \), then:

\[
H_T(\theta) = -2^{r-1} \left[ \exp(-rb(\theta) + b(\theta)) \right] \left\{ \sum_{j=1}^k \theta_j \left( \frac{\partial b(\theta)}{\partial \theta_j} \right) - b(\theta) \right\}
\]

Pasha et. al [1] obtained the formula of divergence measure by use of Taneja’s entropy in exponential family.

References

The arithmetic foundations of mathematics: constructing new mathematics with negative numbers beyond infinity

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Abstract

The basic and fundamental concept underlying the foundations of mathematics is the notion of natural number. Negative numbers had been introduced to extend natural numbers to the set of all integers. Some properties of negative numbers had long been remaining unclear, in particular, the order relation between positive and negative numbers. There existed at least two approaches: (1) negative numbers are less than “nothing” (zero), $-1 < 0$ (Descartes, Girard, Stifel), (2) negative numbers are “greater” than infinity, $-1 > \infty$ (Wallis, Euler, and probably Pascal) [1].

We present theoretical statements of a new mathematical conception underlying the construction of a new theory [2] based on: (1) a new method for ordering the integers (first introduced, but in other form, in [3]): let $a, b \in \mathbb{Z}$, then $a < b \iff \frac{-1}{a} < \frac{-1}{b}$, thus getting $\mathbb{Z} = \{0, 1, 2, \ldots, -1\}$; the set $\mathbb{Z}$ can be geometrically represented as cyclically closed; (2) a new class of real regular functions $f(\cdot)$ and the definition of $\sum_{a}^{b} f(\cdot)$ that extends the classical definition to the case $b < a$: let $\mathbb{Z}_{a,b} = \{a, b\}$ if $a \leq b$ and $\mathbb{Z}_{a,b} = \mathbb{Z} \setminus \{b, a\}$ if $a > b$, $\mathbb{Z} \setminus \{b, a\} = \{a, -1\} \cup \{0, b\}$, then \( \forall a, b \in \mathbb{Z}, \sum_{k=a}^{b} f(k) = \sum_{k \in \mathbb{Z}_{a,b}} f(k) \); (3) a set of conditions imposed on regular functions. From these we define a new regular method for infinite series summation and find a unified approach to summation of divergent series, and to determination of limits of unbounded and oscillating functions.

In this new setting we recently elementarily evaluate the zeta function and the zeta alternating function at integer points [4-5]. We discover various surprising phenomena and unexpected results concerning some areas of mathematics, obtained within the framework of this new theoretical background, which is being further developed. We also discuss some aspects of future research which will be based on the theory to be formulated as a paradigm.

References


2000 Mathematics Subject Classification. 26A03, 40C15
secondaries: 40A05, 11B05, 11M06, 11B68, 54A05, 54F05, 26A09, 00A05

Key words and phrases. integers ordering, limits of functions, summation of series
Some Results on an Advanced Impulsive Differential Equation with Piecewise Constant Argument

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Abstract

In this paper, we consider the following first order advanced impulsive differential equation with piecewise constant argument

\[ x'(t) + a(t)x(t) + b(t)x([t+1]) = 0 \quad t \neq n \]  

\[ \Delta x(n) = d_n x(n) \quad n \in N = \{0, 1, 2, ...\} \]

and the initial condition

\[ x(0) = x_0 \]

where \( a, b : [0, \infty) \rightarrow R \) are continuous functions, \( d_n : N \rightarrow R \), \( \Delta x(n) = x(n^+) - x(n^-) \), \( x(n^+) = \lim_{t \rightarrow n^+} x(t) \), \( x(n^-) = \lim_{t \rightarrow n^-} x(t) \), and \( [.] \) denotes the greatest integer function. Throughout this paper it is assumed that the solution \( x(t) \) is right continuous at \([n] \), \( n \in [0, \infty) \). We established the exact solution of (1)-(3) on the interval \([0, \infty)\) and we study the existence of oscillatory and periodic solutions of the same equation.

References


2000 Mathematics Subject Classification. 34K11, 34K13, 34K45

Key words and phrases. Impulsive differential equation, Differential equation with piecewise constant argument, Oscillatory solution, Periodicity.
Some Forms Of The Banach-Steinhaus Theorem In The Locally Convex Cones

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Abstract

A cone is a set $P$ endowed with an addition and a scalar multiplication for non-negative real numbers. The addition is associative and commutative, and there is a neutral element $0 \in P$. For the scalar multiplication the usual associative and distributive properties hold. We have $1a = a$ and $0a = 0$ for all $a \in P$. A preordered cone is a cone with a reflexive transitive relation $\leq$ which is compatible with the algebraic operations. A subset $V$ of the preordered cone $P$ is called an (abstract) 0-neighborhood system, if $V$ is a subcone without zero directed towards 0. We call $(P,V)$ a full locally convex cone, and each subcone of $P$, not necessarily containing $V$, is called a locally convex cone. We require the elements of a locally convex cone to be bounded below, i.e. for every $a \in P$ and $v \in V$ we have $0 \leq a + \rho v$ for some $\rho > 0$. We verify some forms of the Banach-Steinhaus Theorem in the locally convex cones.
N-dimensional Moment invariants Based Approach for the analysis of Mammography Images using GRID

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Abstract

Mathematical morphology is a well-known image and signal processing technique. Mammography is among the most popular imaging techniques used in the diagnosis of breast cancer. The use of computer to assist clinicians in Digital mammography image screening has advantages over traditional methods. Computer Algorithms can enhance the appearance of the images and highlight suspicious areas. This paper describes the concept of digital mammography, its principles, moment invariants and a novel combination method for computer aided detection (CAD) that identifies structures of interest from medical images. Also describes expected advantages using Grid capability for mammogram image processing. Grids computing promises to resolve many of the difficulties in facilitating medical image analysis to allow clinicians to collaborate without having to colocate. In this technique, some digital image processing methods such as contrast, enhancement and segmentation are used for better processing the image in the next stage and for feature extraction stage of pattern recognition approach. This proposed recognition method includes four stages. In first stage, a preprocessing system is realized for analyzing and sorting the images. In second stage localization of Region of Interest (ROI). In third stage, extraction mechanism and obtaining unique features from the same group of patterns. In forth stage, an adaptive system is used for recognition process. Fast method for computing moment function, for gray-level images are also constructed.

References

[1] Tamas Hauer, Richard McClatchey, Mohammed Odeh, Tony Solomonides, Requirements for Large-Scale Distributed Medical Image Analysis
Analysis of a System of Multi-term Fractional Differential Equations with Polynomial Coefficients

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Abstract

In this paper we present analysis of the system of fractional differential equations:

\[
\left( D^{\alpha_n} - \sum_{j=1}^{n-1} p_j(t) D^{\alpha_n-j} \right) \left[ \vec{x}(t) - \vec{x}(0) \right] = A \vec{x}(t), \quad \vec{x}(0) = \vec{x}_0,
\]

where \(0 < \alpha_j < 1\), \(D^{\alpha_j}\) is the standard Riemann-Liouville fractional derivative and \(p_j(t) = \sum_{k=0}^{N_j} a_{jk} t^k, j = 1, 2, \cdots, n-1\). Further we discuss the initial value problem for nonlinear system:

\[
\left( D^{\alpha_n} - \sum_{j=1}^{n-1} p_j(t) D^{\alpha_n-j} \right) \left[ \vec{x}(t) - \vec{x}(0) \right] = \vec{f}(t, \vec{x}(t)), \quad \vec{x}(0) = \vec{x}_0,
\]

where \(\vec{f} : W(\subset \mathbb{R} \times \mathbb{R}^m) \rightarrow \mathbb{R}^m\). It is shown that for \(\vec{f}\) bounded, continuous and Lipschitz in the second variable, there exists unique solutions. The dependence of solutions on initial conditions has also been discussed. Riemann-Liouville fractional derivative/integral are defined below.

Let \(f \in C[a, b]\), the expression

\[
I_+^{\alpha} f(x) = \frac{1}{\Gamma(\alpha)} \int_a^x (x-t)^{\alpha-1} f(t) dt, \quad x > a,
\]

is called as left-sided fractional integral of order \(\alpha\) and the left-sided Riemann-Liouville fractional derivatives of order \(\alpha\) is defined,

\[
D_+^{\alpha} f(x) = \frac{d^n}{dx^n} \left( I_+^{n-\alpha} f(x) \right), \quad n-1 \leq \alpha < n, \quad n \in \mathbb{N}.
\]

References


2000 Mathematics Subject Classification. 34GXX

Key words and phrases. Fractional derivative/Integral, Sup norm, Gamma function, Volterra integral equation.

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New Dynamic Hysteresis Model by Means of Soft Computing Approach

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Abstract

The study and calculation of magnetic field in electrical machines required dynamic hysteresis model. On the basis of fuzzy clustering and Neuro-fuzzy identification capability of any kind of nonlinear, continuous functions represented by its discrete set of measured data, a new modeling technique for dynamic magnetic hysteresis is presented and compared with measured data. Four techniques are studied and compared, the first one is based on neuro-fuzzy technique by using an adaptive neuro-fuzzy system identification and the others are based in Gustafson-Kessel, Gath-Geva and EM fuzzy clustering algorithm. Very accurate prediction of dynamic hysteresis loops is observed, proving that the clustering and Neuro-fuzzy techniques are suitable for hysteresis modeling.
Asymptotically Central Net in Semigroup Algebras and Inner Invariant Extensions of Dirac Measures

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Abstract

Let $S$ be a locally compact semigroup with identity $e$ and $M_a(S)$ be the semigroup algebra of all complex Radon measures on $S$ with continuous translations. In this paper, we study the existence of quasi-central and asymptotically central nets in $M_a(S)$ of a locally compact semigroup $S$. We also, study inner invariant extensions of Dirac measures at $e$. 

2000 Mathematics Subject Classification. 43A07, 43A10, 43A20, 46H05.
Key words and phrases. Asymptotically central net, inner amenability, inner invariant mean, locally compact semigroup, quasi-central net.
A Comparative Study On The Response Of Prismatic And Non-Prismatic Timoshenko Beams To Accelerating Loads

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Abstract

The Dynamic response of Timoshenko beams of uniform and non-uniform cross-sections resting on elastic foundation whose rigidity is of a linear function and subjected to fast traveling concentrated loads of constant and varying magnitude is scrutinized using an elegant analytical approach. In particular, the spectral generalized Galerkin’s method in conjunction with Integral transform method is used to treat the problem of the coupled system of partial differential equations describing the transverse motion of the vibrating system. The specific aim is to compare the dynamic stability of Timoshenko beams of uniform and non-uniform cross-sections when under the actions of moving concentrated loads of constant and varying magnitudes. The closed-form solutions for both beam problems are obtained. Analytical and numerical Results show that as the foundation parameter \( K_0 \) increases the response amplitudes for both beam decrease. Results also show that foundation parameter \( K_0 \) produces a more noticeable effect on the deflection of a non-uniform beam than on a uniform beam when subjected to variable magnitude loads. It is equally established that, for higher values of foundation modulus, the risk of resonance is sufficiently reduced for both uniform and non-uniform Timoshenko beams resting on variable elastic foundation and under the actions of concentrated moving loads of any magnitude.

2000 Mathematics Subject Classification. 74H45, 74K10

Key words and phrases. Dynamic response, Dynamic Stability, Foundation parameter, Transverse motion, Timoshenko beam, Concentrated loads, Galerkin’s method, Resonance.
A Criterion Of Optimization Of A Modified Green’s Function In Two Dimensional Elastic Waves

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Abstract

In the work [*] an optimal choice of the multipoles coefficients is determined in a circular case of border. These complex factors involved in the modification of the Green’s function, who plays the role of the kernel of the modified integral operator’s in elasticity.

In this note, it is intended to identify relatively simple expressions of this coefficients for the particular case of circular border. And then to find an estimate of the norm of the modified integral operator’s in elasticity.

For this, we consider a domain D of circular border \( \partial D \) (\( \partial D \) is a circle for radius ‘\( a \)’), using the orthogonality proprieties between some vectors \( \{ F_{\sigma \varrho}^{\rho} \}_{\sigma,\varrho=1,2} \) \( m=0,\ldots,\infty \) who are involved in the definition of the modified Green’s function \( G_{1}(p, q) \), and the expressions of optimal choice for the coefficients of multipoles for a general domain’s obtained in [*], and taking into account the fact that the scalar product of vectors \( \{ F_{\sigma \varrho}^{\rho} \}_{\sigma,\varrho=1,2} \) \( m=0,\ldots,\infty \) in this case, is a calculation of integral in circle of radius ‘\( a \)’. We obtain a relatively simples expressions for optimal choice of the coefficients of multipoles, and thereafter, and by replacing the values of this coefficients in the expression of the modified integral operator’s \( K_{1} \), and using a developement of the modified Green’s function \( G_{1}(p, q) \), given by [*]:

\[
G_{1}(p, q) = \frac{1}{2} \left[ G^{D}(p, q) + G^{N}(p, q) \right]
\]

Where \( G^{D} \) and \( G^{N} \) are the Green’s functions for the Dirichlet and Neumann problems respectively. We prof that the norm of the modified integral operator’s \( K_{1} \) is zero. The interest of this result (\( \|K_{1}\| = 0 \)) is that the more we rely on approximate method to solve the integral equation obtained from the use of the integral representations method for the bounded problem defined in [*], at the moment we have more integral equation to be solved, because the fact that (\( \|K_{1}\| = 0 \)) drive then directly to the solution of the bounded problem.

References


2000 Mathematics Subject Classification. 65N38

Key words and phrases. multipoles coefficients, Green’s function, integral equations, elastic waves.
Boundary value problem for the linear Elasticity equations

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Abstract

In this paper, we consider a non linear boundary value problem governed by the equations that describe the evolution of an elastic body. Using the Faedo Galerkin techniques as well as a result of compactness we demonstrate the existence of a weak solution of the problem considered by passing to the limit. The unicity of the solution is demonstrated by removing a heavy enough hypothesis that has been considered by an other authors.

2000 Mathematics Subject Classification.
37L65, 47J35

Key words and phrases. Compacity, Elasticity, Faedo Galerkin, Gronwalle, Holder inequality, Non linear problem, Young inequality.
Mathematical Methods for Modeling of Lightning and Thunderstorm Electrification

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Abstract

The change in the electric potential due to lightning is evaluated. The potential along the lightning channel is a constant which is the projection of the pre-flash potential along a piecewise harmonic eigenfunction which is constant along the lightning channel. The change in the potential outside the lightning channel is a harmonic function whose boundary conditions are expressed in terms of the pre-flash potential and the post-flash potential along the lightning channel. The expression for the lightning induced electric potential change for the continuous equations are based on the properties of the eigenvalues and eigenfunctions of a generalized eigenproblem. The forcing term in the equation which is associated with the movement of charged particles by the wind can be estimated using the balloon-borne electric field sensors (Esonde). The data from the Esonde can be combined with simultaneous Lightning Mapping Array (LMA) measurements of VHF pulses emitted during lightning breakdown processes to estimate the charge transport associated with lightning. Using these techniques, we analyze lightning charge transport for a thunderstorm which occurred on August 18, 2004, near Langmuir Laboratory, New Mexico. The analysis yields the three dimensional current generator structure of the thunderstorm.

References


2000 Mathematics Subject Classification. 35, 65, 86
Key words and phrases. lightning, charge transport, Laplacian, eigenfunction
**This research was supported by National Science Foundation
Role of noncompatible and discontinuous mappings to prove coincidence and common fixed point theorems in various spaces

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Abstract

In this talk, we will discuss single valued and hybrid pair of noncompatible mappings. As applications of noncompatible mappings we will discuss some coincidence and fixed point theorems in metric spaces, fuzzy metric spaces, Menger spaces and intuitionistic fuzzy metric spaces etc. We will point out that continuity of any mapping is not necessary for the existence of common fixed point for noncompatible mappings. We will give some examples to validate our results. We will discuss some recent results and applications.

2000 Mathematics Subject Classification. 47H10, 54H25.

Key words and phrases. Noncompatible maps, Fuzzy metric spaces, Menger spaces, Intuitionistic fuzzy metric spaces, Intuitionistic Menger space, Common fixed point.
Modeling and Optimization in Estimating and Budgeting Projects Using Gath and Geva Fuzzy Clustering Approach

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Abstract

In this paper, a new modeling technique for estimating and budgeting project management is presented using a Gath and Geva fuzzy clustering approach. The Partition Coefficient (PC), the Dunn’s Index (DI) and the Alternative Dunn index (ADI) indices were used for validation of clusters number. The optimization of the number of clusters is significant for subsequent in modeling. However, cost estimates are to be used for bidding purposes; a poor estimation may have negative financial consequences. A cost over estimation bears the risk of making the firm uncompetitive and losing a customer, while underestimating the cost leads to winning a contract but incurring a financial loss. Furthermore, a precise knowledge of prospective resources utilization is critical for project management purposes when passing to the conceptual phase. The proposed model was tested on a set of twenty projects. Very accurate result was achieved, showing that, the clustering technique is more appropriate in modeling and financial budgeting of project management.

References

On Idealized Electromagnetic Singularities in Arbitrary Nonrelativistic Motion

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Abstract

In this talk we present the distributional derivatives in space (gradient, divergence, curl and Laplacian) and in time of generalized functions whose singular parts are concentrated on an arbitrary surface, an arbitrary space curve or a point in arbitrary nonrelativistic motion. Such generalized functions are described in a Schwartz-Sobolev space setting and represent arbitrary sources or field quantities in the equations of mathematical physics. Their regular components are locally integrable functions in the Lebesgue sense and their singular components are assumed to be constructed via the temporal and spatial derivatives of the Dirac-delta distribution of every order. We illustrate the applications of these mathematical tools to the field equations of classical electrodynamics under the postulation that they apply in the sense of distributions. The results cover initial, boundary/continuity, edge and tip conditions for concentrated sources in arbitrary nonrelativistic motion.

References


2000 Mathematics Subject Classification. 78A02, 46A11
Key words and phrases. Dirac-delta distributions, electrodynamics, initial, boundary, edge, tip conditions.
Stability and Optimal Control

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Abstract

We consider the problem of minimizing a quadratic cost functional $J = \frac{1}{2} \int_0^T (c_1 u_1^2 + \cdots + c_\ell u_\ell^2) \, dt$ over the trajectories of a left-invariant control system $\Sigma$ evolving on a matrix Lie group $G$, which is affine in controls. The final time $T > 0$ is fixed and there are no restrictions on the values of the control variables.

Each such invariant optimal control problem defines the appropriate Hamiltonian $H$ on the dual $g^*$ of the Lie algebra of $G$ through the Pontryagin’s Maximum Principle. The integral curves of the corresponding Hamiltonian vector field $\vec{H}$ (with respect to the minus Lie-Poisson structure on $g^*$) are called extremal curves. In this paper we are concerned with regular extremal curves. When the Lie algebra $g$ admits a non-degenerate invariant bilinear form $\langle \cdot, \cdot \rangle : g \times g \to \mathbb{R}$, the Hamilton equations take a more familiar form. This is always possible if $g$ is semisimple.

Lyapunov stability of Hamiltonian equilibria is investigated by using the energy-Casimir method. Explicit computations are done in the special case of the rotation group $SO(3)$.
Nonparametric regression: a brief overview and recent developments

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Abstract

A regression curve describes a general relationship between two or more quantitative variables. In a multivariate situation vectors of explanatory variables as well as response variables may be present. For the simple case of one-dimensional explanatory and response variables, \(n\) data points \(S := \{(X_i, Y_i), i = 1, 2, \ldots, n\}\) are collected. The regression relationship can be modeled by \(Y_i = m(X_i) + \varepsilon_i, i = 1, 2, \ldots, n\), where \(m(x) = E(Y|X = x)\) is the unknown regression function and the \(\varepsilon_i\)'s are independent random errors with mean 0 and unknown variance \(\sigma^2\).

Nonparametric methods relax on traditional assumptions and usually only assumes that \(m\) belongs to an infinite-dimensional collection of smooth functions.

Several popular nonparametric estimators are discussed, mostly of the form \(\hat{m}(x) = \frac{1}{n} \sum_{i=1}^{n} W_{n,i}(x) Y_i\), where \(\{W_{n,i}\}_{i=1}^{n}\) denotes a sequence of weights depending on the explanatory variables. Several kernel and nearest neighbour approaches to the weight functions are considered. Each of these estimators depends on a smoothing parameter and the issue of estimating it is discussed briefly.

The performance of \(\hat{m}(x)\) is assessed via methods involving the mean squared error (MSE) and the mean integrated squared error (MISE).

Two recent developments of improving the performance of \(\hat{m}(x)\) are discussed, namely “boosting” and “bagging”, which are respectively an iterative computer intensive method, and an averaging method involving the generation of bootstrap samples. These methods, together with variations of these methods, for example the method referred to as “bragging”, are illustrated.
On Curvature inheriting symmetry in Finsler space

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Abstract

K. L. Duggal[1] has studied Curvature inheritance symmetry in Riemannian space with application of fluid space time and also Ricci curvature inheriting symmetry of semi-Riemannian manifolds were introduced by K. L. Duggal and R. Sharma [2]. In this paper we have study on Curvature inheritance symmetry and Ricci-Inheriting symmetry in Finsler space and investigated some results.

References


Adaptive Error Estimation for Linear Functionals
Approximation and Applications

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Abstract

While concerning numerical approximation to bounded linear functionals, the approximate errors are generally discussed
by derivatives of the highest orders regarding the exactness degrees of the approximate functionals. This approach, however,
is only valid for functions with sufficient smoothness. For less smooth functions, the Peano/Sard kernels theorems are known
to be useful tools. Actually, the Peano/Sard theorems supply error representations of full orders, including the highest
order representation. Therefore, depending on the smoothness of the underlying functions, there can be more alternatives
to represent an approximation error. It thus makes adaptive local error estimation possible. These important mathematical
results have no more only the theoretical values, by automatic differentiation and interval arithmetic, the kernels method
finally can be realized in numerical computation on computers. One critical task prior to their applications is the nontrivial
calculation of Peano Sard constants. The talk will present all these aspects and their applications in numerical integration.

References

Fixed points and fuzzy stability of a quadratic-quartic functional equation

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Abstract

Using the fixed point method, we prove the generalized Hyers-Ulam stability of the following quadratic-quartic functional equation

\[ f(2x+y) + f(2x-y) = 4f(x+y) + 4f(x-y) + 2f(2x) - 8f(x) - 6f(y) \]

in fuzzy Banach spaces.
Semilinear Evolution Equations on Discrete Time

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Abstract

This work deals with the existence and stability of solutions for semilinear equations on Banach spaces by using recent characterizations of discrete maximal regularity. As application we examine the asymptotic behavior of discrete control systems.

References


2000 Mathematics Subject Classification. 39A12, 39A11, 47D06

Key words and phrases.
Fractional Differential Equations in term of Comparison Results and Lyapunov Stability with Initial Time Difference

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Abstract

The qualitative behaviour of a perturbed fractional differential equation that differs in initial position and initial time with respect to the unperturbed fractional differential equation have been investigated. We compare the classical notion of stability to the notion of initial time difference stability for fractional differential equations. We present a comparison result which again gives the null solution a central role in the comparison fractional differential equation when establishing initial time difference stability of the perturbed fractional differential equation with respect to the unperturbed fractional differential equation.

References


2000 Mathematics Subject Classification.34D10, 34D99.
Key words and phrases.fractional differential equation, perturbed fractional differential systems, initial time difference stability.
Inverse System in the category of Šostak Fuzzy Topological Spaces

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Abstract

The aim of the talk is to introduce and study inverse system and series of its properties in the category of Šostak fuzzy topological spaces. Let $\mathcal{SFTS}$ be the category of Šostak fuzzy topological spaces and $J$ be direct poset (consider as a category).

Definition 1. Any functor $D : J^{op} \rightarrow \mathcal{SFTS}$ is called an inverse system in $\mathcal{SFTS}$, the limit of $D$ is called an inverse limit of $D$.

Theorem 2. Every inverse system in the category of $\mathcal{SFTS}$ has a limit, and this limit is unique.

Theorem 3. Let $\text{Inv}(\mathcal{SFTS})$ be a category of all inverse systems in $\mathcal{SFTS}$ and all mappings between them. Then $\lim$ operation is a functor from the category of $\text{Inv}(\mathcal{SFTS})$ to the category of $\mathcal{SFTS}$.

Theorem 4. If $\left( \left( \left( I^N, \tau, \tau^* \right) \right)_{i \in J}, \left( p^i \right)_{i \prec i'} \right)$ is an inverse system of Smooth fuzzy compact Hausdorff spaces, then $\lim_{\leftarrow} I^N$ is a Smooth fuzzy compact space.

References


2000 Mathematics Subject Classification. 54A40, 08A05, 18A30, 18A35

Key words and phrases. Inverse system; Šostak fuzzy topological space; Mapping of inverse system; Limit of inverse system, Bitopological fuzzy spaces; Sum and product operations; Smooth compactness.
Time Optimal Control Problem Via Differential
Inclusions

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Abstract
We prove existence of solution to the second order differential inclusion of the form

\[ \ddot{u}(t) \in F(u(t), \dot{u}(t)) , \quad u(0) = u(1) = 0 \]  

(1.1)

An application to a time optimal control problem is given under conditions that are weaker than the usual assumptions of
convexity.

References

2000 Mathematics Subject Classification. 34A60, 49J52

Key words and phrases. Differential inclusion, autonomous case, optimal control.
Semi-analytical Solution of the First and Second Kind Abel Integral Equations Using Fractional Differential Transform Method

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Abstract

In this paper, we present a method for solving Abel integral equations of the first and second kinds, which is based on the Fractional Differential Transform method. Performance of the method is illustrated on some examples that verify the expected accuracy.

2000 Mathematics Subject Classification. 65R20

Key words and phrases. Fractional differential transform method (FDTM), Abel integral equations.
A Specific Artificial Neural Network based Model for the Identification of Pollution Sources

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Abstract

The aim of the present work is to suggest an original approach based on the concept of training of an artificial neural network input or IT-Net in order to predict the possible sources of pollution. The IT-Net is composed of three layers of neurons of which one is hidden. The output layer contains m neurons corresponding to the dimension of pollutant concentration noted x. The input layer is composed of one neuron corresponding to the distance between the sources of pollution and the pollutant concentration sensor. Instead of proceeding to a phase of training with five layers of neurons, it appears more interesting to only apply the same phase of training to a part of the network involving three layers. This approach is promising as it extends the back-propagation algorithm as long as the error function is well-defined. The difference between this form in the input training network and multi-layers perceptron is that the input is not necessarily known because it represents sources of pollution searched in a river for example. Therefore during the phase of training, it becomes necessary to adjust not only the external parameters of the network but also the values of the input by minimizing the error of the network output. The training of an IT-Net enables determining the existing relationship between sources of pollution and data of pollutant concentration.
Exemples of differential games with stochastic perturbations associated with solutions of Nash equilibrium and open loop strategies

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Abstract

This paper contained some exemples of differential games with stochastic perturbations associated with solutions of Nash equilibrium and open loop strategies. The necessary conditions for Nash equilibrium solutions can be obtained using variation calculus and Hamilton-Jacobi equations associated with optimal control problem. An optimal control problem, usually, is defined by the same elements as a differential game with open loop strategies, with the difference that, this time, we have just one functional which must be minimized in comparison with admissible comands.

References

Transitive Designs Constructed From Finite Groups

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Abstract

Let $G$ be a finite group. We describe a construction of 1-designs admitting an automorphism group isomorphic to $G$. The designs are constructed by defining incidence structures on conjugacy classes of subgroups of the group $G$. The group $G$ acts transitively on the set of points and the set of blocks of the constructed design. Some of the constructed 1-designs are also 2-designs. We apply this method to construct transitive 2-designs from some finite simple groups. One can use this method to construct other combinatorial structures admitting transitive automorphism group, e.g., strongly regular graphs.

2000 Mathematics Subject Classification. 05B05, 05B20, 05E30

Key words and phrases. combinatorial design, strongly regular graph

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He's Homotopy Perturbation Method for a General Riccati Equation

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Abstract

The factorization method of the Hamiltonian in Quantum Mechanics involves solving a particular type of Riccati equation. In this paper, He’s homotopy perturbation method is applied to a general Riccati equation. The solutions introduced in this paper are in recursive sequence forms which can be used to obtain the closed form with the property of being exactly solvable. This property generally means that one can solve the eigenvalue problem completely for the Hamiltonian operator. The method is tested on various examples which are revealing the effectiveness and the simplicity of the method.

References


2000 Mathematics Subject Classification. 65L99, 34L30
Key words and phrases. homotopy perturbation method, Riccati equation, nonlinear equations.
Introduction Of A Circular Number Line

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Abstract
The present paper introduces a circular number line, the superset of imaginary number line previously given by Yadav[1] and an imaginary circular plane, the superset of circular complex plane given by Yadav[2]. It also introduces the new concepts of imaginary circles and imaginary spheres. Taking different values of n, the natural numbers in in, we find that it takes all the values on the imaginary number line. Giving in the geometrical meaning as the sum of arithmetical distances, we find that the values of in lie on a circle and the imaginary number line lies on this circle, which gives the concept of circular number line. This circular number line is not a straight line but is a circle of imaginary radius. At last some axioms of Elliptical geometry and Euclidean geometry have been observed true in the paper. These axioms have been observed on the imaginary sphere and imaginary circle. The circular number line, imaginary circle and imaginary sphere will play a major role in explaining the concepts of Elliptical geometry and Hyperbolic geometry as well as they will be very helpful in explaining the universe geometrically. In fact the author has given D- theory of Universe by combining different theories of the universe.

2000 Mathematics Subject Classification.14H50, 14H45, 30A99, 97B60, 51M10, 51M09, 51M30.
Key words and phrases.Real Numbers, Real number Line, Imaginary Unit 'i', Imaginary Numbers, Imaginary Number Line, Imaginary Circle, Imaginary Sphere, Axioms of Elliptical Geometry, Hyperbolic Geometry and Euclidean Geometry etc.
Domination dot-critical on a Harary graph

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Abstract

A set of vertices $S$ in a graph $G$ is a dominating set if every vertex of $G - S$ is adjacent to some vertex of $S$. If $S$ has the smallest possible cardinality of any dominating set of $G$, then $S$ is called a minimum dominating set—abbreviated MDS. The cardinality of any MDS for $G$ is called the domination number of $G$ and is denoted by $\gamma(G)$ [3]. More generally, we say that a set of vertices $A$ dominates the set $B$ if every vertex of $B - A$ is adjacent to some vertex in $A$. A vertex $v$ of $G$ is critical if $\gamma(G - v) < \gamma(G)$. A graph $G$ is vertex-critical if every vertex of $G$ is critical. We denote the set of critical vertices of $G$ by $G'$. In [2], Burton et al. introduced a new critical condition for the domination number. A graph is domination dot-critical (hereafter, just dot-critical) if identifying any two adjacent vertices (i.e., contracting the edge comprising those vertices) results in a graph with smaller domination number. If identifying any two vertices of $G$ causes the domination number to decrease, then we say that $G$ is totally dot-critical. For a pair of vertices $a, b$ of $G$, we denote by $G.ab$ the graph obtained by indentifying $a$ and $b$. When we say that $G$ is $k$-edge-critical, $k$-vertex-critical, $k$-dot-critical, or totally-$k$-dot-critical, we mean that it has the indicated property and that $\gamma(G) = k$, for more, see [1, 2, 5]. Given $k \leq n$, place $n$ vertices around a circle, equally spaced. If $k$ is even, form $H_{k,n}$ by making each vertex adjacent to the nearest $k/2$ vertices in each direction around the circle. If $k$ is odd and $n$ is even, form $H_{h,n}$ by making each vertex adjacent to the nearest $\frac{k-1}{2}$ vertices in each direction and to the diametrically opposite vertex. In each case, $H_{k,n}$ is $k$-regular. When $k$ and $n$ are both odd we construct $H_{k,n}$ from $H_{k-1,n}$ by adding an edge between vertices $i$ and $\frac{i(2n-1)}{2}$ for each $1 \leq i \leq \frac{2n-1}{2}$. The graph $H_{k,n}$ in each case is known as Harary graph $H$ that $V(G) = \{1, 2, \cdots, n\}$ ([6]). Domination number in Harary graphs have been studied in ([4]). In this note, we investigate the critical, dot-critical and totally dot-critical of the first type of Harary graphs, that is, $H_{2m,n}(k = 2m)$.

References

Acceptance Single Sampling Plan with Fuzzy Parameter

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Abstract

Single sampling plan for acceptance or rejecting a lot is an important subject in statistical quality control. This plan is one of the sampling method for acceptance or rejection which is along with classical attribute quality characteristic. This plan has a sample size n and acceptance number c. If the number of defective items is less than or equals to c, the lot will be accepted. However, the fraction of defective items (quality characteristic) in a lots is not often exact and certain. Estimations and personal judgments are the useful response for inexactness and ambiguity. In different acceptance sampling plan the fraction of defective items (p), is considered as a precise value, but this precision is not true in real world and decision making problems, and there also exist some uncertainty in the value of p obtained from experiment, personal judgment or estimation. The theory of fuzzy sets is widely used in solving problems in which parameter or quantities cannot be expressed precisely. The theory is a powerful and well-known tool to formulate and analyze the uncertainty resulting from ambiguity and personal judgment. In dealing with the above problem we tried to restore the uncertainty existing in the problem by defining the imprecise parameter as a fuzzy number, and achieve a result with a higher certainty. With this definition, the number of defective items in the sample has a fuzzy binomial probability distribution. In this paper we discuss the acceptance single sampling plan when the fraction of nonconforming products is a fuzzy number. We have shown that the operating characteristic (OC) curve of the plan is like a band having high and low bounds whose width depends on the ambiguity proportion parameter in the lot when that sample size and acceptance number is fixed. When the acceptance number equals zero, this band is convex for different n s and for large n, the convexity will be more. Finally we have given some examples and then compared the OC bands for some values of c.

2000 Mathematics Subject Classification. 62p30

Key words and phrases. Statistical quality control, acceptance single sampling, fuzzy number.
Defining sets of Combinatorial Designs: Recent Developments

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Abstract

In this talk, the defining set problem will be defined for combinatorial designs. Loosely speaking a defining set of a combinatorial design \( D \) is a partial design \( S \) contained in the design such that \( D \) is the unique completion of \( S \) to a design with the given parameters. The emphasis of this talk will be on defining sets of full designs and their connections with the defining sets of other \( t \)-designs. The new found families of minimal defining sets of full designs will be given. And final results on spectrum of minimal defining sets of these designs will be presented.
Silver graphs

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Abstract

A problem was given in the International Mathematical Olympiad in 1997 (IMO97–Problem 4) on “silver matrices”. It came from a research problem in graph colorings called defining sets and in latin squares critical sets, Mahdian and Mahmoodian [2]. In a given graph G, a set of vertices S with an assignment of colors is called a defining set of the (proper) k–coloring if there exists a unique extension of the colors of S to a k–coloring of the vertices of G. A defining set with minimum cardinality is called a minimum defining set and its cardinality is the defining number, denoted by $d(G,k)$. Existence of a silver matrix of order n is equivalent to $d(K_n\square K_n,2n-1) = n^2 - n$. Recently we have studied silver d–cubes [1], that is when we have

$$d(K_n\square K_n\square \cdots \square K_n, dn - d + 1) = n^d - n^{d-1}.$$ Silver d–cubes are attractive, challenging to construct, and appear to be connected with classical combinatorics, including coding theory and projective geometry.

In general a silver graph is defined as follows. Let $c$ be a proper $(r+1)$-coloring of an r-regular graph G. A vertex $x$ in G is said to be rainbow with respect to c if every color appears in the closed neighborhood $N[x] = N(x) \cup \{x\}$. Given a maximum independent set $I$ of G, the coloring $c$ is said to be silver with respect to $I$ if every $x \in I$ is rainbow with respect to $c$. We say G is silver if it admits a silver coloring with respect to some diagonal. If all vertices of G are rainbow, then $c$ is called a totally silver coloring of G and G is said to be totally silver. In this talk we will discuss silver graphs and its relation with some concepts in combinatorics and graph theory and at the end some unsolved problems will be stated.

References

The Characterisation of Compact Operators on Spaces of Strongly Summable and Bounded Sequences

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Abstract

We use the characterisations of the classes of all infinite matrices that map the spaces of sequences which are strongly summable or bounded by the Cesàro method of order 1 into the spaces of null or convergent sequences, given by Başar, Malkowsky and Altay in [Publ. Math. 73(1-2)(2008), 193–213], and the Hausdorff measure of noncompactness to characterise the classes of all compact operators between those spaces.
On weak nil-Armendariz rings

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Abstract

Rege and Chhawchharia introduce the notion of an Armendariz ring. A ring $R$ is Armendariz if whenever $f(x)g(x) = 0$ where

\[ f(x) = a_0 + a_1x + \cdots + a_nx^n \]

and

\[ g(x) = b_0 + b_1x + \cdots + b_mx^m \]

\[ \in R[x], \]

then $a_ib_j = 0$ for each $i$ and $j$. The name of the ring was given due to E. Armendariz who proved that reduced rings (i.e. rings without nonzero nilpotent elements) satisfied this condition. Armendariz rings are thus a generalization of reduced rings, and therefore, nilpotent elements play an important role in this class of rings. There are many examples of rings with nilpotent elements which are Armendariz.

A ring is weak Armendariz if whenever the product of two polynomials is zero then the product of their coefficients is nilpotent. This further motivates the study of the nilpotent elements in this class of rings.

We call a ring $R$ weak nil-Armendariz if whenever $f(x)g(x) \in \text{nil}(R)[x]$ where

\[ f(x) = a_0 + a_1x + \cdots + a_nx^n \]

and

\[ g(x) = b_0 + b_1x + \cdots + b_mx^m \]

\[ \in R[x], \]

then $a_0b_j \in \text{nil}(R)$ for each $j$.

We prove that if $R$ is a nil-Armendariz ring, then the set of nilpotent elements of $R$ is a subring without unit of $R$. This allows us to study the conditions under which the polynomial ring over a nil-Armendariz ring is also nil-Armendariz. These conditions are strongly connected to the question of Amitsur of whether or not a polynomial ring over a nil ring is nil.
An Extension of the Poisson-Lindley Distribution and its Applications

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Abstract

An extended version of the compound Poisson distribution is obtained by compounding the Poisson distribution with the generalized two-parameter Lindley distribution. This paper offers a three-parameter generalized Poisson-Lindley distribution, which generalizes Poisson-Lindley distribution, as a model for count data. This distribution provides enough flexibility for analyzing different types of count data. The study examines various properties of this model. The behavior of the density function, the expressions for the moments, the distribution of the sums of random variables and truncated and weighted versions of this distribution is obtained. Estimation of the parameters is discussed using the method of moments and maximum likelihood estimators. A simulation study is carried out to investigate the average bias and average mean square error (MSE) of the simulated estimates. An application of this distribution, including several examples of the fitting of this distribution to data, and comparing with other discrete distributions, are given.

References


2000 Mathematics Subject Classification. primary: 62E10, 62E15 secondaries: 62F10, 62F12

Key words and phrases. Poisson-Lindley distribution, Truncated distributions, Weighted distributions
On some new sequence spaces with an index defined by a modulus function

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Abstract

In this paper we define the following sequence spaces by using a modulus function

\[ \hat{w}_p(f) = \left\{ x : \sum_{k=0}^{\infty} k^{p-1} f\left(|d_{km} - d_{k-1,m}|\right) \text{ converges uniformly in } m \right\} \]

\[ \hat{\hat{w}}_p(f) = \left\{ x : \sup_m \sum_{k=0}^{\infty} k^{p-1} f\left(|d_{km} - d_{k-1,m}|\right) < \infty \right\} , \]

where \( p \geq 1 \) and

\[ d_{km} = d_{km}(x) = \frac{1}{(n+1)} \sum_{k=0}^{n} t_{km}(x). \]

We also get some inclusion relations. Note that if \( f(x) = x \), then we get \( \hat{w}_p(f) = \hat{w}_p \) and \( \hat{\hat{w}}_p(f) = \hat{\hat{w}}_p \). If \( p = 1 \), then \( \hat{w}_p = \hat{w} \), which was defined in [1].

References

On Double Lacunary $\Delta_{\sigma}$-Statistical Convergence of sequences of Fuzzy numbers

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Abstract

Quite recently, Savas and Mursaleen [1] defined the statistical analogue for double sequences $X = \{X_{k,l}\}$ of fuzzy numbers as follows: A double sequences $X = \{X_{k,l}\}$ is said to be P-statistically convergent to $X_0$ provided that for each $\epsilon > 0$

$$P - \lim_{m,n \to \infty} \frac{1}{mn} \sum_{j \leq m, k \leq n} d(X_{j,k}, X_0) \geq \epsilon = 0.$$

In this paper we introduce and study double lacunary $\Delta_{\sigma}$-statistical convergence for sequences of fuzzy numbers and also we get some inclusion theorems.

References

The algorithms of the program control construction for some classes of the dynamic systems

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Abstract

In this article the program control tracing algorithm is considered for some dynamic systems, which evolve on the dynamic varieties. These algorithms are based on the differential equation systems construction, which have given in advance the collection of the first integrals. The first algorithm is used the stochastic systems and the second is for the determinate systems. The main idea of these algorithms is based on the first integral of SDE system definition, given by prof. V. Doobko [1].

The program control of the stochastic system with the probability equaled to 1

Let us consider the SDE system with control:

\[ dx(t) = [P(t; x(t)) + Q(t; x(t)) \cdot s(t; x(t))] \cdot dt + R(t; x(t)) \cdot dw(t), \]

where \( x(t) \) is a \( n \)-dimensional stochastic process, \( w(t) \) is a \( m \)-dimensional standard Wiener process. The solution \( x(t) = x(t; 0; x_0, s) \) of the stochastic system (1) is called a program motion if it allows to stay on the given integrated variety \( w(t; x(t); \omega) = w(0; x_0) \) with the probability equaled to 1 for all time \( t \) at some \( s \). This variety defines the first integrals of the equations \( dx(t) = A(t; x(t)) dt + R(t; x(t)) \cdot dw(t) \) with the given initial condition \( x(t; x_0) \) = \( x_0 \). Thus we shall name the non-random function \( s = s(t; x(t)) \) as the program control for the dynamic stochastic system. The theory of the first integral of SDE system in the prof. Doobko’s sense [1] allows to construct the new SDE system. In this system the coefficients \( A \) and \( B \) are determined through the given dynamic variety surface for the system. This surface is invariant for the system (1) with the probability equaled to 1, and it may be considered as the first integral collections of this SDE system [2]. The congruence of the coefficients of the equations (1) and new equation make possible define the control \( s(t; x(t)) = (s_1, \ldots, s_n)^T \) and the reaction on random effect \( B(t; x(t)) \).

The continuous program control of the determinate system

As a rule definition of the program control of determinate systems is considered for the discreet points only, which define the system position by the given periods of time. The specificity of our approach is that the controlled system is on the given dynamic variability at any time.

We construct the class of the differential equations similar to [1]

\[ dx(t) = A(t; x(t)) \cdot dt \]

which have given the first integrals collection \( \{u_i(t; x)\}_{i=1}^N, N \leq n \). Then the program control \( s(t; x(t)) \) for system

\[ dx(t) = [P(t; x(t)) + Q(t; x(t)) \cdot s(t; x(t))] \cdot dt \]

is as the solution of equation \( A(t; x(t)) = P(t; x(t)) + Q(t; x(t)) \cdot s(t; x(t)) \). The conditions for the matrix \( Q \) and the invariant surfaces are defined for the different dimensions control \( s \).

References


2000 Mathematics Subject Classification. primary:93C10, secondaries:37A50, 93E03
Key words and phrases. program control, dynamic variety, stochastic and determined system
Optimal Control of The Elliptic Type Differential Inclusions with Dirichlet and Neumann Boundary Conditions

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Abstract

The talk deals with optimization the Dirichlet and Neumann Problems for differential inclusions where the right-hand side is governed by set-valued mapping. The set-valued mapping depends not only of required function, but also the first partial derivatives of these functions. This generalization is very important and the results obtained can’t be deduced from the results considered before [2]. Formulations of sufficient conditions are based on the discretization idea of continuous problem and equivalence theorems [1]. Thus in the form of Euler-Lagrange inclusion sufficient conditions for optimality are derived for which are used locally adjoint mappings. In general, we establish necessary and sufficient conditions for so-called discrete approximation problem on a uniform grid. These conditions take an intermediate place between discrete and continuous problems.

References

Optimal Control of Discrete and Differential Inclusions in Gradient Form

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Abstract

This talk is dedicated to optimization of so-called first order differential inclusions in gradient form on a square domain. As a supplementary problem, discrete-approximation problem is considered. In the Euler-Lagrange form, necessary and sufficient conditions are derived for problems and partial differential inclusions, respectively. The results obtained are based on a new concept of locally adjoint mappings. The duality theorems are proved and duality relation is established.

References

The New Numerical Algorithms For Solving Multiplicative Differential Equations

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Abstract
The mathematical modelling of most phenomena in science and engineering are based on differential equations. But, one can observe that this is not possible to define some problems through classical concepts. While one problem can be easily expressed in one calculus, the same problem can not be expressed as easily as the others. From the point of view of M. Grossmann and R. Katz some new calculi were alternatively defined. Multiplicative calculus and multiplicative differential equations involving multiplicative derivatives become very important in recent studies.

In this study, we define multiplicative Adams Bashforth-Moulton algorithms using the exponential Newton backward division formula for solving multiplicative differential equations. Afterwards, a problem is solved and the error estimations are considered. Solutions are compared with analytic ones.

References

2000 Mathematics Subject Classification.
Key words and phrases. Multiplicative calculus, multiplicative backward division formula, adams methods
On New Inequalities Via Convex Functions

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Abstract
The aim of the present note is to establish some new inequalities for convex functions by using a fairly elementary analysis.

References

2000 Mathematics Subject Classification. Primary 26A51, Secondary 26D07, 26D15
Key words and phrases. Convex functions, convexity, inequalities.
On optimal vertex colorings of graphs

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Abstract

Let \( c \) be a \( k \)-coloring of a graph \( G \), then the number of different colors which appear in \( N(v) \) is called the coloring degree of \( v \) with respect to \( c \) and denoted by \( Cd_c(v) \). \( K \)-coloring index of \( G \) is denoted by \( Ci_k(G) \) and defined as

\[
Ci_k(G) = \min \{ \sum_{v \in V(G)} Cd_c(v) \}
\]

which, the minimum is over all \( k \)-colorings of \( G \). A coloring \( c \) is called an optimal coloring of \( G \) if

\[
\sum_{v \in V(G)} Cd_c(v) \leq Ci_k(G), \forall k.
\]

In this paper we provide some essential conditions for coloring \( c \) to be an optimal coloring and provide an algorithm to create an optimal coloring of a graph \( G \) as a conjecture along with some open problems.
Linear Operator on univalent Function of Complex Order

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Abstract

In the present paper, the author obtains the sharp Fekete-Szego Inequalities for a new class defined on the open unit disk. The author also obtains some properties of this class which is defined by linear operators.

References


2000 Mathematics Subject Classification. 30C45, 30C50.

Key words and phrases. Subordination, Fekete-Szego Inequalities, Linear Operator.
Dynamics for hyperbolic non-invertible maps

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Abstract

We will talk about methods and results in the dynamics of hyperbolic non-invertible maps. One important direction is that of applying thermodynamical formalism (entropy, pressure, inverse pressure) to study various metric properties of fractals obtained from iterations of hyperbolic maps on basic sets. For example inverse pressure helps us estimate the Hausdorff dimension of fractal intersections in the basic set. Another direction is the ergodic study of the invariant measures supported on such sets, in particular the equilibrium measures, and their conditional measures relative to various partitions.

2000 Mathematics Subject Classification. 37C, 37D, 37F.

Key words and phrases. dynamics of hyperbolic non-invertible maps, ergodic theory.
Modified Atkinson method: Forward Search algorithm

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Abstract

The method discussed in this paper is Atkinson’s Forward Search Algorithm (Atkinson, 1994). This is a powerful robust statistical method for detecting multiple outliers. Multiple outliers can have a strong influence on the model fitted to data.

The Forward Search seeks to distinguish a larger “clean” part, which is called the “good” class, from outlier data, the “bad” class. When there are two separated groups in the data, it rejects one of the groups in favour of the other. The main strategy is to separate “good” from “bad” data, where the “good” data lie in one of the clusters and the “bad” lie in the remaining clusters. Real data however might contain more than one class of “good” data in addition to the outliers group. In this paper the standard method will be extended and applied sequentially. That is, the method is applied on the data to identify a “good” group in the data, then remove this group and apply the method again to get the next “good” group from the rest of the data, and so on until all the observations are classified into their groups and one of these group is the outliers class. The main problem, in this case, is that the first “good” data may only contain a small portion of the observations. This matter will be discussed in detail in this work and some applications on different data are presented.

2000 Mathematics Subject Classification. 62-09

Key words and phrases. Atkinson method, Least Median Square, Outliers, stalactite.
Advanced Thermal Imaging and Measurement Techniques: Application to a Printed Circuit Board

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Abstract

Thermal management is vital to the successful design, manufacturing and operation of the most modern electronic systems. The objective of this paper is to describe an experimental setup using an infrared camera system to characterize thermal behavior of the electronic components. A comparison is given for the use of two different coatings to create a uniform surface emissivity within a variety of experimental situations. New oil based heat sink has been implemented. The effect of oil flow regime has also been presented. In addition, three dimensional thermal simulation of the device under test has been performed and the results obtained were compared to experimental test results.
Numerical solutions of NBSP for elliptic equations

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Abstract

In present paper joint with Prof. Allaberen Ashyralyev, Fatih University, we consider the Neumann Bitsadze Samarskii

\[
\begin{aligned}
- u_{tt} - \sum_{r=1}^{n} (a_r(x) u_{x_r})_{x_r} + \delta u &= f(t, x), \\
0 < t < 1, x = (x_1, \ldots, x_n) &\in \Omega, \\
u_t(0, x) &= \varphi(x), x \in \Omega, \\
u_t(1, x) &= \beta u_t(\lambda, x) + \psi(x), x \in \Omega, |\beta| \leq 1, 0 \leq \lambda < 1, \\
\frac{\partial u(t, x)}{\partial u} &= 0, 0 \leq t \leq 1.
\end{aligned}
\]

with \( \psi(x), \varphi(x) \ (x \in \Omega) \) and \( f(t, x) \ (t \in (0, 1), x \in \Omega) \) are smooth functions. Here \( \Omega \) is the unit open cube in the
n-dimensional Euclidean space \( \mathbb{R}^n \) \( (0 < x_k < 1, 1 \leq k \leq n) \) with boundary \( S, \partial \Omega = \Omega \cup S, \delta \) is a large positive constant.

We are interested in studying the stable difference schemes for the numerical solution of the nonlocal boundary value problem (1). The first and second orders of accuracy difference schemes are presented. A modified Gauss elimination method is used for solving these difference schemes for the two-dimensional elliptic differential equation. The method is supported by numerical examples.

References


2000 Mathematics Subject Classification. 65M06, 65J10
Key words and phrases. elliptic equation, difference scheme, stability.
An Algorithm for Robot Path Planning in Environments with Flashing Off-On Obstacles, Using Cellular Automata

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Abstract

This paper presents a new algorithm based on Cellular Automata (CA) for robot path planning. The main novelty in our algorithm is that it can handle the path planning of environments that contain not only stationary obstacles, but also contain flashing on-off obstacles with different fixed flashing periods. Using flashing on-off obstacles with different periods, combined with stationary obstacles, we can model numerous interesting real world path planning problems. Herein the path computation is performed by successive application of some simple transition functions and the proofs show both progress and safety properties are preserved by algorithm. That means algorithm “finally converges” and “no bad” situation happens. Verification against safety property is crucial, because unlike environments that only contain stationary obstacles, in environments where some obstacles flash on and off, we have to ensure that robot never collides with any stationary and flashing obstacles. We used linear temporal logic to formally specify the problem, safety and progress properties. Finally some interesting case studies inspired from real world problems have been tested by algorithm. The results are promising and indicate that the algorithm is time and space efficient in application.
Multiple-Criteria Assembly Flowshop Scheduling Problem

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Abstract

Different performance measures are considered in the scheduling research. These performance measures may be classified as completion time related or due date related. Makespan ($C_{\text{max}}$), a completion time related performance measure, is one of the most widely used performance measures. Minimizing makespan is important in situations where a simultaneously received batch of jobs is required to be completed as soon as possible. For example, a multi-item order submitted by a single customer needs to be delivered as soon as possible. The makespan criterion also increases the utilization of resources. Minimizing maximum lateness ($L_{\text{max}}$) is a widely used due date related measure. This objective is particularly important in situations where there is a penalty to complete a job beyond its due date and the penalty increases with the gap between the two. We consider a two-stage assembly flowshop scheduling problem with the objective of minimizing a weighted sum of makespan and maximum lateness. The problem is known to be NP-hard, and therefore, we propose heuristics to solve the problem. The proposed heuristics are Tabu search (Tabu), particle swarm optimization (PSO), and self-adaptive differential evolution (SDE). An extensive computational experiment is conducted to compare the performance of the proposed heuristics. The computational experiment reveals that both PSO and SDE are much superior to Tabu. Moreover, it is statistically shown that PSO perform better than and SDE. The computation time of both PSO and SDE are close to each other and it is less than 45 seconds for the largest size problem considered.
On Three New Functions Which Determine The Equation Of The Ruled Surface

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Abstract

It is known that a ruled surface in three-dimensional Euclidean space, $E^3$, is determined by three functions $\beta$, $\alpha$, $D$ which are called the distribution parameter, the abscissa of the central point and the function that determined the director-cone of the ruled surface, respectively. But, it is not focused on the question how the equation of the ruled surface is written by these functions; because it is too hard to find the equation of the ruled surface by using them. This work answers this question; in other words, three new functions which are sufficient to take place the equations $\beta$, $\alpha$, $D$, are found. By using the three new functions, it can be written the equation of the ruled surface easily.

References


2000 Mathematics Subject Classification. 53A05

Key words and phrases. Ruled surface, distribution parameter, central point, director-cone, natural equation
Application of Least Square Method to Numerical Solution of Second-Order Boundary Value Problems

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Abstract

The numerical solution of second order linear and nonlinear boundary value problems with a general Sturm-Liouville boundary conditions is considered. A second degree B-spline functions is used to construct the numerical method. E.H.Twizell, H.N.Caglar and S.H.Caglar used a collocation method and B-spline functions of one degree higher of order of boundary value problems. But we use B-spline functions of same degree of the order of boundary value problems we will show that for every \( \varepsilon > 0 \), there exist an approximate solution \( v_\varepsilon \) such that the least square error is less than \( \varepsilon > 0 \) and \( v_\varepsilon \) satisfies the exact boundary conditions.

References

Fuzzy troubleshooting of a complex desalination / dehydration plant

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Abstract

Oil desalination / dehydration plant is very complex and its operation and troubleshooting knowledge is very difficult. This paper tries to represent a fuzzy troubleshooting method in order to use expert knowledge and handle this complexity of plant. For this purpose firstly, problematic instrument were identified then according to the manual information fuzzy membership functions were constructed and related fuzzy rules were generated. Subsequently, a fuzzy troubleshooting program which shows the normality degree of each part work was created. This program is able to show the faulty instrument in a plant which could be the root of some fault in other part of the plant.

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2000 Mathematics Subject Classification.

Key words and phrases: oil desalination / dehydration, fuzzy, troubleshooting, membership functions, fuzzy rules
The Baer criterion for acts over semigroups

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Abstract

It is known that although the Baer Criterion for injectivity holds for modules over rings with unit, it is not true for acts over an arbitrary monoid. Recently, the present author, together with M. Ebrahimi and M. Mahmoudi, published a paper (Comm. Algebra 35 (2007), 3912-3918) giving for the acts over some classes of semigroups, the Baer Criterion is true. In this paper we find another classes of monoids such that for acts over them the Baer Criterion hold. We also construct injective hull of separated acts over another classes of semigroups. Finally we characterize the subdirectly irreducible of acts over some classes of semigroups.

References

The Greeks of Indonesian Call Option

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Abstract

Indonesian Stock Exchange has started to trade option at September 9th, 2004. The option can be considered as an American style barrier option with immediate (forced) exercise if the price hits or crosses the barrier before maturity. The payoff of the option is based on a Weighted Moving Average (WMA) of the price of the underlying stock. The barrier is fixed at the strike price plus or minus a 10 percent. The option is automatically exercised when the underlying stock hits or crosses the barrier and the difference between strike and barrier is paid immediately. We will refer to type of this option as Indonesian option.

To calculate price of Indonesian option contracts, we have to model the WMA price. This is not easy. In this paper we study the pricing of Indonesian call option when WMA is replaced by stock price in a Black-Scholes model. We will derive analytic approximations for the Greeks of the option.
Determination of Sintering Kinetics of Mullite by Differential Dilatometry

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Abstract

Reaction sintering of zircon and alumina is an easy inexpensive route to obtain homogeneous mullite-zirconia composites with enhanced mechanical properties. In the present paper we studied the crystallization behavior of the zircon and boehmite (as alumina source) mixtures. The powder of boehmite was obtained from partial dehydration of a gibbsite. As-received raw materials were weighed to produce the 3:2 alumina: silica stoichiometric mixture. All raw powders have been ball milling and then isostatically pressed followed by sintering at different temperatures. The non-isothermal activation energies for mullite crystallization were calculated by the Kissinger method using differential dilatometry. Analysis of the results showed that mullite crystals that bulk nucleation was dominant in mullite crystallisation followed by three-dimensional growth of mullite crystals with polyhedron-like morphology controlled by diffusion from a constant number of nuclei.

References


2000 Mathematics Subject Classification. 74N25

Key words and phrases. Mullite, Kinetics of formation, Phase transformation, Activation energy, differential dilatometry.
Singularity of the solutions of some transmission problems in a dihedral

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Abstract

In this paper we prove the existence and uniqueness results for the weak solution of Lamé system in a three-dimensional domain \( Q \) non homogeneous composed of two homogeneous bodies \( Q_+ \) and \( Q_- \) for various boundary value problems. Using [2] and [9], we show that the study of singularities of the solutions of problems at the neighborhood of edge \( A \) in the spatial case becomes a study of two problems: a problem of plan deformation and the other is of antiplan deformation.

References


2000 Mathematics Subject Classification. 35B40, 35B65, 35C20.

Key words and phrases. Dihedral, Elasticity, Singularity, Transcendental function, Edge, Sobolev spaces.
Completion Of Cone Metric Spaces

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Abstract

In case of ordinary metric spaces, completion of a metric space is well-known. In 2007, the concept of cone metric space was introduced by Huang Long-Guang and Zhang Xian. In this note, we construct completion of cone metric spaces, and prove that any cone metric space can be completed.

References

Completion Of Cone Normed Spaces

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Abstract

In case of ordinary normed spaces, completion of a normed space is well-known. In 2007, the concept of cone metric space was introduced by Huang Long-Guang and Zhang Xian. Recently Sonmez introduce the concept of cone normed space. In this note, we construct completion of cone normed spaces, and prove that any cone normed space can be completed.

References


2000 Mathematics Subject Classification. primary:54 H25, secondaries:47H10

Key words and phrases. Cone metric spaces, completion.
Some Topological Properties Of Cone Metric Spaces

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Abstract

In 2007, the concept of cone metric space was introduced by Huang Long-Guang and Zhang Xian. Recently Sönmez introduce the concept of cone normed space. Some topological properties of cone metric spaces was recently given by Türkoglu, D. and Abuloha M. In this note, we give some more properties of cone metric spaces and prove related theorems.

References


2000 Mathematics Subject Classification. primary:54 H25, secondaries: 47H10

Key words and phrases.Cone metric spaces, topological spaces.
Approximating the p.d.f of $\alpha$-stable distribution by using Pade and Spline Interpolation

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Abstract

Improvements in numerical evaluation of $\alpha$-stable distribution are presented, the proposed approach is mainly based on Pade and Spline interpolation, for approximating the p.d.f of $\alpha$-stable distribution a procedure is presented, the algorithm for the approximation of $\alpha$-stable densities is developed, and the results are compared with the other methods and the accuracy of the algorithm is verified. Finally, numerical example are presented for illumination.

References


Common Fixed Points of New Iterations for Two Asymptotically Nonexpansive Nonself-Mappings in Banach Spaces

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Abstract

In this paper, we introduce a new two-step iterative scheme for two asymptotically nonexpansive nonself-mappings in a uniformly convex Banach space. Weak and strong convergence theorems are established for the new two-step iterative scheme in a uniformly convex Banach space.

References


2000 Mathematics Subject Classification. 47H10, 47H09

Key words and phrases. Asymptotically nonexpansive nonself-mapping, Weak and strong convergence, Common fixed points.
Cone $D$-Metric Spaces With $\Delta$-Distance And Fixed Point Theorems Of Contractive Mappings

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Abstract

Naoki Shioji, Tomonari Suzuki and Wataru Takahashi in 1995 describe the relationship between weakly contractive mappings and weakly Kannan mappings. They discuss characterizations of metric completeness which are connected with the existence of fixed points for mappings and then they showed that a metric space is complete if it has the fixed point property for Kannan mappings. Huang Long-Guang, Zhang Xian in 2007 introduced cone metric space and then they proved some fixed point theorems of contractive mappings on cone metric spaces. Recently, Dhage in 1992 introduced the concept of $D$-metric. Afterwards Y.J.Cho and R.Saadati in 2006 introduced a $\Delta$-distance on a $D$-metric space which is a generalization of the concept of $w$-distance due to Kada, Suzuki and Takahashi in 1995. This generalization is non trivial because a $D$-metric doesn’t always define a topology, and even when it does, this topology is not necessarily Hausdorff. In this paper, we first introduce cone $D$-metric spaces with $\Delta$-distance. Then we describe the relationship between weakly contractive mappings and weakly Kannan mappings on this spaces. We discuss characterizations of cone $D$-metric spaces with $\Delta$-distance completeness which are connected with the existence of fixed points for mappings and then we show that a cone $D$-metric spaces with $\Delta$-distance is complete if it has the fixed point property for Kannan mappings.

References


2000 Mathematics Subject Classification. 54H25, 47H10
Key words and phrases. fixed point, Kannan mappings, $D$-metric, $\Delta$-distance
Abstract

Osama Kada, Tomonari Suzuki, and Wataru Takahashi in 1996 first introduced the concept of w-distance on a metric space and improved Caristi’s fixed point theorem, and the nonconvex minimization theorem according to Takahashi. Further they proved a fixed point theorem in a complete metric space. Huang Long-Guang, Zhang Xian in 2004 has introduced cone metric space without w-distance and then proved some fixed point theorems of contractive mappings on cone metric spaces. Naoki Shioji, Tomonari Suzuki, and Wataru Takahashi in 1998 study the relationship between weakly contractive mappings and weakly Kannan mappings and then discuss characterization of metric completeness which are connected with the existence of fixed points for mappings and they show that a metric space is complete if it has the fixed point property for Kannan mappings. We compose these concepts together and introduce cone metric space with w-distance and then we prove a few fixed point theorems. In this paper, we introduce cone metric spaces with w-distance on X. Then we prove fixed point theorems of weakly contractive, weakly Caristi and weakly Kannan mappings.
Weighted Function Algebra on Weighted Flows, Compactifications of Weighted Flows, Existence and None Existence

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Abstract

During the past decade harmonic analysis on weighted semigroups has enjoyed considerable attention, and a good deal of results have been proved in this connection. H A M Dzinotyiweyi in 1984 first introduced the concept of weighted function algebra on groups and semigroups. Let $S$ be a locally compact Hausdorff semitopological semigroup. A mapping $w_S : S \rightarrow (0, \infty)$ is called a weight function on $S$ if $w_S(st) \leq w_S(s)w_S(t)$. Khadem-Maboudi A A and Pourabdollah M A in 1999 study the relationship between semigroups and weighted semigroups with the introduce means, homomorphisms, and compactifications of weighted semitopological semigroups. They also show that these compactifications do not retain all the nice properties of the ordinary semigroup compactifications unless we impose some restrictions on the weight functions.

In this paper, we introduce a weight function on flow $(S, X, \sigma)$ as follows: Let $X$ be a locally compact Hausdorff topological space and a mapping $w_X : X \rightarrow (0, \infty)$ is called a weight function on $X$ if $w_X(sx) \leq w_X(s)w_x(x)$. Then transform it to weighted flow $(S, w_S, (X, w_X), \sigma)$. We define them corresponding to weighted flows compactifications. We also show that these compactifications do not retain all the nice properties of the ordinary flow compactifications unless we impose some restrictions on the weight functions.

2000 Mathematics Subject Classification. 22A20, 22A25, 43A60.

Key words and phrases. weighted flow, weighted LUC-compactifications, weighted AP-compactifications, weighted WAP-compactifications.

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Prediction of technical state of petrol equipments
(thermic motor case)

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Abstract

The improvement of the exploitation accuracy of petrol equipments is possible by the prediction of their technical state, this operation can insure their rational use, and permit to avoid unexpected damages of the equipments by enlarging in one hand the average time between the reparation that is reduced by consequence the time and the volumes of the reparations. In the resolution of the prediction problem of parameters variations which characterize the state of entities functioning of petrol equipments in time.

We determine the mutual relation between future gaps of parameters and retrospective values. The observation, of parameters variations characterising petrol equipments state, shows that they are uncertain functions. The knowledge of distribution laws of these uncertain functions is not enough and it must know also the uncertain functions values for some values of time argument. The distribution laws present a certain difficulty for speaking. For this we use for the uncertain processes description, their moments to be known: Mathematical expectation, the variety, the moments of correlation. As a particular case of study, we consider diesel motors. A lot of parameters characterize the state of entities and their functioning of diesel motors, they are function of work time. We consider particularly the value and the uniformity of the flow of pump motor-fuel at high pressure of the system (motor diesel). These letters vary in the time according to the variation of temperature conditions or of usury of mechanical pieces, and cinematical couples that constitute the pump.

Key words and phrases. Mathematical expectation; prediction problem; function work time; petrol equipments.

2000 Mathematics Subject Classification.
Detecting and adjusting inconsistencies through a graphical and optimal approach in AHP

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Abstract

It is difficult to rank the alternatives in an ordinal or/and cardinal inconsistent AHP model. There is an iterative method to detect and adjust inconsistencies. In this study it is improved, lots of conditions omitted and it is confirmed by the numerical results by MATLAB. Gower Plot upon the singular value decomposition of paired comparisons matrix is used to detect inconsistencies. The improved optimization model provides suggested adjustments satisfying the bounds determinate by decision maker. After observing suggested numerical changes and Gower Plot the decision maker may revise iteratively the preferences to improve inconsistencies.

2000 Mathematics Subject Classification.90B50, 91C99, 62C05
Key words and phrases.AHP, Inconsistency, Gower Plot, Paired Comparisons, Singular Value Decomposition.
A Summability Factor Theorem By Using An Almost Increasing Sequence

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Abstract

When given an infinite series $\sum a_n$ with the partial sums $(s_n)$ and a normal matrix $A = (a_{nv})$, i. e. a lower triangular matrix of non-zero diagonal entries, $A$ defines the sequence-to-sequence transformation, mapping the sequence $s = (s_n)$ to $As = (A_n(s))$, where

$$A_n(s) = \sum_{v=0}^{n} a_{nv} s_v, \ n = 0, 1, ...$$

In this case, by $|A|_k$ summability of this infinite series we mean the convergence of the series $\sum n^{k-1} |A_n(s)|^k$, by Tanovic-Miller in [5], where $k \geq 1$ and $\Delta A_n(s) = A_n(s) - A_{n-1}(s)$.

Let $(p_n)$ be a sequence of positive numbers such that $P_n = \sum_{v=0}^{n} p_v \to \infty$ as $n \to \infty$, ($P_{-i} = p_{-i} = 0, i \geq 1$). Sulaiman in [4] defined $|A, p_n|_k$ summability of the series. Specifically, when $a_{nv} = \frac{1}{P_n} |A, p_n|_k$ summability is equivalent to $|\nabla, p_n|_k$ summability which was introduced by Bor in [1].

Bor in [2] proved the sufficient conditions for $|\nabla, p_n|_k$ summability of the series $\sum a_n \lambda_n$, later Mazhar in [3] also proved under weaker conditions by using an almost increasing sequence.

The object of this paper is to show that these two results can be generalized to a wide class of summability methods.

References


2000 Mathematics Subject Classification.

Key words and phrases: Absolute summability, summability factors, infinite series
Topological Left Almost Convergence and Extreme Points of Amenable Locally Compact Semigroups

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Abstract

In this talk, the extreme points and topological left almost convergence in the set of all topological left invariant means of locally compact semigroups are considered, which are the generalization of the results of S. P. Lloyd.

References

A Simultaneously Determination Of The Optimal Trajectory And Control For Vibrating Shell Systems By Measures

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Abstract

In the recent decade, a considerable number of optimal control problems have been solved successfully based on the properties of the measures. This method, called embedding method, has many useful benefits like finding the global solution, a linear treatment even for the strong nonlinear problems and also easy calculations in the numerical schemes. But, in general, the method is not able to determine the optimal trajectory and control at the same time; moreover, it rarely uses the advantages of the classical solutions of the involved systems. In this article, for a wave control system governed by vibrating shell equations, we are going to present a new solution path by applying this method and also using the trigonometric series. First by considering all conditions, the problem is represented in a variational format in which the trajectory is shown by a trigonometric series with the unknown coefficients. Then the problem is converted into a measure theoretical optimization one that the unknowns are the mentioned coefficients and a positive radon measure. It is also proved that the new problem has the optimal solution and how one be able to identify the optimal trajectory and control simultaneously form the solution of a finite linear programming problem. In this manner some numerical examples are also given.

2000 Mathematics Subject Classification. 49Q10, 49Q20, 49J20
Key words and phrases. vibrating shell, trigonometric series, Radon measure, optimal control, linear programming.
Evaluating A Novel Cellular Automaton Based Energy-Conservating Solution In Mobile Wireless Sensor Networks

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Abstract

According to the traditional definition of wireless sensor networks (WSNs), static sensors have limited the feasibility of WSNs in some kind of approaches, so the mobility was introduced in WSN. Mobile nodes in a WSN come equipped with battery and from the point of deployment; this battery reserve becomes a valuable resource since it cannot be replenished. Hence, maximizing the network lifetime by minimizing the energy is an important challenge in mobile WSN. Energy conservation can be accomplished by different approaches. One approach is utilizing the low-power stand-by mode supported by the wireless devices and adjusting the transmission range on each node. In this paper, an energy conservation solution based on cellular automata is presented. The main objective of this approach is based on dynamically adjusting the transmission range and switching between operational states of the sensor nodes.

2000 Mathematics Subject Classification. 37B15, 68Q80, 90B18
Key words and phrases. Cellular Automata, Energy Conservation, Mobile Wireless Sensor Networks
Growth of Solutions of Linear Differential Equations With Entire Coefficients Having the Same Order and Type

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Abstract

The value distribution theory of a meromorphic function founded by R. Nevanlinna play an important role in the study of the growth and oscillation of solutions of linear differential equations in the complex plane. The question which arises in this domain is when and how many independent solutions of finite order may appear. Partial results have been available since a paper of Frei [2]. In its generality, the problem remains open. Recently, Jin Tu and Cai- Feng Yi [5] have investigated the case when the coefficients have the same order and different types. In this paper, we will improve this result by taking coefficients having the same order and type.

References


2000 Mathematics Subject Classification. 34M10, 30D35

Key words and phrases. Growth of solutions, entire coefficients, order of growth
Existence and uniqueness results of some fractional BVP

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Abstract

In recent years the fractional derivatives have considerably received a great interest of a lot of investigators. As a matter of fact they have been successfully applied in several fields of science and engineering such as viscoelastic materials, electrotechnical processes as well as signal processing.

Actually, the concept of fractional derivatives is a systematic generalization of the classical derivatives to non integral orders which gives reliable models in engineering and other fields of science better than those based on the ordinary derivatives. Our contribution in this matter is the investigation of the existence and uniqueness of the fractional boundary value problem

\[
\begin{align*}
^{c}D_{0}^{\alpha} y(t) & = f(t, y(t), y'(t)), \quad 0 < t < T, \quad 1 < \alpha \leq 2, \\
a_1 y(0) + a_2 y(T) & = c_1, \\
b_1 y'(0) + b_2 y'(T) & = c_2,
\end{align*}
\]

where \(^{c}D_{0}^{\alpha}\) is Caputo’s fractional derivative, \(f : [0, T] \times \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}\) is a continuous function, \(a_1, a_2, b_1, b_2, c_1,\) and \(c_2\) are given real constants. By using the Banach fixed point theorem we establish the existence of a unique continuously differentiable solution to the above BVP.

2000 Mathematics Subject Classification. 26A33, 65L10

Key words and phrases. Boundary value problem, fractional differential equation, fixed point theorem.
Copulas Pareto: Characterizations and Dependence Measures

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Abstract

A bivariate copula can be statistically interpreted as a bivariate distribution function with uniform marginals. Sklar (1959) argues that for any bivariate distribution function, say $H$ with marginals $F$ and $G$, there exists a copula functional, say $C$, such that $H(x, y) = C[F(x), G(y)]$, for $(x, y)^T$ in the support of $H$. This article provides Copulas pareto using Sklar theorem and new characterizations and dependence measures Kendall’s tau and Spearman’s rho of the Copulas pareto.

2000 Mathematics Subject Classification.

Key words and phrases. Copulas, bivariate pareto, Kendall’s tau, Spearman’s rho
The Importance of Using The “Omega Calculus” in Computer Algebra

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Abstract

In his book "Combinatory Analysis", Percy A. MacMahon developed the so called "Omega calculus". In this contribution we emphasize the importance of the "Omega Calculus". Using the properties of this tool, we investigate the possible application in computer algebra. We investigate how the methods presented by Macmahon's can be applied to the problem of enumerating lattice points in convex polyhedron. A lot of Scientific and Engineering problems require the solution of large systems of linear equations of the form $Ax=b$ in an effective manner. LU-Decomposition offers good choices for solving this problem. QR Factorization has implementation in various problems of linear algebra. Discrete Fourier transformation can be implemented in different problems regarding the signal and image processing, pattern recognition etc. We investigate a possible optimization of these problems finding the lower bound of processing elements (PEs) required by a schedule as a function of $n$. From a given algorithm, defining a corresponding index space, we consider that the elements of that index space are lattice points inside 3-dimensional convex polyhedron. The faces of the polyhedron are defined by the inequalities which are the consequence of the given algorithm. From these inequalities augmenting by the condition of linear schedule for the corresponding dag, we convert the geometrical interpretation of the problem, into a combinatorial interpretation, exactly into finding of solutions to the system of Diophantine equations. Then we run the Mathematica program DiophantineGF.m. This program calculates the generating function from which is possible to find the number of solutions to the system of Diophantine equations, which in fact gives the lower bound for the number of processors needed for achieving a given schedule. We give a mathematical explanation and then we confirm the conclusion taking a random example.

References


2000 Mathematics Subject Classification. 11Y50

Key words and phrases. Omega calculus, generating function, system of diophantine equations, lattice points, convex polyhedron, lower bound of PEs.

**This research was supported by Scientific Research Committee of SEE-University, Tetovo
An Approach for Simultaneously Determining the Optimal Trajectory and Control of a Heating System

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Abstract

In the recent decade, a considerable number of optimal control problems have been solved successfully based on the properties of the measures. Even the method, has many useful benefits, in general, the method is not able to determine the optimal trajectory and control at the same time; moreover, it rarely uses the advantages of the classical solutions of the involved systems.

In this article, for a one-dimensional heat wave control system, we are going to present a new solution path. First, by considering all necessary conditions, the problem is represented in a variational format in which the trajectory is shown by a trigonometric series with the unknown coefficients. Then the problem is converted into a new one that the unknowns are the mentioned coefficients and a positive Radon measure. It is proved that the optimal solution is exited and it is also explained how the optimal pair would be identified from the results deduced by a finite linear programming problem. In this manner, a numerical example is also given.

References


2000 Mathematics Subject Classification. 49Q20, 49J45, 49M25, 76D33
Key words and phrases.optimal control, trigonometric series, optimal trajectory, finite linear programming
An Equity-efficiency Location of a Noisy Facility in a continuous plane

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Abstract

Production engineers are often faced with the problem of placing a noisy but necessary piece of equipment, process, material, or facility in general, into a working environment. Such semi-obnoxious facilities are defined here as facilities that could introduce hazards into the workplace. Similarly, urban planners are often faced with the challenging task of placing in a city a fire department, an airport or a shopping center. These public service facilities should be placed close to the residential area they serve but not too close to prevent noise pollution. In this paper, a new model for the noisy facility location problem in a continuous plane is introduced. The new model is composed of a minisum function to represent the transportation costs and a maximin function to represent the obnoxious effects of the facility by maximizing the distance of the nearest inhabitant from new facility. Although transportation is managed into a network approximately could be supposed as rectangular roads, intensity of noise inversely depends on the squared euclidean distance of the inhabitants from noise source, so the formulation includes rectangular minisum and squared euclidean maximin criteria problem. Using some mathematical theories, the problem dimension is decreased from three to two and then efficient points on this two-dimensional space are searched. An algorithm that constructs the entire nondominated vectors and efficient sets is presented and it is illustrated in an example problem.

References


2000 Mathematics Subject Classification. 60K30, 90C90, 90B85, 90C29, 90C30

Key words and phrases. Location, Noisy Facility, Semi-obnoxious Facility, Efficient Set, Nondominated Set
Holditch-Type Theorems
for The 1-Parameter Closed Motions
Using Lorentzian Matrix Multiplication

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Abstract

In [6], a new matrix multiplication was defined in \( \mathbb{R}^m \times \mathbb{R}^n \) by using Lorentzian inner product in \( \mathbb{R}^n \), where \( \mathbb{R}^m \) is the set of matrices with \( m \) rows and \( n \) columns.

In this study, under the 1-parameter closed motion in Lorentzian 3-space \( L^3 \), Holditch-Type Theorems are given by means of this Lorentzian matrix multiplication and the areas of the closed projection curves of the closed space curves onto Euclidean plane.

References


2000 Mathematics Subject Classification. 53A17, 53B30, 53B50
Key words and phrases. Lorentzian matrix multiplication, Lorentzian motion, Holditch-Type Theorems

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Optimal Control For High Order Pdes

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Abstract

In this paper we consider linear high order PDEs with nonhomogeneous boundary conditions. Our goal is to find some control functions that acts in a part of boundary such that desired state is reached in the given time $T$. At first, solution of high order PDE is calculated, then we construct a moment problem for solving optimal control problem. The moment problem can be solved by choosing appropriate optimization algorithm.

References


2000 Mathematics Subject Classification. 49J20, 35E99, 47F05
Key words and phrases. Optimal control; High order PDEs; Moment problem
Counting of the distinct fuzzy subgroups of the dihedral group $D_{2p^n}$

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Abstract

In this paper, by using of an equivalence relation on fuzzy subgroup, we determine the number of distinct fuzzy subgroups of the dihedral group of order $2p^n$ such that $p$ is a prime and $p \geq 3$. A fuzzy subset of a set $X$ is mapping $\mu : X \rightarrow [0,1]$. Fuzzy subset $\mu$ of a group $G$ is called a fuzzy subgroup of $G$ if

1. $\mu(xy) \geq \mu(x) \land \mu(y) \forall x, y \in G$;
2. $\mu(x^{-1}) \geq \mu(x) \forall x \in G$.

The set of all fuzzy subgroup of a group $G$ denoted by $F(G)$. Let $G$ be a group, and $\mu, \nu \in F(G)$. Defined three equivalence relation as follow respectively:

(i) We say that $\mu$ is equivalence $\nu$, written as $\mu \equiv \nu$ if $F_\mu = F_\nu$.
(ii) We say that $\mu$ is equivalent to $\nu$, written as $\mu \sim \nu$ if $\mu(x) \equiv \nu(x)$, for all $x \in G$.
(iii) We say that $\mu$ is equivalence $\nu$, written as $\mu \equiv_1 \nu$ if there exists an isomorphism $f$ from supp$\mu$ to supp$\nu$ such that for all $x \in G$.

Let $G$ be a group and $\mu, \nu \in F(G)$. We say that $\mu$ is equivalence $\nu$, written as $\mu \sim \nu$, if and only if $F_\mu = F_\nu$ and supp$\mu = $ supp$\nu$.

The set of all fuzzy subgroups $\mu$ of $G$ such that $\mu(e) = 1$ denoted by $F_1(G)$. The number of equivalence classes $\sim$ on $F_1(G)$ will be denoted by $r_0^\sim$.

Theorem. Suppose that $p$ be a prime and $p \geq 3$. If $G$ is a dihedral group of order $2p^n$, then $r_0^\sim = \sum_{i=1}^{n-1} p^i r_1^{\sim}(D_{2p^{n-1}}) + \frac{p^n - 1}{p - 1} + 2^{n+2} + p^n - 1$.

References


2000 Mathematics Subject Classification:20N25.

Key words and phrases. Fuzzy subgroups, Dihedral group, Equivalence relation
Analyzing Near-Normal Data Using A New Class Of Skew Distributions

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Abstract

A family of distributions, which was first introduced by OHagan and Leonard in 1976 for Bayesian analysis of normal means and was later investigated in detail by Azzalini in 1985 and 1986, is modified leading to a new class of asymmetric distributions. A new score test is derived for detecting non-normality within the new class of asymmetric distributions. Then, the new score test is applied on two examples of real data sets within the new class of asymmetric distributions to detect non-normality. Maximum likelihood estimators are used to fit the data with a skew distribution and compared to studies in which researchers used the normal distribution.

References

Common zeros of exponential polynomials and Shapiro conjecture

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Abstract

Shapiro conjectured that if two exponential polynomials have infinitely many zeros in common, they have a non trivial common factor. In this paper we prove this conjecture in many particular cases where the coefficients of the polynomials are algebraic and the frequencies are linear combination with rational coefficients of two algebraic numbers.

2000 Mathematics Subject Classification. 11L03, 11L07, 11C08

Key words and phrases. Zeros of exponential polynomial, Shapiro conjecture.
What Are Copulas?

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Abstract

A copula is, in fact, a multivariate distribution function with standard uniform margins. Sklar (1959) proved that for a $d$–vari...
Congruence relations on generalized fuzzy subsemimodules

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Abstract

In this paper, the notion of interval valued intuitionistic fuzzy subsemimodules of a semimodules, by different examples, are introduced. We generalize this notion by considering $t$-norms and $s$-norms. Also some basic properties such as homomorphic image and inverse image are investigated. Finally, by the help of the congruence relations on semimodules, new interval valued intuitionistic fuzzy subsemimodules are constructed.
U-statistic Testing in Competing Risk Models in Two-Sample Cases

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Abstract

In this paper we consider a situation in which two systems are subject to failure from competing risks or could be censored from an independent censoring process. A procedure, based on a U-statistics, is proposed for testing the equality of two systems with respect to two failure rates in the competing risk set in each sample. Under independence assumptions, the asymptotic distribution of the statistic is given and used to construct the test.

References


2000 Mathematics Subject Classification. primary:60E15 secondaries:60K10
Key words and phrases. U-statistic, competing risks, censored, failure rates
Generalized Cauchy problem: Caputo type

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Abstract

Fractional derivatives, or more precisely derivatives of arbitrary orders, have played a significant role in engineering, sciences, pure and applied mathematics in recent years. Several types of fractional derivative and integral have proposed. These definitions include Riemann-Liouville fractional derivative and integral, Grunwald-Letnikov, Weyl-Marchaud, Caputo and Riesz fractional derivative. In this research work we will generalize Cauchy problem to fractional derivative. We will introduce generalized cauchy problem (GCP) as two faces, left side GCP and right side GCP. In next section we will generalize numerical Euler method to GCP. The generalized numerical Euler method (GNEM) reduces to numerical Euler method (NEM) when GCP reduce to CP.

References


2000 Mathematics Subject Classification. 26A33, 78M25.
Key words and phrases. Differential equation, Fractional calculus, Numerical method.
The Projective Quarter Symmetric Metric Connections and Recurrent Projective Curvature Tensor

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Abstract

In 1970, Yano, studied Riemannian manifolds admitting semi-symmetric metric connections whose curvature tensors vanish. In 1980, Misra and Pardey, studied quarter symmetric metric connections in Riemannian, Kaehlerian and Sasakian manifolds and found some properties of curvature tensors of them. In 1982, Yano and Imai, gave the most general form of quarter symmetric metric connections and studied its applications. In 2008, Zhao, investigated the properties of projective semi-symmetric metric connections of a Riemannian manifold and gave some interesting results with respect to this semi-symmetric connection. In the present paper, after describing the projective quarter symmetric metric connection D, we define a projective recurrent manifold M with respect to D and study some properties of it.

References


2000 Mathematics Subject Classification. 53B, 53C

Key words and phrases. Projective quarter symmetric metric connection, projective recurrent tensor
A Fixed Point Theorem Without Convexity

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Abstract

In this paper we give the Schauder fixed point theorem for compact and connected subset of a strictly convex space imposing a mild condition on the set. The results of this paper are completely original.

References


2000 Mathematics Subject Classification. 47H09, 47H10

Key words and phrases. Fixed point,Brouwer fixed point theorem, Schauder, continuous mapping, compact, connected, convexity
On Computing The Eigenvectors Of Structured Matrices

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Abstract

A numerical method for computing the eigenvectors of symmetric tridiagonal matrices is studied in this paper. This method can easily be adapted for other classes of matrices, e.g. semiseparable matrices, as long as a step of the QR method requires $O(n)$ floating point operations. A real symmetric matrix of order $n$ has a full set of orthogonal eigenvectors. The most used approach to compute the spectrum of such matrices reduces first the dense symmetric matrix into a symmetric structured one, i.e., tridiagonal matrices or semiseparable matrices. This step is accomplished in $O(n^3)$ operations. Once the latter symmetric structured matrix is available, its spectrum is computed in an iterative fashion by means of the QR method in $O(n^2)$ operations. In principle, the whole set of eigenvectors of the latter structured matrix can be computed by means of inverse iteration in $O(n^2)$ operations.

References

On The Relationship Between Regression Analysis and Mathematical Programming

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Abstract

In the development of the underlying theories in statistical methods, it has been face to face with an optimization problem. For example, for the aim of regression problem estimates the β parameters that makes minimum the objective function according as structure of functions, is a optimization problem. Least Squares Method and Minimizing Mean Absolute Deviations (MINMAD) are at most using approaches in this problem. Although it has long been popular to utilize the Least Squares estimation procedure for fitting the linear regression model to observed data, with the development of Mathematical Programming, solving the MINMAD regression problem with Simplex Method has been a robust alternative to Least Squares Method (LS). In this study solving the MINMAD regression problem with Simplex Method has been given.

References


2000 Mathematics Subject Classification. 62J05
Key words and phrases. Linear Programming, Regression Analysis, Statistics, Simplex Method
Solutions of the topological structure in the early universe via conformal motions

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Abstract

In this article Einstein’s field equations are solved for topological structures in the early universe (spherical space-time) by using conformal motions. Also the features of the obtained solutions are discussed.
Tauberian theorems for \((A)(C, \alpha)\) summability method

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Abstract

Using Tauberian theorems for Abel summability method by Hardy [1], Littlewood [2] and Pati [3], we have given several Tauberian theorems for \((A)(C, \alpha)\) summability method. Also in this work some theorems given by Pati [3] are generalized and new Tauberian conditions are introduced.

References

Some Tauberian theorems for Borel summability methods

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Abstract

We investigate the conditions needed for a Borel summable sequence to be convergent. The results of this paper extend and improve the well known result of Hardy and Littlewood [Proc. London Math. Soc. 11 (1913), 1-16].

References


2000 Mathematics Subject Classification. 40E05
Key words and phrases. Borel summability, general control modulo, Tauberian conditions, slow oscillation
On Tauberian theorems for \((A, k)\) summability method

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Abstract

Let \((u_n)\) be a sequence of real numbers which is \((A, k)\) summable. In this work, several new Tauberian theorems for \((A, k)\) summability methods will be given in terms of generating sequences of \((u_n)\).

References


2000 Mathematics Subject Classification. 40E05, 40G10

Key words and phrases. General control modulo, regularly generated sequence, slow oscillation, \((A, k)\) summability, moderate oscillation
Some Characteristics of Systolic Arrays

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Abstract

We investigate a possible optimization of some linear algebra problems which can be solved by parallel processing using the special arrays called systolic arrays. In this paper are used some special types of transformations for the designing of this arrays. We show the characteristics of each one giving the examples of their implementation as well. The main focus is on discussing the advantages of these arrays in parallel computation of matrix product, with special approach to the designing of systolic array for matrix multiplication and discrete Fourier transformation. Multiplication of large matrices requires a lot of computational time and its complexity is $O(n^3)$. There are developed many algorithms (both sequential and parallel) with the purpose of minimizing the time of calculations. Systolic arrays are good suited for these purpose. In this paper we show that using a appropriate composite function, the given index space can be mapped in another index space suitable for systolic array. This mapping implicates in finding more optimal arrays for doing the calculations of this type. We show that this can be implemented on the designing of optimal systolic array for Discrete Fourier transformation.

References


2000 Mathematics Subject Classification. 65Y05

Key words and phrases. Systolic arrays, matrix multiplication, Fourier transformation, data dependences, optimization.

**This research was supported by Scientific Research Committee of Pedagogical Faculty of University of "Ss. Cyril and Methodius", Skopje.
Solution of the Cauchy Problem for a Degenerate Parabolic Equation

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Abstract

We consider a degenerate parabolic equation and investigate conditions of the existence of a solution of the Cauchy problem .

2000 Mathematics Subject Classification.

Key words and phrases. Degenerate parabolic equation, Cauchy problem, diffusion matrix
Control Adaptive for Binary Time series

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Abstract

The model ARMAX provides a complete framework for stochastic difference equation. In this paper we will extend this methodology to cover binary time series. A particular example is the adaptive control of Markov processes with two states.

By employing a logistic model we will analyze a recursive estimator procedure and an adaptive control law. This enables the observer to regulate the transition probabilities system. These indicate that the proposed control law is asymptotically optimal with respect to a certain criterion. The paper terminates with illustrate some important points by simulations binary time series with inputs according a first order autoregressive process.

2000 Mathematics Subject Classification.

Key words and phrases. control adaptive, models input-output, Markov chain, model logistic

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Solution of mixed B.V.P including a first order three dimensional P.D.E with nonlocal and global boundary conditions

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Abstract

In this paper solution of mixed complex boundary value problem of first order is considered. The basic term in the problem with respect to space variables. has Cauchy-Riemann operator. We first use Laplace transformation to introduce spectral problem. Then we investigate corresponding for Fredholms type.

The spectral problem here is different from classical boundary value problems. Here boundary conditions are nonlocal and global and dependent functionals to boundary conditions are in general linear. At the end for the solution of spectral problem which depends on unknown complex parameter. We find asymptotic expansion. With the help of this asymptotic expansion we prove existance and uniqueness of mixed problem.

2000 Mathematics Subject Classification.

Rational approximation on closed curves

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Abstract

A problem an approximation of classes of function determined only on the boundary of domain takes important place simultaneously with studying approximation by means of polynomials analytic in the domain $G$ and with some conditions on the boundary $\Gamma$ of functions.

Obviously, generally speaking, it is impossible to approximate such classes of function by means of polynomials. Therefore, in this case, usually different forms of rational functions or so called generalized polynomials are used as approximation aggregate. My followers D.Israfilov, I.Botchaev and me studied problems on approximation of function determined only on the boundary of domain by means of rational functions of the from $R_n(z) = P_n(z; \frac{1}{z})$.

In the given report, we consider a rational function of the form $R_n(z) = P_n(z; \frac{1}{z})$ as an approximate aggregate. For this case, analogies of Jackson’s direct theorems on closed curves of complex plane are proved.

References


2000 Mathematics Subject Classification. primary: 41A17 secondary: 41A20

Key words and phrases. Jackson’s direct theorems, closed curve, polynomial approximation, continuity modulus, rational functions.
Estimation of stochastic differential equations with applications in finance

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Abstract

In this note, we will present a new simple method for constructing the approximate solutions of nonlinear stochastic differential equations (sde). We shall consider solutions \(w : [0, T] \times R^d \mapsto R\) to the following problem

\[
\frac{dw}{dt} + aw = \sum_{i=1}^{d} \mu_i(t, x) \frac{\partial w(t, x)}{\partial x_i} + 1 \sum_{i,j=1}^{d} \sigma_{ij}(t, x) \frac{\partial^2 w(t, x)}{\partial x_i \partial x_j} + c, \tag{0.1}
\]

for known functions \(a : [0, T] \times R^d \mapsto [0, \infty), c : [0, T] \times R^d \mapsto R, \mu : [0, \infty) \times R^d \mapsto R^d\) and \(\sigma^2 : [0, \infty) \times R^d \mapsto R^{d \times d}\) be given. By using the Feynman-Kac Representation, a direct link between the solution to (0.1) and a conditional moment involving the process \(X_t\) solving the following nonlinear sde

\[
dx_t = \mu(t, X_t)dt + \sigma(t, X_t)dB_t, \quad 0 \leq t \leq T, \tag{0.2}
\]

where \(B_t\) is Brownian motion. Equation (0.2) on \([0, T]\), may be linearized as follows

\[
dx(t) = (f^*(t) + F^*(t)x(t))dt + \sum_{j=1}^{d} [g_j^*(t) + G_j^*(t)x(t)]dB_j(t) \tag{0.3}
\]

where \(F^*(\cdot), G^*(\cdot)\) are \(d \times d\)-matrix-valued functions, \(f^*(\cdot), g_j^*(\cdot)\) are \(R^d\)-valued functions. Equations (0.3) is a linear sde whose analytical solution may be written as

\[
x(t) = \Phi(t)(x_0 + \int_0^t \Phi^{-1}(s)[f^*(s) - \sum_{j=1}^{d} G_j^*(s)g_j^*(s)]ds + \sum_{j=1}^{d} \int_0^t \Phi^{-1}(s)g_j^*(s)dB_j(s)), \tag{0.4}
\]

where \(\Phi(t)\) is the fundamental matrix of the homogeneous. If a solution to (0.2) exist, then we define the generalized solution \(w_{P,K}\) as

\[
w_{P,K}(t, x) = E_{t,x}[b(X_T) \exp[-\int_t^T a(s, X_s)ds]] + E_{t,x}[\int_t^T c(s, X_s)exp[-\int_t^s a(u, X_u)du]ds, \tag{0.5}
\]

where \(E_{t,x}[\cdot] = E[\cdot | X_t = x].\) In some cases \(X_t\) (exact solution of (0.2)) may not exist, then by using the (0.4), we can obtain the approximate solution of the PDE (0.1).

References

A Semi Numerical-Analytical Method for Solving Nonlinear Integro-Differential Equations

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Abstract

In this paper, we present a new scheme based on Taylor series to convert high-order nonlinear Volterra-Fredholm integro-differential equations to a $M$-order linear differential equations which may be integrated using classical methods. Also, the objective of this paper is to assess both the applicability and the accuracy of linearization method in several problems of general high-order nonlinear Volterra-Fredholm integro-differential equations. This method provides piecewise linear differential equations which can be easily integrated. It is shown that the accuracy of linearization method can be substantially improved by employing variable steps which adjust themselves to the solution. Numerical examples are used to illustrate the preciseness and effectiveness of the proposed method.

References


2000 Mathematics Subject Classification. 45J05, 47G20

Key words and phrases. Taylor polynomials, integro-differential equations, Numerical treatments, Linearization method, Nonlinear Volterra integral equations.

**This research was supported by Scientific Research Project Commission of Islamic Azad University, Shabestar Branch, Shabestar-Iran**
Gardner’s Mathematical Intelligence Theory To Measure Managers Mathematical Intelligence And Organizational Effectiveness In East Azerbaijan’s Gas Company

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Abstract

Increasing recession and emergence of new markets and various customers on the other hand caused the world encounter lots of sophisticated and complicated changes. If the trend continues, chaos will emerge; although we can touch chaos now in today’s economic conditions and markets[1]. In today economy we can not expect that the sea will be calm tomorrow, but probably we could do that in the past and could plan exactly the outcome and process but can we do this for the current activities? May be the answer is No[2]. Should we be panicked in this downturns or be smarter and find ways to outperform our competitor? What is the duty of science here? The aim of this paper is to study the relationship between Gardner’s Mathematical Intelligence among managers with Stephen Robbins organizational effectiveness in East Azerbaijan Gas Company. This is based on a project studies empirically and concluded that there is a relationship between Mathematical Intelligence and organizational effectiveness

References

A Description Of 3-Place Functions Of Idempotent Algebras

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Abstract

An algebra is idempotent if and only if for every algebraic operation f the equation f(x,x,...,x)=x holds for every x. In [4], K.Urbanik characterize the set of all binary operations of idempotent algebras that has no essentially n-ary algebraic operation for some \( n > 2 \). In this paper we characterize the set of all ternary algebraic operations of idempotent algebras that has no essentially n-ary algebraic operation for some \( n > 3 \) and show that this set is finite and costruct a ternary algebra.

References


2000 Mathematics Subject Classification. 62H05, 14H05, 62E10

Key words and phrases. Algebraic operation, idempotent algebra, boolean algebra, ternary algebra, 3-place function.
Bootstrap-based tests for two measures of association

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Abstract

We propose two new bootstrap-based tests for both Spearman’s rho and Kendall’s tau. The first test is a semiparametric test based on copulas, while the second is a nonparametric test. The efficiency of the various tests are investigated by means of a Monte-Carlo study. It is found that they perform very satisfactorily as far as size and power are concerned. Some recommendations regarding the practical use of the new tests are made.

2000 Mathematics Subject Classification. 62G09, 62G10, 62G30

Key words and phrases. Spearman’s rho, Kendall’s tau, copula, bootstrap

This research was supported by the National Research Foundation of South Africa
Common fixed points of nonlinear contraction in Menger spaces

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Abstract

In this paper, we introduce the notion of common property (E.A) in Menger spaces. We prove a result which shows the relation between property (E.A) and common property (E.A). Using common property (E.A), some common fixed point theorems proved for self mappings satisfying Ciric-type and f-type contractions in Menger PM spaces. Our results generalize many known results in Menger as well as metric spaces. Some related results and illustrative examples are also furnished.
Conditions for Uniqueness of Fractional Powers

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Abstract

It is well-known the important role that plays, in relation to Cauchy problems associated to an operator $A$, the fact that $A$ has an additive family of closed operators $\{A_t\}_{t>0}$, $A_1 \equiv A$, such that the operator $-A_t$ is the generator of a semigroup of bounded linear operators for small exponents $t$. The need of considering the inverse, the closure or the adjoint of single-valued linear operator leads in a natural way to deal with multivalued linear operator. Applications of multivalued methods to degenerated evolution equations can be found in [1]. A theory of fractional powers for nonnegative multivalued linear operators in a complex Banach space was introduced in [4].

This work is devoted to the study of uniqueness of a continuous semigroup of fractional powers for a nonnegative multivalued linear operator $A$. In [3] we can find several uniqueness results in the single-valued case. Very recently, in [1], it has been established a uniqueness result analogous to the presented here, but only for injective single-valued and nonnegative linear operators.

More specifically, we prove that there exists a unique family $\{A_t\}_{t>0}$ of closed multivalued linear operators satisfying

(i) $A_1 = A$,
(ii) $A_t A_s = A_{t+s}$ ($s, t \geq 0$),
(iii) there exists $0 < \varepsilon \leq 1$, such that, for all $u \in D(A)$, the set-valued map $t \in [0, \varepsilon] \mapsto A_t u$ is lower semicontinuous,
(iv) $A_t$ is a sectorial operator of angle $tw$ ($tw < \pi$, $A$ is sectorial of angle $w$).

This result is proved in two different ways. One method is based on the property of multiplicativity for the fractional powers $\{A^\alpha\}_{\alpha>0}$ introduced in [4], that is, $(A^\alpha)^\beta = A^{\alpha\beta}$. The other one is to prove uniqueness of $2^n$ roots of $A$ thanks to be unique the solution of the incomplete Cauchy problem of second order associated to $A$. From this second method, that makes no appeal to multiplicativity, we provide also a new and simple proof of the multiplicativity for the fractional powers of a multivalued linear operator.

References


2000 Mathematics Subject Classification. 47A06, 47D06

Key words and phrases. Multivalued linear operators, Semigroups of linear operators, Fractional powers

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Minimization Theorems And Fixed Point Theorems For A Generalized Metric

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Abstract

We prove new minimization theorems, fixed point theorems and variational principles on a S-complete quasi-metric space. Using these theorems, we extend, improve and unify many known results due to Caristi, Ekeland, Ciric, Kada-Suzuki-Takahashi, Ume and others.
Hereditary orders in the quotient ring of a skew polynomial ring

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Abstract
Let $K$ be a field, and let $\sigma$ be an automorphism of $K$ of finite order, say $n$. One can form a skew polynomial ring $K[X, \sigma]$ over $K$ with the usual rules of multiplication defined by the commutation rule: $xa = \sigma(a)X \forall a \in K$. Let $K(X, \sigma)$ denote the skew field of quotients of $K[X, \sigma]$. If $F$ is the fixed field of $\sigma$, then $K(X, \sigma)$ is a cyclic algebra of degree $n$ with center $F(X^n)$. If $V$ is a valuation ring of $F(X^n)$ containing $F$, and $S$ is the integral closure of $V$ in $K(X^n)$, then any order of $K(X, \sigma)$ with center $V$ can be written as a “crossed-product $V$-algebra”:

$$A_f = \sum_{i=0}^{n-1} Sx_{\sigma^i},$$

with the multiplication rule $x_{\sigma^i}s = \sigma^i(s)x_\sigma$ for all $s \in S, 0 \leq i < n$ and $x_{\sigma^i}x_{\sigma^j} = f(\sigma^i, \sigma^j)x_{\sigma^{i+j}}$, where $f : G \times G \rightarrow S \setminus \{0\}$ is some normalized 2-cocycle, and $G$ is the Galois group of the cyclic extension $K(X^n)/F(X^n)$.

Let $H = \{\sigma^i \mid f(\sigma^i, \sigma^{i-1}) \in U(S)\}$, where $U(S)$ denotes the group of the multiplicative units of the ring $S$. Then $H$ is a subgroup of $G$. On $G/H$, one can define a partial ordering by the rule

$$\sigma^iH \leq \sigma^jH \text{ if and only if } f(\sigma^i, \sigma^{j-1}) \in U(S).$$

Then “$\leq$” is well-defined, and depends only on the cohomology class of $f$ over $S$. Further, $H$ is the unique least element. We call this partial ordering on $G/H$ the graph of $f$.

The aim of the talk is to determine the conditions on the graph of $f$ that would guarantee that $A_f$ is a hereditary order.

2000 Mathematics Subject Classification. 16H05, 16S35, 16S36, 16W60.
Key words and phrases. skew polynomial ring, crossed product, hereditary orders, valuation rings.
Extensional Flows With Viscous Heating

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Abstract

In this talk we will investigate the role played by viscous heating in extensional flows of viscous threads with temperature-dependent viscosity. We will show that there exists an interesting interplay between the effects of viscous heating, which accelerates thinning, and inertia, which prevents pinch-off. We will first consider the steady drawing of a thread that is fed through a fixed aperture at given speed and pulled with a constant force at a fixed downstream location. For pulling forces above a critical value, we will show that inertialess solutions cannot exist and inertia is crucial in controlling the dynamics. We will also consider the unsteady stretching of a thread that is fixed at one end and pulled with a constant force at the other end. In contrast to the case in which inertia is neglected, the thread will always pinch at the end where the force is applied. Our results show that viscous heating can have a profound effect on the final shape and total extension at pinching.

\textbf{2000 Mathematics Subject Classification.}

\textbf{Key words and phrases.}
On a size-structured two-phase population model with infinite states-at-birth

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Abstract

We introduce and analyze a linear size-structured population model with infinite states-at-birth. We model the dynamics of a population in which individuals have two distinct life-stages: an “active” phase when individuals grow, reproduce and die and a second “resting” phase when individuals only grow. Transition between these two phases depends on individuals’ size. First we show that the problem is governed by a positive quasicontractive semigroup on the biologically relevant state space. Then we investigate, in the framework of the spectral theory of linear operators, the asymptotic behavior of solutions of the model. We prove that the associated semigroup has, under biologically plausible assumptions, the property of asynchronous exponential growth.

\textbf{2000 Mathematics Subject Classification.} 92D25, 47D06, 35B35

\textbf{Key words and phrases.} Size-structured populations, positivity, quasicontractive semigroups, spectral methods, asynchronous exponential growth
Solution of the system of tenth-order boundary value problems using Non-polynomial spline

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Abstract

Non-polynomial spline is used for the numerical solution of the tenth-order linear boundary value problems. We show that the present method gives an approximation which are better that those produced by order finite difference and spline methods. The end condition consistent with the boundary value problems are also derived. An example is considered for the numerical illustration of the method developed.

References

On Commutative Distributive Algebras with Division Operations

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Abstract

A binary algebra \( \langle Q, \Sigma \rangle \) called q-algebra, if there exists an invertible operator of binary type in \( \Sigma \). In [8, p.115-189] q-algebras with nontrivial hyperidentities of distributivity are described. In this article we prove analogical results for algebras \( \langle Q, \Sigma \rangle \) with commutative division operations.

References

A condition for points and compact subsets of $C(X)$ to be $G_δ$ Subsets of $\mathbb{R}^X$

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Abstract

It was given in [6], a condition for points and compact subsets of $C(X)$ to be $G_δ$ Subsets of $\mathbb{R}^X$, the set of all real-valued functions defined on a topological space $X$, when it is equipped with a compact-open topology. It was also shown in the same paper that if $C(X)$ contains a non empty $G_δ$ Subset of $\mathbb{R}^X$, then $X$ is the topological sum of a $σ$–compact space and a discret space. In this talk it will be shown that these two results remain valid in the frame work of a set-open topology more general then the considered compact-open topology.

References


2000 Mathematics Subject Classification. 54C35

Key words and phrases. Compact-open topology, set-open topology, Pseudocompleteness, $σ$–compacity, $G_δ$ sets
Estimate Of The Parameters Of The Stochastic Differential Equations. Balck-Scholes Model

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Abstract

In this paper, one treats the techniques of estimate of the parameters of the Black-Scholes model. These techniques are based on the function of probability. The "discrete" method considers the function of density of transition from the process of diffusion normal log. The second method proposes the estimate of the parameters of the model via the observation of the time of first passage of the process through a constant terminal of which the density is known. One treats an application of the action Toyota MTR.

References


2000 Mathematics Subject Classification. 60H15, 60H30, 62M10, 62M20, 62P05

Key words and phrases. Estimate parameters, discrete method, time of the first passage
Precise determination of object corners in an image is very important in applications of robotics and computer vision, such as pattern recognition and 3-D reconstruction. The corners of a polygonal object plane, e.g. roof, wall, etc. in an image, can be determined by detecting image corners bounding the plane edges. An automatic system for locating image corners is likely to produce many corners do not represent corners of a polygonal object, and so despite many studies in the field of boundary recognition, the question of whether the detected corner in the image of a 3-D scene corresponds to an object point still merits further investigation. The aim of the research presented in this paper is to propose an image system capable of detecting image corners and then show the ones that correspond to polygonal object planes for a variety of types of subject. A review of the existing literature suggested that a two-camera approach based on uncalibrated images would offer the most flexible potential solution. The method is based on rectified images obtained from a pair of uncalibrated images utilizing the epipolar constraint, and is illustrated with images of several scenes captured using a digital camera.
Studies on Sensitivity of Clock and Data Recovery Circuits to Power Supply Noise

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Abstract

This paper deals with the study of the impact of power supply noise on the performance of CMOS Clock and Data Recovery (CDR) Circuits. The sensitivity of the various blocks of the dual loop CDR circuit to power supply noise is first studied and then it is demonstrated that insertion of suitable Low Dropout Regulators (LDO) can enhance the performance of the CDR system with respect to power supply noise. Based on extensive simulations, it was observed that while the system can tolerate only about 20 mV/10MHz noise on the power supply, incorporation of LDOs enables it to tolerate 200mV/10MHz noise without degradation in performance.
Scatter Search for Vehicle routing

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Abstract

In our work, we are interested in the scatter search method that was described by Glover in 1977. The approach comes from research strategies for the creation of decision rules and constraints substitution. Recent studies demonstrated the practical benefits of this approach for solving various optimization problems. Scatter search operates on a set of reference solutions to generate new ones by weighted linear combinations of structured subsets of solutions. The reference set is required to be made up of high-quality and diverse solutions and the goal is to produce weighted centers of selected subregions that project these centers into regions of the solution space to be explored by auxiliary heuristic procedures. In this paper, we illustrate how this method can be effectively used for the solution of general permutation problems that involve the determination of optimal cycles (or circuits) in graph theory and combinatorial optimization and we identify a general conception to resolve the vehicle routing problem.

References

Simultaneous Quadruple Series Equations Involving Generalized Bateman-K Functions

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Abstract

In this paper a closed form solution has been obtained for the simultaneous Quadruple Series equations involving generalized Bateman -K functions.
On Identification of Distribution for Two Independent Markov Chains to the Subject Reliability Criterion

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Abstract

Ahlswede and Haroutunian in [1] formulated an ensemble of problems on multiple hypotheses testing for many objects and on identification of hypotheses under reliability requirement. The problem of many \( (L > 2) \) hypotheses testing on distributions of a finite state Markov chain is studied in [5] via large deviations techniques. In this paper we solve the problem to identification of distributions of many hypotheses for two independent objects by usage of simple homogeneous stationary finite states of Markov chains.

References


\textbf{Key words and phrases.} Identification, error probability, hypotheses testing, two independent Markov chains
On Identification Of Distributions For Multiple Lao Hypotheses Testing

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Abstract

Applications of information-theoretical methods in mathematical statistics are reflected in the monographs by Kullback [5], Csiszár and Körner [2], Gutman [3] and others.

In [1] Ahlswede and Haroutunian formulated an ensemble of new problems on multiple hypotheses testing for many objects and on identification of hypotheses. The problem of many ($L > 2$) hypotheses testing on distributions of a finite state Markov chain is studied in [6] via large deviations techniques.

In this paper we solve the problem to identification of distributions of many hypotheses for one object by usage of simple homogeneous stationary finite states of Markov chains.

References

Hypotheses Optimal Testing Via Large Deviations Techniques

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Abstract

The problem of many hypotheses testing for a model consisting of \( L > 2 \) hypotheses on distribution of a Markov chain is studied. We apply large deviations techniques (LDT) and the method of types to the empirical distributions of finite states of Markov chain.

It is proved that this method of investigation in solving the problem of logarithmically asymptotically optimal (LAO) hypotheses testing is easier than the procedure that was introduced by Haroutunian.

The matrix of exponents \( \mathbf{E} = \{ E_{l|m} \}, \ m, l = 1, L \) of error probabilities of the LAO test \( E_{l|m}(\phi) = \lim_{N \to \infty} - \frac{1}{N} \log \alpha_{l|m}(\phi_N) \), where \( \alpha_{l|m}(\phi_N) \) for \( l \neq m \) is the probability to accept the hypothesis \( l \), when the hypothesis \( m \) is true, is determined.

References


2000 Mathematics Subject Classification. 62M02

Key words and phrases. Large Deviation Techniques (LDT), Markov chain, Logarithmically asymptotically optimal (LAO) hypotheses testing, reliability matrix.

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The Subdifferential of a Convex Functional on regulated function space

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Abstract

We treat here about the utilization of classic tools of Convex Analysis in the study of optimality conditions in the optimal control convex process for a Volterra-Stieltjes linear integral equation in the Banach space $G([a, b], X)$ of the regulated functions in $[a, b]$, that is, the functions $f : [a, b] \rightarrow X$, $X$ a Banach space, that have only discontinuity of first kind, in Dushnik (or interior) sense, and with an equality linear restriction. In this work we report the initial investigation of the subdifferentiability of the lower-semicontinuous convex functional $L_{\beta,f}(x)$ of Nemytskii type, we had already introduced. This notion is related with the properties of directional derivative and with the notion of Gateaux differentiability. Then natural the investigation of its subgradients and the duality aspects, because the classical result on characterization of its global minimum in $x_0$ by the condition $0 \in \partial L_{\beta,f}(x_0)$.

References

Computation of Expected Interference Between FSS and Imt-Advanced for Fixed and Mobile Users in Deferent Malaysian Environments

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Abstract

The impact of single and aggregates cases of IMT-Advanced (4G) systems on Fixed Satellite Services (FSS) earth station (ES) was conducted in this research paper for deferent Malaysian environments. The study initiated within detailed calculations of the most useful formulas for path loss effect and clutter loss by using the existing parameters of FSS and the most expected parameters for the IMT-Advanced. Site shielding, isolation, off-Axis, and in-band have been concluded, analyzed and simulated using Matlab software for several scenarios. Numerical formulas to calculate the power of the interference signal received at the FSS ES when IMT-Advanced base stations (BS) are operated is presented. Simulation results indicate that the proposed mitigation scheme is highly efficient in terms of reducing the separation distance as well as robust against DOE estimation errors. The study also used the propagation model of Rec. ITU-R P.525 to see the effect of terrain profile on the separation distance of the two systems for frequency sharing. Finally, the frequency sharing results are analyzed in the co-channel with respect to minimum separation distance, possible FSS elevation angle, and direction of FSS-ES (DOE).

References


2000 Mathematics Subject Classification. 78A55
Key words and phrases. Antenna, WLAN, RWSA, SMA connector, Bandwidth
Kanan Fixed Point Theorem On Generalized Metric Space With Extended Kind Of Contraction

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Abstract

Here, we obtain sufficient conditions for existence of fixed point of extension of Kannan type mappings defined on a generalized metric space.

References


2000 Mathematics Subject Classification. 47H10; 54H25.

Key words and phrases. Generalized metric; Kannan fixed point theorem; Contractive type mapping.
Some mapping properties of strongly $p$–summing

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Abstract

We prove that if $X$ is a Banach space type 2, $Y$ is a Banach space and $T : X \rightarrow Y$ is strongly $2$–summing if and only if $T$ takes members of $Rad(X)$ into members of $l_2 \hat{\otimes} Y$.

References


2000 Mathematics Subject Classification. 46B28, 47B25, 46M05

Key words and phrases. Absolutely $p$–summing , strongly $p$–summing operator.
Some Results About Algebraic Properties Of Generalized Cellular Automata


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Abstract

Let $G : R^A \rightarrow R^A$ be a cellular automaton where $R$ is a ring and $A$ is an R-module. In module structure point of view no attempt was made to classify cellular automata (CA). In this presentation we will discuss some properties of linear CA. We prove that if $R$ is a countable ring, $G$ an R-module epimorphism and its restriction to finite configurations is a monomorphism then $G$ is isomorphism.
Classification of Systems of Nonlinear ODEs: Multi-Species Interaction

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Abstract

In this paper, we study one class of multi-species interaction including predator-prey, competition and coexistence model, each which can be divided into three cases depending upon “the density changes of each species leads to either diminish or increase the growth rate of another species”. Furthermore, we study the general Lotka-Volterra equations, Lotka-Volterra equations for food chain, and Kolmogorove equations in the last section.

References


2000 Mathematics Subject Classification. 34A34, 37N25, 92B05, 92D25

Key words and phrases. Multi-Species, Nonlinear Systems of ODEs, Predator-Prey, Competition, Coexistence
Quasirecognition by the prime graph of the group $C_n(2)$

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Abstract

If $G$ is a finite group, we denote by $\pi(G)$ the set of all prime divisors of $|G|$ and by $\omega(G)$ the spectrum of $G$; i.e., the set of element orders of $G$. The prime graph (or Gruenberg-Kegel graph) $\Gamma(G)$ of $G$ is the graph with vertex set $\pi(G)$ where two distinct vertices $p$ and $q$ are adjacent by an edge (we write $(p, q) \in \Gamma(G)$) if $p.q \in \omega(G)$.

A finite simple nonabelian group $P$ is called quasirecognizable by its prime graph, if each finite group $G$ with $\Gamma(G) = \Gamma(P)$ has a unique nonabelian composition factor isomorphic to $P$. In this paper, we show that the simple group $C_n(2)$, where $n$ is an odd number and $n \geq 9$, is quasirecognizable by its prime graph.

References


A Set Theory Based Centralized Diagnosability in Discrete Event Systems

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Abstract

This paper addresses a new set theory based model of centralized diagnosability in discrete event systems. This research improves the efficiency of Sampath's approach as a reference framework. The proposed model meets the necessary and sufficient conditions of diagnosability and it benefits from ZBDD (Zero-suppressed Binary Decision Diagram) in set theory representations. The CUDD - Colorado University Decision Diagrams package was used to implement the related algorithms, and we have also derived a formal proof which shows the superiority of the proposed method in space and time complexity to former existing methods.

Mainly we address centralized diagnosability in discrete event systems (DES). DESs have discrete states and events. By occurring a certain event, DES's state is changed. Diagnosability, first was introduced by [1] who considered its properties in the framework of DES. In summary, the sequencing of events uses to determine whether a system is operating as desired or whether a failure may have occurred. A methodology for building DES models for failure diagnosis is also provided and a model-based approach for detecting failure events using diagnosers is presented, which state necessary and sufficient conditions for a language to be diagnosed. Jiang [2] is one of the related research works. Then, the researchers like Yoo focused on polynomial tests of failure diagnosability [3], and such a new direction like timed discrete event systems where sequencing and timing of events are considered. After all decentralized and distributed diagnosability have been introduced. In these two latter concepts, there are more than one observer in large and distributed systems. If the observers do not speak with each other, the decentralized diagnosability is considered; and if they do speak each other, the distributed diagnosability is considered. Since Diagnosability is important in large complex systems, so it has been received considerable attentions in scientific and industrial literatures.

References


Two-Dimensional Mechanical Stresses in a Hollow FGM Sphere

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Abstract

This paper studied the analytical solution for two-dimensional steady-state mechanical stresses in hollow functionally graded spheres. Material properties of the sphere are graded continuously across the thickness as power function in radial direction. Displacements and stresses are derived due to the general mechanical boundary conditions as function of radial and circumferential directions. The Navier equations are solved analytically, using Taylor and Legendre series. The direct method of solving Navier equations is presented.

Functionally graded materials are very advanced and nonhomogeneous material where changed continuously from metal surface to ceramic surface. Spherical vessels are very applicable and useful in petroleum industrials, gasoline industrials and power plants.

In this work by using direct method for solving Navier equations, we obtain general relations that we can apply many complicated mechanical boundary conditions on them, and see the behavior of FG sphere in each problem. These relations are evaluated analytically and are exact solution generally, not in special case and not numerically. And at the end of paper an example is solved and results are shown by two, three-dimensional figures and are discussed.

References


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2000 Mathematics Subject Classification.
Key words and phrases.
Genetic Algorithm based on Fuzzy System for Uncapacitated P-Median Problem

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Abstract

In this paper for solving uncapacitated p-median location problem a genetic algorithm is considered. In this genetic algorithm is using fuzzy system to control probability of crossover and mutation. In this fuzzy system two membership functions for each chromosome is considered. One membership function for minimizing the weighted average distance traveled from demand point to facility sites and other, for amount of covering demand points by facilities. A sexual selection is considered and during the sexual selection, the male and female chromosomes are selected randomly. When a parent is selected the fuzzy system considers membership functions and a probability of crossover for this parent is introduced. And after crossover fuzzy system calculated a probability for mutation and introduce to genetic algorithm. In order to assess the performance of the techniques used in this study, the benchmark problems available in open literature are used.
On Regularized Quasi-Semigroups and the Evolution Equation

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Abstract

In this note we introduce the notion regularized quasi-semigroups of bounded linear operators on a Banach space, as a generalization of regularized semi-groups of operators and its generator. After some examples of such semigroups the properties of this notion will be studied. Also some application of regularized quasi-semigroups in the abstract evolution equation will be considered.

References


2000 Mathematics Subject Classification. 47D60, 46D06

Key words and phrases. Quasi-semigroup, generators, evolution equation.
Fuzzy 2-Normed Spaces and its Fuzzy I-Topology

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Abstract

In this paper a fuzzy 2-norm on a vector space is introduced and a fuzzy I-topology generated with this concept is constructed. After making our elementary observations on this fuzzy topology, fuzzy continuity of functions on these spaces is studied. Next continuity of the operations of vector space under this topology is discussed and it is proved that this structure is not an I-topological vector space with respect to the I-topology.

References

On the basis number of the lexicographic product of two graphs and some related problem

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Abstract

For a given graph $G$, the set $E$ of all subsets of $E(G)$ forms an $|E(G)|$-dimensional vector space over $Z_2$ with vector addition $X \oplus Y = (X \setminus Y) \cup (Y \setminus X)$ and scalar multiplication $1X = X$ and $0X = \emptyset$ for all $X, Y \in E$. The cycle space, $C(G)$, of a graph $G$ is the vector subspace of $(E, \oplus, .)$ spanned by the cycles of $G$. Traditionally there have been two notions of minimality among bases of $C(G)$. First, a basis $B$ of $G$ is called a $d$-fold if each edge of $G$ occurs in at most $d$ cycles of the basis $B$. The basis number, $b(G)$, of $G$ is the least non-negative integer $d$ such that $C(G)$ has a $d$-fold basis; a required basis of $C(G)$ is a basis for which each edge of $G$ belongs to at most $b(G)$ elements of $B$. Second, a basis $B$ is called a minimum cycle basis (MCB) if its total length $\sum_{B \in B} |B|$ is minimum among all bases of $C(G)$.

The lexicographic product $G[H]$ has the vertex set $V(G[H]) = V(G) \times V(H)$ and the edge set $E(G[H]) = \{ (u_1, v_1)(u_2, v_2) | u_1 = u_2 \text{ and } v_1 \neq v_2 \in H, \text{ or } u_1 \neq u_2 \in G \}$.

In this work, we give an upper bound of the basis number for the lexicographic product of two graphs. Moreover, in a related problem, construct a minimum cycle bases for lexicographic product of the same.

2000 Mathematics Subject Classification. 05C38; 05C75

Key words and phrases. Cycle space; Minimum cycle basis; Basis number; Lexicographic product.
Application of Graph Theory in Stability of Nonlinear Complex Dynamic Systems

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Abstract

In this paper we follow a graph theoretic approach to develop a decomposition tool which exploits the structure of the directed graphs associated with a nonlinear dynamical system. Through this structural exploitation a new stability results for a nonlinear complex systems described by time varying ordinary differential equations are established. The present results make use of directed graph to transform complex systems into an interconnection of strongly connected subsystems (SCS). The stability is then accomplished in terms of the subsystems and in terms of the interconnection structure of the complex systems. To demonstrate the applicability of these results to physical systems, a damped transiently driven pendulum is considered as a specific example.

\textit{2000 Mathematics Subject Classification.} 62P10

\textit{Key words and phrases.} Complex Dynamical systems, Control theory, Decomposition, Graph theory, Stability.
Applications of Numerical Solution Method HPM

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Abstract

In this Letter, approximate solution of Kawahara equation is obtained by the known homotopy perturbation method (HPM) and the approximate solution has been compared with their known theoretical solution and result obtained via variational iteration method (VIM) in [8]. Using this method, it is possible to find the exact solution or an approximate solution of the problem.

References


2000 Mathematics Subject Classification. 65L80,65L05

Key words and phrases. Homotopy perturbation method, Variational iteration method, Kawahara equation
Discrete First-Order Four-Point Boundary Value Problem

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Abstract

We establish existence results for solutions to four-point boundary value problems for systems of first-order difference equations associated with systems of first-order ordinary differential equations.
Serial-Parallel Access Method (SPAM) for Instruction Cache Performance Improvement

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Abstract
Achieving to high fetch bandwidth and low power consumption are the more important challenges in cache performance. The approach to achieve these goals is to use way prediction in associative caches. Although this technique satisfies the above mentioned goals but it enforces some hardware complexities which could not be neglected. There are other techniques such as serial and parallel that have some advantages and disadvantages.

In this paper we are introducing a method that is the combination of serial and parallel techniques which is named Serial-Parallel Access Method (SPAM). Performance and power consumption of proposed method has been compared to serial and parallel architecture. The results show that our proposed combined technique in comparison with serial increases Instruction Per Cycle (IPC) and power consumption. Also the results of comparing parallel and combined techniques show decreasing both in IPC and power consumption. Although the former decrease doesn’t look good, but the latter is more important especially in systems which power consumption is critical for.

References
Applying the WKB Method to The Bifurcation of an Everted Spherical Shell Made of Elastic Varga Material

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Abstract

The WKB method is a powerful tool to obtain solutions for Eigenvalue problems. We apply the WKB method to the bifurcation analysis of everted a spherical shell composed of Varga material. Incompressible cases are considered. The method is degenerate but we obtain explicit bifurcation criteria and compare with previous numerical approximations.

References


\textbf{2000 Mathematics Subject Classification.} 73C, 73G, 73H

\textbf{Key words and phrases.} Elastic, spherical shells, eversion, bifurcation, asymptotic, WKB method
Application Of Generalized Purcell Method For Real Eigenvalue Problems

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Abstract

In numerical linear algebra, the singular value decomposition (SVD) is an important factorization of a rectangular real or complex matrix, with several applications in signal and image processing, image compression and statistics. A new method based on generalized Purcell method for real eigenvalue problem and QR decomposition of an arbitrary matrix is proposed. The method in comparison to the inverse power method generates better results and has less computational cost. In addition, the method obtains directly the rank of a matrix and gives linearly independent eigenvectors corresponding to an eigenvalue.

2000 Mathematics Subject Classification. 65F05, 65F10, 65F15

Key words and phrases. Eigenvalue problem, Singular value decomposition, QR decomposition
Design, Manufacture And Optimization Of Intelligent Cane For Blinds By Avr Microcontroller

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Abstract

Sight is one of the most important blessing of God that in case privation of it, there are many problems for blind persons. Blind persons use of white cane for informing of obstacles and for finding suitable route, but application of it is not enough for their requests, so they are confronted with many dangers.

The aim of this article is design, manufacture and optimization of electronic circuits in intelligent cane with advanced features and better application. In these electronic circuits we can determine distance and depth by ultrasonic waves. After sending waves by transmitter circuit and their encounter with an obstacle, receiver circuit receives return waves, then AVR microcontroller processes data, auditory alarms become active and LCD shows distance to an obstacle and the depth of hole. The basis of distance distinction is given by \( X = \frac{V \cdot t}{2} \). \( X \) stands for distance, \( V \) is velocity of sound and \( t \) is the time of transmitting and receiving ultrasonic waves. The velocity of sound is 330 m/s - 340 m/s, but its changes depends on temperature and properties of matter in air.

In this article we use of AVR (ATMEGA8) microcontroller and have designed, manufactured and optimized transmitting and receiving circuits. Distance distinction is computed with our written program.

2000 Mathematics Subject Classification. 93A, 94C

Key words and phrases. Circuit, Control.
Monomial Irreducible $\mathfrak{sl}_n(\mathbb{C})$-Modules

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Abstract

In this talk, we introduce monomial irreducible representations of the special linear Lie algebra $\mathfrak{sl}_n(\mathbb{C})$. We will show that, this kind of representations have bases for which the action of the Chevalley generators of the Lie algebra on the basis elements can be given by a simple formula.

Let $L$ be a finite dimensional complex simple Lie algebra. For any functional integral dominant weight $\lambda$, we denote the associated irreducible module by $L(\lambda)$. One of the most important problems concerning representations of simple Lie algebras, is considered in this talk: to find an ordered basis for $L(\lambda)$, such that one can obtain the matrix representations of elements of $L$ with respect to this ordered basis. It is trivial that handling with matrix representations are more flexible than working with $L$-modules, especially in practise.

It is the aim of this talk to introduce such a suitable basis for $L(\lambda)$. In the present work we do this for monomial weights of the Lie algebra $\mathfrak{sl}_n(\mathbb{C})$. Note that every dominant integral weight $\lambda$ is associated with a partition $\pi$. We say that $\lambda$ is monomial, iff $\chi_{\pi}$, the corresponding character of $\pi$, is monomial character. In this case, by a paper of me and A. Madadi, (see [2]), there is a subgroup $G \leq S_m$ and a linear character $\chi$ of $G$, such that

$$L(\lambda) \cong V_{\chi}(G),$$

where $V_{\chi}(G)$ is symmetry class of tensors associated with $G$ and $\chi$ over $V = \mathbb{C}^n$.

The symmetry class of tensors $V_{\chi}(G)$ has an orthonormal basis, consisting of decomposable symmetrized tensors, say

$$E = \{ |\alpha\rangle : \alpha \in \Delta \}$$

such that $|\sigma^{\alpha}\rangle = \chi(\sigma^{-1})|\alpha\rangle$, for all $\sigma \in G$. This is just the basis we need, because for Chevalley generators of $\mathfrak{sl}_n(\mathbb{C})$, we will prove that

$$H_i.|\alpha\rangle = \mu_\alpha |\alpha\rangle,$$

$$X_i.|\alpha\rangle = \sum_{r=1}^{n} \mu_{i+1,\alpha, r} \chi(\sigma_{r}^{-1})|\alpha - \epsilon_{r}\rangle_{r}.$$
Multiple Confounded and Orthogonal Replicated Full Factorial BIB Designs

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Abstract

The $s^n$ factorial design, where $s$ is a prime number like 2, 3, 5, etc., generally confounds a set of different orthogonal factorial effects with $sr$ blocks ($n > r > 1$) under one replicate. Thus there will be a complete set of orthogonal replicates of different group of orthogonal factorial effects for constructing a partially confounded $s^n$ factorial design in $s^r$ blocks. The factorial design, in general, when it partially confounds different orthogonal sets of different groups of orthogonal factorial effects under the complete set of different orthogonal replicates constitutes a BIB design having their individual properties, same result and detailed information of all factorial effects. The procedure is illustrated with some examples and one practical application.
Fractional $s^{n-k}$ Factorial BIB Designs

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Abstract

The partially confounded different $s^{n-k}$ fractional factorial designs under complete orthogonal replicates of different groups of factorial effects constitute different BIB designs with detailed but same factorial and BIB result. The method with some examples of different levels and one application are given.
Multi-Stage Multi-Phase BIB Designs

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Abstract

The multi-stage multi-phase BIB designs are the chain of BIB factorial designs produced at each of its different stages of fractional factorials. It is very interesting and important that it meets the scarcity of development of different types of BIB designs providing individual factorial treatment ss’s equivalent to BIB’s adjusted treatment ss for each. A chain example is given to illustrate procedure in details.
A Fuzzy Goal Programming Approach to Multi-Objective Transportation Problems

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Abstract

Transportation problem is one of the most widely used operations research tools and has been a decision making aid in almost all manufacturing industries and service organizations. This paper focuses on multi-objective transportation problems (MOTPs). To deal with MOTPs, a new approach based on fuzzy goal programming is suggested. In fact, the proposed approach considers each objective function as a fuzzy goal. Then a solution to MOTP obtains using a method developed in [4,5] interactively. The performance of the proposed approach is evaluated by comparing its result with that of some existing methods in [1,2,3]. Indeed, the proposed approach can be implemented easily during the interactive procedure and its solution is better than some of the other methods presented in [1].

References


2000 Mathematics Subject Classification. 90C08, 90C29, 90C70

Key words and phrases. Multi-objective transportation problem, fuzzy goal programming, interactive approach

**This paper has been partially supported by the Research Group of Dynamical Systems, Shahid Bahonar University of Kerman, Iran**
A model to create orthogonal Graeco Latin square experimental designs

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Abstract

Graeco Latin square designs and Latin square designs are used as experimental designs including more blocks. A Latin square arrangement is an arrangement of n symbols in n rows and n columns, such that every symbol occurs once in each row and each column. When two Latin squares of same order are superimposed on one another, in the resultant array if every ordered pair of symbols occurs exactly once, then the two Latin squares are said to be orthogonal or Graeco Latin square. Creating a Graeco Latin square arrangement is time consuming. However, it has good usage in scope of blocking design in DOE. It helps the SSE (Sum of Squares Error) of design to be pure because of disarticulation of block factors’ effects from the error effects. This paper proposes a model to arrange the position of pair words of Latin and Graeco. A heuristic approach to set the Graeco Latin Square design and a proposed Linear Assignment Model are two proposed methods to develop mentioned experimental designs. To solve the proposed linear model for any rank of square, we used Lingo software to program the problem. And finally some numerical examples were used to show the applicability of proposed methods.

2000 Mathematics Subject Classification. 62Kxx, 90Bxx

Key words and phrases. Design of experiments, Blocking design, Nuisance factor, Graeco Latin Square, Linear Programming (LP), Assignment, Mutually Orthogonal Latin Square.
Distributions of order statistics from a bivariate selection elliptical distribution as mixtures of univariate selection elliptical distributions

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Abstract

We consider here a univariate selection elliptical distribution, and focus on normal and t ones. In the normal case we derive its moment generating function as well as the first and second moments. Next, we show that the distributions of order statistics from a bivariate selection elliptical distribution are mixtures of these univariate selection elliptical distributions; hence, using the established properties of the univariate selection elliptical distribution, we derive the moment generating functions of order statistics, and also present expressions for means and variances of these order statistics, where they exist.

References


Total Ordering Cones in $\mathbb{R}^n$ and Optimality Condition for Set-Valued Optimization Problems

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Abstract

In this work, existence of a total ordering cone that consists a cone with a compact base is shown, the representation of a convex, pointed, total ordering cone in $\mathbb{R}^n$ is given and it is shown that any total ordering cone in $\mathbb{R}^n$ is isomorphic to the cone $\mathbb{R}^n_{lex}$. Then optimality conditions are given by using total ordering cone to scalarize the set-valued optimization problem.

References


Key words and phrases. total ordering cone, scalarization, set valued optimization

2000 Mathematics Subject Classification. 80M50, 49J53
Repairable 2-Consecutive-2-Out-Of-n:F System

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Abstract

In this paper, a repairable 2-consecutive-2-out-of-n: F system is studied. Assume that the working time and the repair time of each component are both exponentially distributed, and each component after repair is as good as new. By using the notion of generalized transition probability, we derive the state transition probability of the system. we obtain the exact formulas of the system reliability.

2000 Mathematics Subject Classification. 90B25, 60K20

Key words and phrases. 2-consecutive-2-out-of-n: F system; generalized transition probability; exponential distribution; repairable system.
Prey- Predator system and Lotka-Volterra model

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Abstract

Lotka-Volterra equation are a pair of first order nonlinear differential equations that are used for analyzing the biological and dynamical systems. This paper gives an improvement for prey-predator system in N species case with an overview for the nonlinear dynamical system and the result of simulations, by solving of Lotka-Volterra equation analytically and numerically by using rung kutta method.

2000 Mathematics Subject Classification.

Key words and phrases. dynamical system, prey-predator system, Lotka-Volterra equation
Fixed Point Theorems With Contractive Conditions Involving Product On Cone Metric Spaces

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Abstract

In this paper, we generalized the consequence of fixed point theorem with contractive conditions involving products, of Pachpatte and investigated properties P and Q, which defined by Rhoades and Jeong on cone metric spaces.

References


2000 Mathematics Subject Classification. 47H10

Key words and phrases. Fixed Point, Cone Metric Space.
A Simple algorithm for inverse general pentadiagonal matrix with LU method

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Abstract

In this paper, we compute determinant of matrix $A$ by Sogabe’s and Zhao’s algorithms. Then employing the Doolittle and Court factorization matrix $A$ is factorized into uptriangular and downtriangular matrix. The inverse of matrix $A$ is obtained by suitable algorithm. This method is more efficient than the others as such as illustrated.

References


Identification of all DEA Efficient Facets

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Abstract

The ability of identifying efficient frontier prior to the DEA calculation is of extreme importance to an effective and efficient DEA computation. We introduce a new computational framework which is based on enumerating the extreme points of a convex polytope specified by some linear constraints. The number of extreme points of the proposed model is about equal to the number of efficient facets of the production possibility set (PPS). Access to efficient frontier of PPS permits a complete analysis in a second phase for the corresponding model either oriented or orientation-free.

References


2000 Mathematics Subject Classification. 90C05, 90B50
Key words and phrases.Data Envelopment Analysis, Efficient Frontier, Vertex Enumeration.
This research was supported by Islamic Azad University-Karaj Branch
On a class of divergent sequences

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Abstract

A sequence \( x = (x_n)_{n \in \mathbb{N}} \) of positive real numbers belongs to the class \( \text{ARV}_s \) if for each \( \lambda > 1 \) there are \( n_0 \in \mathbb{N} \) and \( c(\lambda) > 1 \) such that for each \( n \geq n_0 \) it holds \( x_{\lambda n} \geq c(\lambda) \cdot x_n \). We present some results on this class of sequences and its relationships with translationally regularly varying and translationally rapidly varying sequences.
Quasi-Permutation Representations of the Borel and Maximal Parabolic Subgroups of $G_2(2^n)$

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Abstract
By a quasi-permutation matrix we mean a square matrix over the complex field $\mathbb{C}$ with non-negative integral trace. Thus every permutation matrix over $\mathbb{C}$ is a quasi-permutation matrix. For a finite group $G$ the minimal degree of a faithful representation of $G$ by quasi-permutation matrices over the complex numbers is denoted by $c(G)$, and $r(G)$ denotes the minimal degree of a faithful rational valued complex character of $G$. In this paper $c(G)$ and $r(G)$ are calculated for the Borel and maximal parabolic subgroups of $G_2(2^n)$.

References

2000 Mathematics Subject Classification.20C15
Key words and phrases.Character table, Quasi-permutation representation, Schur index
P-Adic Study in Linear 2-Normed Spaces

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Abstract
We shall study $p$-adic analysis in linear 2-normed spaces and give some results in this sense.

References

2000 Mathematics Subject Classification.46A15, 41A65, 11B68, 11S80.
Key words and phrases.2-normed spaces, $p$-adic numbers, $p$-adic norm, $p$-adic 2-norm.
The Effect Of Multiple Intelligence Approach In Project Based Learning To Mathematics Learning Achievement

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Abstract

The purpose of this research is to determine effects of multiple intelligence approach in project based learning applied in mathematics lesson on the students’ mathematics achievements. This experimental research that was conducted related to this aim was designed in the model of pretest-posttest with control group. The experimental study was conducted at two different schools in the Fatih district of Istanbul in the spring semester of 2006-2007 education years. The participants of the study are totally 144 students of 6th classes of these schools. In each school, three classes are randomly chosen as two experiment groups and one control group. While students in experimental groups learn mathematics with project based learning, control group students learn mathematics with traditional method. In the project application, in the first experiment groups the project topics are assigned according to intelligences which the students get the maximum points in multiple intelligence quiz. In the second experiment groups, the project topics are assigned according to intelligences which the students get the minimum points in multiple intelligence quiz. The data in the research were gathered through mathematics achievement test and multiple intelligence quiz. The data were analyzed descriptively and then the findings were determined and evaluated based on the research questions by the help of some statistical programs. At the end of the study, it was found that there is no statistically important effect of multiple intelligence approach in project based learning applied in mathematics lesson on the students’ mathematics achievements.
A unified approach to generalized continuities

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Abstract

Contribution deals with a concept which covers many known types of continuities. Method is based on stating appropriate system $E$ of subsets on domain. The first motivation for introducing comes from definition of quasi continuity. Namely, a mapping $f : X \to Y$ is $E$-continuous at $x$, if for any open sets $V$ and $U$ such that $x \in U$ and $f(x) \in V$, there is a set $E \in E$, such that $E \subset U \cap f^{-1}(V)$. The next, stronger variant, is generalization of continuity. A function $f$ is dense $E$-continuous at $x$, if for any open set $V$ containing $f(x)$, there is an open set $U \ni x$, such that for any open set $H \subset U$, there is a set $E \in E$ such that $E \subset H \cap f^{-1}(V)$. When $E$ is system of all non-empty open sets, it is equivalent to the notion of quasi continuity or (dense variant) $\alpha$-continuity. Using different systems $E$, we are able to describe many types of continuities. Approach is used in function as well as multifunction setting.
On analysis of nonlinear dynamic system of separation

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Abstract

This paper proposes an approach to quantitatively and systematically search for analysis process of separation which is highly nonlinear. Since the separation process unrolls inside a block of separation, used in hydrocarbon field, it is necessarily that the model takes in the account the dimension of the separator and the physical properties of the composites to be separated. This paper deals with the problem of finding a moderately complex model of the separator that may capture the key dynamical properties of the physical plant.
A SystemC QoS router design with virtual channels reservation in a wormhole-switched NoC

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Abstract

The current levels of integration make it possible to assemble on the same chip a complete numerical system. The systems on chip or SoCs become increasingly complex; the forecasts promise in the next years the integration of electronic systems of 4 billion transistors for frequencies close to 10 GHz. A powerful and economic solution consists in benefitting from an infrastructure of pre-established configurable communication, namely NoC for Network on Chip. The components communicate then between them by exchanging packages through interconnected network, providing a reusable communication-structure. The recourse to NoC is essential for the great dimension circuits, as well from the technological point of view, as from the functional point of view (facilitated connection of the IP's components and thus of their re-use). The control of the NoC characteristics is a major asset because the consumption and the performance of SoC will be dominated more and more by the communication resources. This paper presents the design of an on-chip network router with Quality-of- Service (QoS) support. The router uses virtual channel architecture with a priority-based scheduler to differentiate between multiple connections with various QoS requirements sharing the same physical channel. The architecture that we propose in this work is composed mainly of five ports. In addition, inside a router we find two under-routers. A SystemC based methodology is used to achieve an RTL simulation of the design.
Determination of Residual Stress by Artificial Neural Network in Hsla-100 Steel Weldments

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Abstract

The residual stress fields near the weld bead in HSLA-100 steel weldments were examined in detail by means of neural network. Many different specimens that were subjected to different conditions were studied. At first, the residual stress by x-ray diffraction is calculated. Then a neural network is created. The input of this network is heat input, preheat, and yield strength, temperature of age and measurement direction. Residual stresses were determined without any calculating or experiment on the surface by using this network under any condition of problem. However, accurate predictions of residual stress could not be obtained without a large number of time and money by experimentally method. An application of the back-propagation neural network using short term measuring data is presented in this paper. In this study experimental and numerical methods are combined to determination of the residual stress. Some advantage of this numerical method is saving in time and money. The Artificial Neural Network (ANN) is superior to existing experimental techniques. In this study, the neural networks have been employed as a general approximation tool for estimation of the residual stresses in welding of steel. For this purpose used of three functions such as newelm, newff and newcf and by using of MATLAB software, the network is created. The Levenberg-Marquardt algorithm is chosen to perform the training of the networks. A number of samples are analyzed with ANN for parameters of residual stress and the results are compared with experimental method. Back Propagation Neural network (BPN) is used to approximation of residual stress. Resultant low relative error value of the test indicates the usability of the BPN in this area. The results show that, estimation by newelm function is better than newff and newcf functions because it has less error than another function. Also specimens which are subjected to different welding heat input have similar distributions of residual stress on the surface, but the magnitudes of stresses are different. Higher welding heat input generates smaller stress.

2000 Mathematics Subject Classification.

Key words and phrases. Residual Stress, Welding, HSLA100, Artificial Neural Networks.
A survey on Mathematics’ role on Customer Relationship Management (CRM) to Improve Customer Satisfaction and Production Increase

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Abstract

Emergence of new products in chaotic markets and development of small and medium enterprises, (SME’s) in national and international era has caused companies, factories and in general whole enterprises in private and also governmental and non-governmental organizations by different challenges which all have gone to bring new customers and also to keep previous ones who are accounted for their revenue. For this a new aspect of management science and mathematics as a basic and mother science shines to keep enterprise’s efficiency in the current economical recession. The aim of this paper is analyzing the role of problem solving strategies in mathematics with Customer Relationship Management, CRM. This paper will be studying the logical relation between them.

2000 Mathematics Subject Classification. 92-xx

Key words and phrases. Mathematics Problem solving strategies, Customer Relationship Management, Proficiency, Customer, SME
Generalized Bi-Quasi-Variational Inequalities for Quasi-Pseudo-Monotone Type II Operators on Compact Sets

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Abstract

In this paper, the authors prove some existence results of solutions for a new class of generalized bi-quasi-variational inequalities (GBQVI) for quasi-pseudo-monotone type II and strongly quasi-pseudo-monotone type II operators defined on compact sets in locally convex Hausdorff topological vector spaces. In obtaining these results on GBQVI for quasi-pseudo-monotone type II and strongly quasi-pseudo-monotone type II operators, we shall use Chowdhury and Tan's generalized version in [M. S. R. Chowdhury and K.-K. Tan, Generalization of Ky Fan’s minimax inequality with applications to generalized variational inequalities for pseudo-monotone operators and fixed point theorems, J. Math. Anal. Appl. 204 (1996), 910–929] of Ky Fan’s minimax inequality in [K. Fan, A minimax inequality and applications, in “Inequalities, III” (O. Shisha, Ed.), pp.103-113, Academic Press, San Diego, 1972] as the main tool.

References


2000 Mathematics Subject Classification. 47, 46, 54, 90
Key words and phrases. Generalized bi-quasi-variational inequalities, quasi-pseudomonotone type II operators, strongly quasi-pseudo-monotone type II operators, locally convex Hausdorff topological vector spaces.
Stability Analysis of Infectious Disease with Media Coverage and Poverty

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Abstract

In this paper, the effect of poverty along with media coverage on the stability of dynamics of infectious disease has been checked. The incorporation of the factor, poverty along with media coverage makes our model more closer to the real life situations. Using stability theory, the analysis of the model has been made by finding out all the equilibrium points of the system. The stability analysis has also been done for parameters involved in the model.

2000 Mathematics Subject Classification.

Key words and phrases. Poverty; equilibrium points; media coverage; stability.
Modelling The Interaction Between Crude Oil Price And Other Commodities Price

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Abstract

Crude oil price issues have gained much attention worldwide lately. This is due to the shortage of crude oil production, which increases the price tremendously. The fact that an increase in crude oil price will then increase the disposal income of oil exporting countries together with the demand for some commodities have outburst the primary idea of doing this research. In this paper, we study the nonlinear interactions between crude oil price changes on five commodities namely lamb, olive oil, rubber, tea, wheat and zinc by using a two regimes multivariate Markov switching vector autoregressive (MS-VAR) model with regime shifts in both the mean and the variance. The empirical results show that all the series are not cointegrated but the MS-VAR model with two regimes manage to detect common regime shifts behaviour in all the series. The estimated MS-VAR model reveals that when the crude oil price fall the price of the five commodities also moving downward and when the crude oil price gain the price of the five commodities will increase. In addition, the MS-VAR model fitted the data better than the linear vector autoregressive model (VAR).

2000 Mathematics Subject Classification. 37M10, 91B82, 91B84.

Key words and phrases. Markov switching vector autoregressive model, crude oil price, nonlinearity.
A new system of implicit variational-like inclusion problems involving \((H(\cdot, \cdot), \eta)-}\)monotone operators

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Abstract

In this paper, we introduce a new concept of \((H(\cdot, \cdot), \eta)-\)monotone operator. The generalized resolvent operator associated with this type of monotone operators is defined and Lipschitz continuity of it is established. By using Lipschitz continuity of generalized resolvent operator a new system of implicit variational-like inclusion problems is solved. Finally, some algorithms and their convergence theorems are considered.

References


2000 Mathematics Subject Classification. 47H05, 47J20, 49J40

Key words and phrases. monotone operator, resolvent operator, implicit variational inclusion
Some Characterizations of Multi-Criteria Shortest Path in A Multi-Valued Network

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Abstract

The problem of shortest path is considered as one of combinatorial optimization problems the most important and most studied ([1], [2]). Mono-criteria variant of this problem is considered as practically solved ([3]). But the case of multi-criteria variant is NP-complete ([4], [5]). The algorithms for solving the problem of multi-criteria shortest path is based essentially on the use of algorithms of the classical problem or slightly modified versions ([6], [7], [8]). In several problems in the routing network, conflicting objectives must be considered. Paths problems in networks are usually multi-dimensional nature and in many cases the explicit consideration of multiple objectives is adequate. Objectives related to cost, distance, time, environmental impact, …etc. are appropriate to select the best compromise solution ([9]). Our contribution is focused on two research problems of shortest paths in the multi-objectives context. We establish some results, particularly in the characterization of the existence of non-dominated solutions. We also give the mathematical formulation of multi-objective problems as well as the resolution algorithms.

References


2000 Mathematics Subject Classification. 90B50, 90C27, 65K05, 52B05
Key words and phrases. multi-criteria shortest path problem, combinatorial optimization, mathematical programming.
Asymptotic behaviour of a dynamic problem of linear elasticity with Tresca boundary conditions

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Abstract

We consider a problem associated to the linear elastic body in dynamic regime in a three dimensional thin domain $\Omega^\varepsilon$. We first establish an existence result for weak solutions of this problem. Then we study the asymptotic analysis when one dimension of the domain tends to zero. A specific weak Reynolds equation, the limit of Tresca boundary conditions are obtained. The uniqueness result for the limit problem is also proved.

References


2000 Mathematics Subject Classification. 35R35; 78M35; 35B65.

Key words and phrases. Free boundary problems; Tresca law; Elasticity system; Asymptotic approach; Reynolds equation.
Generalized potentials in weighted variable exponent Lebesgue spaces on homogeneous spaces

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Abstract

In the sequel \((X, \varrho, \mu)\) always stands for a bounded quasimetric space with quasidistance \(\varrho\) and Borel regular measure \(\mu\). We denote \(d = \text{diam } X\). The measure \(\mu\) is supposed to satisfy the growth condition

\[
\mu(B(x, r)) < Kr^N.
\]

A function \(\Phi : X \times [0, +\infty) \to [0, +\infty)\) is said to be an \(N\)-function, if

1. for every \(x \in X\) the function \(\Phi(x, t)\) is convex, nondecreasing and continuous in \(t \in [0, +\infty)\),
2. \(\Phi(x, 0) = 0\), \(\Phi(x, t) > 0\) for every \(t > 0\),
3. \(\Phi(x, t)\) is a \(\mu\)-measurable function of \(x\) for every \(t \geq 0\).

Let \(\Phi\) be an \(N\)-function and \(w\) a weight. The weighted Orlicz-Musielak space \(L^{\Phi}(X, w)\) is defined as the set of all real-valued \(\mu\)-measurable functions \(f\) on \(X\) such that

\[
\int_X \Phi\left(x, \frac{w(x)f(x)}{\lambda}\right) d\mu(x) < \infty
\]

for some \(\lambda > 0\). We equip it with the norm

\[
\|f\|_{\Phi, w} = \inf \left\{ \lambda > 0 : \int_X \Phi\left(x, \frac{w(x)f(x)}{\lambda}\right) d\mu(x) \leq 1 \right\}.
\]

In particular, \(\Phi(x, t) = t^{p(x)}\), where \(1 \leq p(x) < \infty\), is an \(N\)-function and the corresponding space is the variable exponent Lebesgue space \(L^{p(x)}(X, w)\). Everywhere in the sequel, when dealing with the space \(L^{p(x)}(X, w)\), we suppose that

\[
1 < p_- \leq p(x) \leq p_+ < +\infty,
\]

(0.1)

and denote

\[
|p(x) - p(y)| \leq \frac{A}{\ln \left(\frac{x+1}{x}\right)}, \quad g(x, y) < \frac{1}{2}
\]

(0.2)

and denote

\[
w_r = \varrho(x, x_0)^r, \quad x_0 \in X.
\]

The function \(a : [0, d] \to [0, +\infty)\) is assumed to satisfy the assumptions

1) \(a(r)\) is continuous, almost increasing, positive for \(r > 0\) and \(a(0) = 0\),
2) \(\int_0^d a(r) dr < \infty\). We denote

\[
A(r) = \int_0^r \frac{a(t)}{t} dt.
\]

The lower dimension of \(X\) is defined by

\[
\text{dim}^\text{\lower}(X) = \sup_{r>1} \left(\ln \left(\liminf_{x \to 0} \inf_{x \in X} \frac{\mu_B(x, r)}{\mu_B(x, r^N)}\right) \right).
\]

It is clear that \(\text{dim}^\text{\lower}(X) = N\) in the cases where \(X\) has constant dimension \(N\), that is, \(c_1 r^N \leq \mu_B(x, r) \leq c_2 r^N\). In general, if \(X\) has the property that

\[
0 < \text{dim}^\text{\lower}(X) < \infty,
\]

then \(X\) satisfies the growth condition with every \(0 < N < \text{dim}^\text{\lower}(X)\).
**Theorem** Let \((X, \varrho, \mu)\) be quasimetric space with doubling measure and positive finite lower dimension \(\overline{\dim}(X)\), and let \(p\) fulfill assumptions (0.1)-(0.2) and
\[
0 \leq \nu < \frac{\overline{\dim}(X)}{p(x_0)}.
\]
Suppose that there exists a \(\beta \in \left(0, \frac{\overline{\dim}(X)}{p(x_0)}\right)\) such that \(\frac{a(r)}{r^\beta}\) is almost decreasing. Then the operator
\[
I_\alpha f(x) := \int_X a(\varrho(x, y)) \varrho(x, y)^N f(y) d\mu(y)
\]
is bounded from the space \(L^{p(x)}(X, w^\nu)\) into the weighted Orlicz-Musielak space \(L^{\Phi}(X, w^{\nu_1})\), where \(\nu_1 = \frac{\nu}{p(x_0)}\) and the \(N\)-function \(\Phi\) is defined by its inverse (for every fixed \(x \in X\))
\[
\Phi^{-1}(x, r) = \int_0^r A\left(t^{-\frac{1}{N}}\right) t^{-\frac{1}{p(x)}} dt.
\]
Fixed Points of Mappings Satisfying a New Condition in Cone Metric Spaces

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Abstract

In this paper we proved some fixed points of mappings satisfying a new condition in cone metric spaces, where some of the main results of iri [4] are recovered.

References


2000 Mathematics Subject Classification.

Key words and phrases. Fixed point, cone metric space, minihedral cone, strongly minihedral cone, cone metrically convex
Using the Algebra of Hypergraph for Reconstruction Phylogenetic Trees

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Abstract
In this paper, we will construct phylogenetic trees by using the algebra of hypergraph through Neighbor Joining Algorithm. Directed hypergraph can represent metabolic networks \(M(X, J)\), where \(X\) is the set of metabolites and \(J\) is the set of chemistry reactions. Metabolic network datas are obtained from citric-acid cycle of microorganism of 3 classes, which are 4 Archea, 11 Bacteria and 1 Eukaryote. Moreover, the result will be compared to the phylogenetic tree based on nucleotide sequences of 16s rRNA Gene of the same microorganisms.

\(2000\) Mathematics Subject Classification.

Key words and phrases. phylogenetic tree, algebra of hypergraph, Neighbor Joining Algorithm, metabolic networks, citric-acid cycle, nucleotide sequence of 16s rRNA Gene
Some Applications of Determinant in Undergraduate Statistics Courses

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Abstract

This paper explains some concepts of statistics and probability courses via the approach of determinant. It demonstrates the concept of independence of Navidi (2008) along with its implication on the basic properties of probability. The definition of conditional probability leads to Bayes's rule and the determinant form of it yields that they are equivalent. The presentation of the proof via determinant approach is simple, interesting and it derives the strength from Venn diagrams of the relevant events.

An alternative formula of pairwise independence is presented when dealing with three events. This is different from Devore (2004). Applications of determinant help provide a new approach to revisit the contingency tables. Finally, the concept of correlation is explained by utilizing the notion of determinant. Throughout the paper, examples are presented to point out the usefulness of the various determinant formulas.

The aim of this paper is provide insights that determinants are extremely useful as they create pedagogical value to one's learning.
Implementation of New Algorithm for Steepest Descent Method

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Abstract

Exact line searches along each steepest descent direction converge very slowly. Barzilai and Borwein suggested two stepsizes that ensures superlinear convergence and performs quite well. Barzilai-Borwein method is not monotone, thus it is not easy to be generalized for general nonlinear functions. A new stepsizes enables fast convergence and possesses monotone property is proposed by Yuan. The new stepsizes is modified to obtain modified new steepest descent method, which is for convex quadratic problems only is proposed by Yuan. The new steepest descent method uses the new stepsizes after every m exact line search iterations. An algorithm for m=2 is proposed in this paper. We use quadratic functions to test the performance of our algorithm.

2000 Mathematics Subject Classification.

Key words and phrases: steepest descent, line search, unconstrained optimization, convergence, monotone
On Some Generalized Sequence Spaces Of Fuzzy Numbers Defined By A Sequence Of Orlicz Functions

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Abstract

The purpose of the paper is to introduce the concepts of almost $\lambda$-statistical convergence and strongly almost $\lambda$-convergence of sequences fuzzy numbers. We establish some connections between these concepts. It is also shown that if a sequence of fuzzy numbers is strongly almost $\lambda$-convergent with respect to a sequence of Orlicz functions then it is almost $\lambda$-statistical convergent.

References


2000 Mathematics Subject Classification. 40A05, 40D25

Key words and phrases. Fuzzy numbers, Orlicz function, de la Vallee-Poussin means, statistical convergence.
Hybrid Broyden Method For Unconstrained Optimization

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Abstract

In this article we consider a hybrid search direction of Broyden method and steepest descent method. In particular, we try to analyze the performance and discuss thoroughly on the convergence of this hybrid method. We also provide some numerical results to show that the algorithm is comparable to the Broyden algorithm.
Discretization Methods for Nonconvex Differential Inclusions

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Abstract
In the present paper we consider the Cauchy problem for first order differential inclusion of the form
\[ \dot{x}(t) \in F(x(t)) + f(t, x(t)), x(0) = x_0 \] (1.1)
where \( F \) is a given set-valued map with nonconvex values and \( f \) is a Carathéodory function. The nonconvexity of the values of \( F \) do not permit the use of classical technique to obtain the existence of solution to this problem. One way to overcome this fact is to suppose \( F \) upper semicontinuous cyclically monotone, i.e., the values of \( F \) are contained in the subdifferential of a proper convex lower semicontinuous function. The first result is due to [4] when \( f \equiv 0 \) and [1] for the problem (1.1) in the finite dimensional setting. An extension of this result is obtained by [21] under the assumption that \( F(x) \) is contained in the subdifferential of a Clarke regular function. A different class of function has been used in [3] to solve the same problem, namely the authors take \( F(x) \) in the proximal subdifferential of a locally Lipschitz uniformly regular function and proved that any convex lower semicontinuous function is uniformly regular. The present paper is a continuation of the above results. We prove that, for locally Lipschitz functions, the class of convex functions, the class of lower-\( C^2 \) functions and the class of uniformly regular functions are strictly contained within the class of regular functions and we present existence results to problem (1.1) in the finite and infinite dimensional setting with weaker and more natural conditions. An application to a controlled nonlinear diffusion inclusion is given.

References
On the non-commuting graph of the simple groups

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Abstract

Given an arbitrary non-abelian group $G$ and arbitrary finite group $H$, denote by $\Gamma(G)$ the non-commuting graph of $G$ and denote by $GK(H)$ the prime graph of $H$. In 2006, A. Abdollahi, S. Akbari and H. R. Maimani put forward the following conjecture [1]:

AAM’s Conjecture: If $S$ is a non-abelian finite simple group and $H$ is a group such that $\Gamma(H) \cong \Gamma(S)$, then $H \cong S$.

Even thought this conjecture is known to hold for finite simple groups with disconnected prime graph [2, 3], it is still unknown for simple groups with connected prime graph. In this paper, we show that if $\Gamma(H) \cong \Gamma(S)$, then $GK(H) = GK(S)$.

References


2000 Mathematics Subject Classification. 20D06, 20D20, 20E28

Key words and phrases. Simple group of Lie type, non-commuting graph, maximal independent set.
Mixed Problems for systems of First Order PDE

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Abstract

In this talk, we will study the following mixed problem.

$$A \frac{\partial u(x, t)}{\partial t} + B \frac{\partial u(x, t)}{\partial x} + Cu(x, t) = f(x, t) \quad x \in (0, 1), \ t > 0 \quad (1)$$

$$\alpha u(0, t) + \beta u(1, t) = 0 \quad t \geq 0 \quad (2)$$

$$Au(x, 0) = A\phi(x), \quad x \in [0, 1] \quad (3)$$

where $A, B, C$ are real $m \times n$ matrices, $f(x, t)$ is a $m \times k$ matrix whose entries are functions upon the variables $x, t, \phi(x)$ is a $n \times k$ matrix whose entries are functions upon the variable $x$ and $u(x, t)$ is a $n \times k$ matrix whose entries are unknown functions upon the variables $x, t$. Finally, $\alpha$ and $\beta$ are $n \times k$ real matrices which satisfy the condition

$$\text{rank} B = \text{rank}(\alpha, \beta) \quad (4)$$

where $(\alpha, \beta)$ is the $m \times 2n$ real matrix which we obtain it by putting the matrix $\beta$ next to the matrix $\alpha$.

References

Properties of $\gamma_{tr}$-vertex critical graphs

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Abstract

A graph $G$ with no isolated vertex is total restrained domination vertex critical if for any vertex $v$ of $G$ that is not adjacent to a vertex of degree one, the total restrained domination number of $G - v$ is less than the total restrained domination number of $G$. In this talk, we study properties of $\gamma_{tr}$-critical graphs.
Variational analysis of a frictionless contact problem for viscoplastic materials with internal state variables

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Abstract

The subject of this work is the study of a value problem describing the quasistatic evolution of semilinear retetype viscoplastic models with internal state variables, and we suppose the problem of Tresca's Friction Law at the presence of recal forces. The existence and uniqueness of the solution is proved using results of evolutionary variational inequalities and a fixed point theorem.
Non-Uniqueness of Solution of Tricomi Problem for Degenerating Multidimensional Mixed Hyperbolic-Parabolic Equations

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Abstract

Let $D$ - final area of Euclidean space $E^{m+1}$ of the points $(x_1, ..., x_m, t)$, limited in half-space $t > 0$ by cones $K_0 : |x| = \frac{1}{\sqrt{p}} t^{\frac{2+p}{4}}$, $K_1 : |x| = 1 - \frac{1}{\sqrt{p}} t^{\frac{2+p}{4}}$, $0 \leq t \leq (2+p)^{\frac{2}{2+p}}$ and at $t < 0$ - cylindrical surface $\Gamma = \{(x, t) : |x| = 1\}$ and a plane $t = t_0 < 0$, where $|x|$ - vector-length and $p = const > 0$. Let’s designate through $D^+, D^-$ the parts of domain $D$ lying respectively in half-paces $t > 0$ and $t < 0$. And parts of the cones $K_0, K_1$ limiting areas $D^+$, well denote through $S_0$ and $S_1$, accordingly. Let $\Gamma = \{(x, t) : t = 0, |x| = 1\}$. Consider following mixed modeling hyperbolic-parabolic equation in area:

$$0 = \begin{cases} \Delta_x u - u_{tt} + \sum_{i=1}^{m} a_i(x,t) u_{x_i} + b(x,t) u_t + c(x,t) u, & t > 0, \\ \Delta_x u - u_t, & t < 0 \end{cases}$$ (1)

where $\Delta_x$ is the Laplace operator on variable $x_1, x_2, ..., x_m$, $m \geq qeq2$. Following a technique from [1] as multidimensional analogue of a problem of Trikomi we will consider the following problem Problem T: To find a solution of equation (1) in the area $D_t$ when $t \neq 0$ on the class $C^2(\mathcal{B} \setminus \Gamma_0) \cap C^2(\mathcal{D}^+ \cup \mathcal{D}^-)$ satisfying boundary conditions:

$$u|_{S_0} = 0, \quad u|_{\Gamma} = 0.$$

For smooth coefficients of the equation (1) examples are constructed, which show, that the problem T has innumerable solutions.

References

Bayesian Methods For The Occurrence Of REM Among Apnea Patients

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Abstract

Studies on apnea patients are often carried out based on data obtained from the sleep study. Sleep stages that occurred during sleep is light sleep, deep sleep and Rapid Eye Movement (REM). The proportion of REM during sleep is difference according to gender, age group and Body Mass Index(BMI). Most apnea events occurred during REM sleep stages. Data on apnea subjects is quite scarce since high cost is required for conducting the study. Bayesian method is particularly suitable for analyzing limited data as it allows for updating of information by combining the current information with the prior belief. In this paper we demonstrate the use of Bayesian methods to rank the occurrence of REM for 22 apnea patients, based on the posterior mean of the rate of occurrence of REM. From the comparison of results using three different prior distributions for the underlying rate of occurrence of REM, that is improper, gamma and log-normal priors, the ranking of patients in terms of severity of apnea are the same, regardless of the choice for the prior distributions, but the model fitting is found to be slightly better when based on gamma prior. Based on the sample, it is found that the most frequent case of REM experiences two episodes of REM for every two minutes.

References


2000 Mathematics Subject Classification.

Key words and phrases. apnea, REM, gamma prior, log-normal prior, improper prior.
Fully Spectral Methods for the Solution of High Order Differential Equations

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Abstract

In the recent years spectral methods are used for solving stiff and non-stiff partial differential equations and ordinary differential equations. Various types of spectral methods for steady and unsteady problems are proposed to solve stiff and non-stiff partial differential equations efficiently. In this article some schemes for solving stiff partial differential equations are derived. There are twofold: first method is based on Chebyshev polynomials for solving high-order boundary value problems. Second methods are based on Fourier-Galerkin and collocation spectral methods in space and Runge-Kutta, exponential time differencing, Taylor expansion and contour integral in time for solving stiff PDEs. Numerical results show the efficiency of proposed schemes.

2000 Mathematics Subject Classification. 65M70, 35Q53, 74H15, 65L10.

Key words and phrases. Spectral methods, Exponential time differencing, KdV and KS equations.
Prime submodules of multiplication modules and Cohen-Macaulay property

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Abstract

Let \( R \) be a multiplication commutative ring with nonzero identity and \( M \) be a unitary multiplication \( R \)-module. A characterization of certain prime submodules of \( M \) will be presented. Also we show that if \( R \) is Noetherian and \( M \) is finitely generated, then \( M \) is Cohen-Macaulay \( R \)-module. As a consequence any multiplication Noetherian ring is Cohen-Macaulay.

2000 Mathematics Subject Classification. 13C14, 13E05

Key words and phrases. Sprime submodule, multiplication rings and modules, Cohen-Macaulay rings and modules.
Decomposition of Additive Processes

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Abstract

The main purpose of this paper is to prove that every additive process is the sum of three independent parts, i.e., the deterministic part, the discontinuous part and the continuous part.

References


2000 Mathematics Subject Classification. 62P10

Key words and phrases. additive process, decomposition, stochastic continuity
Linear And Nonlinear Models Of Heredity For Blood Groups And Rhesus Factor

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Abstract

We consider linear and nonlinear stochastic models for transmission of blood types and Rhesus factor from parents to their offspring and investigate long run behavior of these models. In this paper we will consider an application of the theory of Markov chains and the theory of nonlinear transformations in medicine. It is well known that the gene which determines blood group in humans has three different alleles, A, B, O and that there are four groups of blood, A, B, AB, and O. The aim is to investigate the transmission of blood groups from parents to their offspring. For simplicity, we will consider only positive Rhesus factors, since the portion of the population with negative Rhesus is around 1%. It is well known that the blood groups of parents do not determine unambiguously their offspring’s blood group. To describe this transmission, we have rather extensive statistics for blood groups of parents and their offspring. In connection with these statistics, we construct the following two Markov chains. The first Markov chain describes the transmission from a father to his sons; the second Markov chain describes the transmission from a mother to her daughters.

References


2000 Mathematics Subject Classification. 62P10

Key words and phrases. Markov Chain; Quadratic Stochastic Operator; Blood type; Rhesus factor; Heredity.

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Equivalent of elliptic integrals

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Abstract

The finite elliptic similar integrals of second kind are well known as

\[ L = a \int_0^1 \left(1 + \left( \frac{b}{a} \right)^2 \left( \frac{k^r}{1 - k^r} \right)^{\frac{2r-2}{2r}} \right) \frac{1}{2} \, dk. \]

Those integrals cannot be solvable by any classical method. In this paper, we prove that the above equation can be replaced by

\[ L = a. \left(1 + \left( \frac{b}{a} \right)^s \right)^{\frac{1}{2}}. \]

As known, on the positive Cartesian, all astroids are expressed by:

\[ (x/a)^r + (y/b)^r = 1, \]

where \(a, b,\) and \(r\) are any positive constant real numbers. Using this equivalency and when \((r = 2)\) the perimeter of an ellipse is estimated at full-range with a maximum error \(\% = -0.000002432.\) Full-range is \((1 < b/a < \infty).\)
Numerical Solutions Of Hyperbolic Equations With The Nonlocal Integral Condition

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Abstract

In present paper joint with Prof. Dr. A. Ashyralyev, the mixed boundary value problem for the multi-dimensional hyperbolic equation

\begin{equation}
\begin{aligned}
\frac{\partial^2 u(t,x)}{\partial t^2} - \sum_{r=1}^{m} (a_r(x)u_{x_r})_{x_r} &= f(t,x), \\
x &= (x_1, \ldots, x_m) \in \Omega, \quad 0 < t < 1, \\
u(0,x) &= \int_{\alpha}^{\beta} \alpha(\rho) u(\rho,x) d\rho + \varphi(x), \quad x \in \overline{\Omega}, \\
u_t(0,x) &= \psi(x), \quad x \in \Omega, \\
u(t,x) &= 0, \quad x \in S, \quad 0 \leq r \leq m
\end{aligned}
\end{equation}

(0.1)

is considered. Here \( \Omega \) is the unit open cube in the \( m \)-dimensional Euclidean space \( \mathbb{R}^m \) \( \{x = (x_1, \ldots, x_m) : 0 < x_j < 1, 1 \leq j \leq m\} \) with boundary \( S, \overline{\Omega} = \Omega \cup S, a_r(x) (x \in \Omega), \varphi(x), \psi(x) (x \in \overline{\Omega}) \) and \( f(t,x) (t \in (0,1), x \in \Omega) \) are given smooth functions and \( a_r(x) \geq a > 0 \).

A numerical method is proposed for solving multidimensional hyperbolic partial differential equations with nonlocal integral condition. The first and second orders of accuracy stable difference schemes are presented. The stability of these difference schemes are established. The method is illustrated by numerical examples.

References


Hilbert transforms and related topics associated with the Dunkl-Hermite functions

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Abstract

We consider expansions of functions in $L^p(\mathbb{R}, |x|^{2k} \, dx), 1 \leq p < +\infty$ with respect to Dunkl-Hermite functions in the rank-one setting. We actually define the heat-diffusion and Poisson integrals in the one-dimensional Dunkl setting and study their properties. Next, we define and deal with Hilbert transforms and conjugate Poisson integrals in the same setting. The formers occur to be Calderón-Zygmund operators and hence their mapping properties follow from general results.

References


2000 Mathematics Subject Classification. 33C52, 43A32, 33C80, 22E30
Key words and phrases. Dunkl operator, Paley–Wiener theorem, generalized translations
Effect of a Deformable Free Surface on the Marangoni Convection in a Horizontal Porous Layer Permeated by a Fluid Layer in the Presence of Internal Heat Generation

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Abstract

The onset of Marangoni convection in a two-layer system comprising an incompressible fluid-saturated porous layer over which lies a layer of the same fluid in the presence of internal heat generation is investigated theoretically. The upper free surface is assumed to be deformable and the lower boundary is conducting to temperature perturbation. The Beavers-Joseph condition is employed at the interface and the Forchheimer-extended-Darcy equation is used to describe the flow regime in the porous medium. The linear stability theory and the normal mode analysis are applied and the resulting eigenvalue problems are solved exactly. We found that an increase of the surface deflection effect that is Crispation number, Cr; destabilize the system. However an increase of the Bond number and the decrease of the Darcy number will help to slow the process of destabilizing.

References


2000 Mathematics Subject Classification. primary:76S05 secondaries:26C10
Key words and phrases. Marangoni Convection, Heat Generation, Porous Medium

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A study is carried out to model tracks followed by clusters of electrons during the sporadic burst of the brainstorm epilepsy. The challenges faced were to choose the right model for the event as well as to maximize the accuracy of the real-time data taken. The growth of cosmic structure, including a detailed formation of galaxies with super massive black holes in their centers provides a great model for this brainstorm epileptic event. General relativity explains that the fundamental force of gravitation can be described as a curved spacetime caused by the presence of matter and energy. Excellent data from Generalized EEG signals, with six flat cubic surfaces represent mass and energies of clusters of electrons from an epileptic patient were converted into clusters of three-dimensional space and time. When fed into Einstein Field Equation, these masses and energies curved the spacetime which represents the movements or tracks of these electrons in a given time. The domains of these tracks were the first to be identified. Strength of each EEG signals as well as the locations of each domain relative to each other were weighted and later were regressed to estimate the best location that represents point of embarkation of these electrons for each second during an epilepsy attack. Correlation analysis identified outliers which might come from other epileptic foci burst. These represent much smaller bursts of electrons that occur simultaneously. Illustrations for these tracks are plotted in three-dimensional spaces as time progresses.
Generalized characteristic polynomials of a square matrix

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Abstract

Let \( n \) be a positive integer number and \( G \) be a subgroup of the full symmetric group on \( n \) letters. Assume that \( F \) be a favorite field and \( c \) be a function from \( G \) to \( F \). We refer the generalized matrix function afforded by \( G \) and \( c \), \( d^G_c \), which is a generalization of the concept of ordinary determinant of \( n \times n \) matrices. By using \( d^G_c \), we refer and determine the generalized characteristic polynomials of \( n \times n \) matrices over a favorite field \( F \) afforded by some permutation groups, which is a generalization of the concept of ordinary characteristic polynomial.

References


2000 Mathematics Subject Classification. 15A69

Key words and phrases. Generalized matrix function, Generalized characteristic polynomial.
A Quasistatic contact problem with slip dependent friction for linear elastic materials

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Abstract

We consider a mathematical model describing the contact with friction between a deformable body and a foundation. We use a linear elastic constitutive law. The contact takes into account the effects of friction, which are modelled with the slip dependent friction law. We derive a variational formulation of the problem and establish the existence of a weak solution under a smallness assumption of the friction coefficient. The proof is based on arguments of compactness, lower semicontinuity and time discretization.

2000 Mathematics Subject Classification. 35J85, 49J40, 47J20, 58E35

Key words and phrases. linear elasticity; slip dependent friction; variational inequality; weak solution; time discretization method.
New method for constructing exact solutions to nonlinear PDEs

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Abstract

We propose in this paper a new approach to construct exact solutions of nonlinear PDEs. The method used is called "the travelling profiles method". The travelling profiles method enables us to obtain many exact solutions to large classes of nonlinear PDEs.

References


2000 Mathematics Subject Classification. 35K55, 35B35, 35K65.

Key words and phrases. Nonlinear PDE - exact solutions - travelling profiles method.
A Tabu Search Algorithm to Find the Pareto Solutions of Dual Response Systems in Quality Engineering

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Abstract

This paper presents a tabu search metaheuristic algorithm for finding the Pareto optimal solutions of the dual response system problems in industrial applications. First we convert the problem into a scalar one by using a weighted linear sum of objectives and then optimize the combined objective function of the mean and the standard deviation of a given quality characteristic. The proposed formulation does not require any constraints on the secondary response (i.e., the process standard deviation). Unlike the other multi-objective alternatives, tabu approach does not set any specific assumptions on the behavior or the preference structure of the decision maker. A further advantage of tabu search is its simplicity and we show that the entire process only occupies a few lines of codes and generates string of solutions in speedy manner. This makes the search simpler and also computationally attractive than the other heuristic algorithms. The procedure is illustrated with an example.

References


2000 Mathematics Subject Classification. 62P30, 62K25, 62K20, 65K10

Key words and phrases. Robust Design, Quality Engineering, Response Surface Methodology

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Numerical Approximation of Dirichlet Problem in Bounded Domains and Applications

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Abstract

We consider numerical approximation of Dirichlet problem for the Laplace equation in a domain $D \in \mathbb{R}^d$, that is we will consider the problem of finding a $C^2$ function $u = u(z) \in C^2(D) \cap C^0(\partial D)$ such that

\[
\begin{cases}
\Delta u = 0, & \text{in } D \\
u = 0, & \text{on } \partial D
\end{cases}
\]

Using probabilistic methods we can give explicit representation of solution of Dirichlet problem $u(z) = E^z f(B_{\tau_D})$, where $B_t$ is a Brownian motion starting at $B_0 = z$, $E^z$ denotes the expectation of function in $B_{\tau_D}$, and $\tau_D = \inf\{t \geq 0, B_t \notin D\}$ is the exit time of Brownian motion from $D$. We give a Mathematical implementation of function $u(z)$ for different choices of $f$ and domain $D$ (half-plane, unit disc, rectangle, triangle) and we apply it to obtain some numerical results.

References


2000 Mathematics Subject Classification.

Key words and phrases. Brownian motions, Laplace equation, Dirichlet problem, stochastic approximation
A note on the multipoint nonlocal boundary value problems for elliptic-parabolic equations

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Abstract
In present paper joint with Prof. A. Ashyralyev, we are interested in studying the stable difference schemes for the numerical solution of the multipoint nonlocal boundary value problem

\[
\begin{align*}
-u_{tt} - \sum_{r=1}^{n} (a_r(x)u_{x_r})_{x_r} &= g(t, x), \ 0 < t < 1, x \in \Omega, \\
u_t + \sum_{r=1}^{n} (a_r(x)u_{x_r})_{x_r} &= f(t, x), \ -1 < t < 0, x \in \Omega, \\
u(t, x) &= 0, x \in S, -1 \leq t \leq 1; \ u(-1, x) = \sum_{r=1}^{n} \alpha_r u(\mu_r, x) + \varphi(x), \\
\sum_{r=1}^{n} |\alpha_r| \leq 1, 0 \leq \mu_1 < \mu_2 < ... < \mu_n \leq 1, \\
\nu(0^+, x) &= \nu(0^-, x), u_t(0^+, x) = u_t(0^-, x), x \in \overline{\Omega}.
\end{align*}
\]

for multidimensional elliptic-parabolic equations. Here \(\Omega\) be the unit open cube in the n-dimensional Euclidean space \(\mathbb{R}^n\) \((0 < x_k < 1, 1 \leq k \leq n)\) with boundary \(S\), \(\overline{\Omega} = \Omega \cup S\). The first and second orders of accuracy difference schemes are presented. The coercive stability and almost coercive stability of these difference schemes are obtained. The method is illustrated by numerical examples.

References
Spectral properties of one class of sign-symmetric matrices

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Abstract

A matrix $A$ of a linear operator $A: \mathbb{R}^n \to \mathbb{R}^n$ is called $\mathcal{J}$–sign-symmetric, if there exists such a subset $\mathcal{J} \subseteq \{1, \ldots, n\}$, that the inequality $a_{ij} \leq 0$ follows from the inclusions $i \in \mathcal{J}$, $j \in \mathcal{J}$ and $j \in \mathcal{J}$, $i \in \mathcal{J}$ for any two numbers $i, j$, and one of the inclusions $i \in \mathcal{J}$, $j \in \mathcal{J}$ or $j \in \mathcal{J}$, $i \in \mathcal{J}$ follows from the strict inequality $a_{ij} < 0$ (here $\mathcal{J}^c = \{1, \ldots, n\} \setminus \mathcal{J}$). This definition is a generalization of the well-known definition of positive matrices, which are widely used in economics, mechanics, biology and other branches of science.

Let $A$ be a $\mathcal{J}$–sign-symmetric matrix, and let $\mathcal{J}$ be a subset of $\{1, \ldots, n\}$ in the definition of $\mathcal{J}$–sign-symmetry. Let its second compound matrix $A^{(2)}$ also be a $\mathcal{J}$–sign-symmetric matrix. Let $\mathcal{J}$ be a subset of $\{1, \ldots, C^2_n\}$ in the definition of $\mathcal{J}$–sign-symmetricity for the matrix $A^{(2)}$. Let us construct the set $W(\mathcal{J}, \mathcal{J}) \subseteq ([1, \ldots, n] \times [1, \ldots, n])$ by the following way: $(i, j) \in W(\mathcal{J}, \mathcal{J})$ if and only if one of the following two cases takes place:

(a) both the numbers $i, j$ belong either to the set $\mathcal{J}$, or to the set $\mathcal{J}^c$, besides, if $i < j$, then the number of the pair $(i, j)$ in the lexicographic numeration belongs to the set $\mathcal{J}$, and if $i > j$, then the number of the pair $(j, i)$ belongs to the set $\mathcal{J}^c = \{1, \ldots, C^2_n\} \setminus \mathcal{J}$;

(b) one of the numbers $i, j$ belongs to the set $\mathcal{J}$, the other belongs to the set $\mathcal{J}^c$, besides, if $i < j$, then the number of the pair $(i, j)$ belongs to the set $\mathcal{J}^c$, and if $i > j$, then the number of the pair $(j, i)$ belongs to the set $\mathcal{J}$.

Such a set is not uniquely defined, but there is a finite number of different ways of its constructing. The set $W(\mathcal{J}, \mathcal{J})$ is called transitive if the inclusion $(i, k) \in W(\mathcal{J}, \mathcal{J})$ follows from the inclusions $(i, j) \in W(\mathcal{J}, \mathcal{J})$ and $(j, k) \in W(\mathcal{J}, \mathcal{J})$ for any indices $i, j, k \in \{1, \ldots, n\}$.

**Theorem 0.1.** Let the matrix $A$ of a non-zero linear operator $A$ be $\mathcal{J}$–sign-symmetric together with its second compound matrix $A^{(2)}$. Then the operator $A$ has a positive eigenvalue $\lambda_1 = \rho(A)$. More than that, if $\lambda_1$ is a simple eigenvalue, then one of the following two cases takes place:

1. If at least one of the possible sets $W(\mathcal{J}, \mathcal{J})$ is transitive, then the second in modulus eigenvalue $\lambda_2$ of the operator $A$ is nonnegative and different in modulus from the first eigenvalue $\lambda_1$.

2. If all the possible sets $W(\mathcal{J}, \mathcal{J})$ are not transitive, there is an odd number $k$ of eigenvalues on the spectral circle $|\lambda| = \rho(A)$. All of them are simple and coincide with kth roots of $(\rho(A))^k$.

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2000 Mathematics Subject Classification. primary 15A48, secondaries 15A18, 15A75

Key words and phrases. Totally positive matrices, Sign-symmetric matrices, Eigenvalues, Gantmacher–Krein theorem

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The Development of Mathematics Problem Solving Attitude Scale (MPSAS)

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Abstract

Lack of scale measuring students' attitudes of mathematics problem solving (at grades 6, 7 and 8) has been observed in the relevant literature. The present research, which was motivated to remedy such deficiency, aims to develop a likert-type attitude scale (Mathematics Problem Solving Attitude Scale-MPSAS). A draft of the scale which contained 77 items was composed based on both review of the extant literature and the opinions of experts on this area of research. The draft scale was tested on a group of 638 students at 6th, 7th and 8th grades. As a result of factor analysis, 58 items were omitted, and the remaining 19 items have been divided into two dimensions called "Enjoyment" and "Teaching". Two dimensions accounted for 43 Various techniques were used to ensure the content and construct validity of the scale. Test-retest and split-half test techniques were used to test the reliability. The Pearson correlation coefficient revealed by test-retest technique was 0.89. Cronbach alpha coefficient calculated to ensure the internal consistency was 0.848 for MPSAS, 0.869 and 0.777 for the sub scales MPSAS-E (Enjoyment) and MPSAS-T (Teaching) respectively. The research has produced a valid and reliable likert-type attitude scale as a research instrument.
Global geometries in space kinematics

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Abstract

The geometry of path trajectory ruled surfaces generated by the oriented lines fixed in a moving rigid body is important in the study of rational design problem of spatial mechanism. An x-closed trajectory ruled surface (x-c.t.s.) is characterized by two real integral invariants, the pitch and the angle of pitch. Using the integral invariants, the closed trajectory surfaces have been studied in many papers [1],[2]. In this study, based on [3] introducing a relationship between the dual integral invariant, and the dual area vector, $V_x$, of the spherical image of an x-c.t.s., new results on the feature of the trajectory surfaces are investigated. And also, since the dual angle of pitch, defined in [4], of an x-c.t.s. is a useful apparatus in the study of line geometry, we use the dual representations of the trajectory surfaces with their dual angle of pitches.

Therefore, besides the results on the real angle of pitches, that some of them given [3] many other results on the pitches of closed trajectory ruled surfaces are obtained. And some relationships between the other invariants are given. Also, using the some method, the area of projections of spherical closed images of the trajectory surfaces are studied.

It is hoped that the findings will contribute to the geometry of trajectory surfaces, so the rational design of spatial mechanisms.

References

Local Group-Groupoids

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Abstract

The theory of covering groupoids plays an important role in the applications of groupoids (cf. [1], [5]).
There are two important results about group-groupoids given in [2].
One is that if \( X \) is a topological group whose underlying space has a universal cover, then the category \( \text{TGCov}/X \) of topological group covers of \( X \) is equivalent to the category \( \text{GpGpdCov}/\pi_1X \) of group-groupoid covers of \( \pi_1X \).

The other is that if \( G \) is a group-groupoid, then the category the category \( \text{GpGdCov}/G \) of covering morphisms over \( G \) is equivalent to the category \( \text{GpGdAct}(G) \) of group-groupoid actions of \( G \) on groups is equivalent to equivalent.

In this paper we introduce the notion of a local group-groupoid as a local group object in the category of gorupoids and prove local group-groupoid version of these results.

For the first result we prove that if \( L \) is a local topological group, whose underlying topology has a universal cover, then the category \( \text{LTGCov}/L \) of local topological covers of \( L \) and the category \( \text{LGGdCov}/\pi_1(L) \) of local group-groupoid covers of \( \pi_1(L) \) are equivalent.

For the second result we prove that if \( G \) is a local group-groupoid, then the category \( \text{LGpGdCov}/G \) of local group-groupoid covers is equivalent to the category \( \text{LGpGdAct}(G) \) of local group-groupoid actions of \( G \) on local groups.

References

Quasilinearity of the classical sets of sequences of fuzzy numbers and some related results

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Abstract

In the present study, we prove that the classical sets $\ell_\infty(F), c(F), c_0(F)$ and $\ell_p(F)$ of sequences of fuzzy numbers are normed quasilinear spaces and the $\beta-$, $\alpha-$duals of the set $\ell_1(F)$ is the set $\ell_\infty(F)$. Besides this, we show that $\ell_\infty(F)$ and $c(F)$ are normed quasialgebras and an operator defined by an infinite matrix belonging to the class $(\ell_\infty(F) : \ell_\infty(F))$ is bounded and quasilinear. Finally, as an application, we characterize the class $(\ell_1(F) : \ell_p(F))$ of infinite matrices of fuzzy numbers and establish the perfectness of the spaces $\ell_\infty(F)$ and $\ell_1(F)$.
A note on hyperbolic equations with nonlocal boundary
and Dirichlet-Neumann conditions

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Abstract

In present paper joint with Prof. Allaberen Ashyralyev, the nonlocal boundary value problem

\[
\begin{array}{l}
\frac{\partial^2 u(t,x)}{\partial t^2} - \sum_{r=1}^{m} \left( a_r(x) u_{x_r}\right)_{x_r} + \sigma u = f(t, x), \\
x = (x_1, \ldots, x_m) \in \Omega, \quad 0 < t < 1, \\
u(0, x) = \sum_{j=1}^{n} \alpha_j u(\lambda_j, x) + \varphi(x), \\
u_t(0, x) = \sum_{k=1}^{n} \beta_k u_t(\lambda_k, x) + \psi(x), \\
x \in \Omega, u(t, x) = 0, \quad x \in S_1, \\
\frac{\partial u}{\partial n} = 0, \quad 0 \leq t \leq 1, x \in S_2, \\
\end{array}
\]  

(0.1)

for the multidimensional hyperbolic equation is considered. Here \( \Omega \) be the unit open cube in the \( m \)-dimensional Euclidean space \( \mathbb{R}^m \) with boundary \( S = S_1 \cup S_2, \quad \Omega = \Omega \cup S \).

The first and second order of accuracy difference schemes for the numerical solution of hyperbolic equations with nonlocal boundary and Dirichlet-Neumann conditions are presented. The stability estimates for the solutions of the difference schemes are obtained. A procedure of modified Gauss elimination method is used for solving these difference schemes in the case of one dimensional hyperbolic equation.

References


2000 Mathematics Subject Classification. 65N12: 65M12: 65J10

Key words and phrases. hyperbolic equation, nonlocal boundary value problems, difference schemes, stability
On The Asymptotic Behaviour Of The Negative Part Of the Second Order Differential Operator

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Abstract

In this work we find the asymptotic formula for the negative eigenvalues of Sturm-Liouville operator with unbounded operator coefficient which has singularity in the space $H_1 = L^2(H; [0, \infty))$ where $H$ is a separable Hilbert space.
Solving linear programming using Newton method and Goldstein conditions

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Abstract

The aim of this paper is to find an exact least 2-norm solution to the dual linear programming problem and to generate an exact solution to the primal programming problem. The Newton method is proposed for solving linear programs with very large numbers of constraints and variables. We use Goldstein conditions in order to find a suitable step-size in each iteration. The proposed method is based on the apparently overlooked fact that the dual of an exterior penalty formulation of a linear program provides an exact least 2-norm solution to the dual of the linear program. Solving the dual yields an exact least 2-norm solution to the dual and the exact least 2-norm solution to dual problem can be used to generate an exact primal solution. A simple prototype of the method is given in eleven lines of MATLAB code. Encouraging computational results are presented.

2000 Mathematics Subject Classification.
90C05, 90C06, 90C20

Key words and phrases.Newton method, Goldstein conditions, penalty function, least 2-norm solution.
Recent Trends in Fixed Point Theorems and Applications

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Abstract

In this talk, I will start from the results of fixed point theory and applications after the remarkable fixed point theorem due to Banach (Sur les operations dans les ensembles abstraits et leur applications aux equations integrables, Fund. Math. 3(1922), 131 - 181), Kannan (Some results on fixed points, Bull. Cal. Mth. Soc. 60(1968), 71 - 76), Edelstein (An extension of Banach’s contraction principle, Proc. Amer. Math. Soc. 12(1961), 7 - 10), Boyd and Wong’s (On non-linear contractins, Proc. Amer. Math. Soc. 20(1969), 458 - 464), Ciric’s (Generalized contractions and fixed point theorems, Publ. Inst. Math. 12(26)(1971), 19 - 26), Das and Naik’s (Common Fixed Point theorems for commuting maps on a metric space, Proc. Amer. Math. Soc. 77(1979), 369 - 373) Fixed Point Theorems many types of results appeared in the literature of Fixed Point Theory and Applications. In this talk, I would like to discuss some TOOLS and their importance for obtaining fixed points. Some applications also discussed in the field of Dynamic Problems, Integral Equations, etc. Very recently the concept of Cone Metric Space introduced by Haung and Zhang (Cone metric spaces and fixed point theorems of contractive mappings, J. Math. Anal. Appl. 332(2007), 1468 - 1476) and proved some common fixed point theorems in this space. We shall discuss in detail about this space and few results in this line by generalizing some results of metric fixed point theorems.

2000 Mathematics Subject Classification.

Key words and phrases.
Application of stochastic differential equations models for solving ship roll motion

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Abstract

Stochastic differential equation (SDE) models play a relevant role in many application areas including environmental modeling, biological and engineering modeling. This paper is intended to provide a second order SDE model excited by random sea waves for ship roll motion. The mathematical (SDE) model for the responses of a ship to the random sea waves will be presented and then this model will be solved analytically and numerically. Numerical examples are performed by using the Euler-Maruyama method in order to show the accuracy of the present work.

References


2000 Mathematics Subject Classification. 65C30

Key words and phrases. stochastic differential equations, ship roll motion, Brownain motion, Euler-Maruyama method.
Torsion Graph of Modules

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Abstract

Let $R$ be a commutative ring and $M$ be an $R$-module. the concept of zero-divisor graph of a commutative ring was introduced by I. Beck in 1988. He let all elements of the ring be vertices of the graph and was interested mainly in colorings. In this talk, we give a generalization of the concept of zero-divisor graph in a commutative ring with identity to torsion-graph in a module. We associate to $M$ a graph denoted by $\Gamma(M)$ whose vertices are non-zero torsion elements of $M$ and two different elements $x, y \in T(M) - \{0\}$ are adjacent if and only if $[x : M][y : M]M = 0$. The residual of $Rx$ by $M$, denoted by $[x : M]$, is a set of elements $r \in R$ such that $rM \subseteq Rx$ for $x \in M$. The annihilator of an $R$-module $M$ denoted by $\text{Ann}_R(M)$ is $[0 : M]$. Let $T(M)$ be a set of element of $M$ such that $\text{Ann}(m) \neq 0$. It is clear that if $R$ be an integral domain $T(M)$ is a submodule of $M$ and is called torsion submodule of $M$. We investigate the interplay between module-theoretic properties of $M$ and the graph-theoretic properties of $\Gamma(M)$. An $R$-module $M$ is a multiplication module if for every $R$-submodule $K$ of $M$ there is an ideal $I$ of $R$ such that $K = IM$. Among the other result, we prove that $\Gamma(M)$ is finite if and only if either $M$ is finite or $M$ is a torsion free $R$-module and $\Gamma(M)$ is connected and $\text{diam}(\Gamma(M)) \leq 3$ for faithful $R$-module $M$, and that if $M$ be a multiplication $R$-module. then there is a vertex of $\Gamma(M)$ which is adjacent to every other vertex if and only if either $M = M_1 \oplus M_2$ is a faithful $R$-module, where $M_1$, $M_2$ are two submodules of $M$ such that $M_1$ has only two elements, $M_2$ is finitely generated with $T(M) = \{(x, 0), (0, m_2) | x \in M_1, m_2 \in M_2\}$, or $T(M) = IM$, where $I$ is an annihilator ideal of $R$. Also if $M$ be a multiplication $R$-module, then $\Gamma(M)$ and $\Gamma(S^{-1}M)$ are isomorphic as graph where $S = R - Z(M)$.

References


Existence Of Fixed Point In C-contraction

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Abstract

Kramosil and Michalek introduced the notion of fuzzy metric space which is similar to generalized Menger space. Then George and Veeramani imposed some stronger conditions on fuzzy metric space in order to obtain a Hausdorff topology. Many authors have extended fixed point theorem to different type of contraction in both probabilistic and fuzzy metric space. Mihet also showed fixed point theorem for fuzzy contractive mappings by using point convergence. In this paper we use the concept of point convergence for showing the existence of fixed point for B-contractions and C-contractions mapping. We notice that the condition of point convergency is weaker than convergency.

Definition 1: A B-contraction on a probabilistic space \((X, F)\) is a self mapping \(f\) of \(X\) for which 
\[ F(f(x)f(y)(kt)) \leq F(x,y)(kt) \quad \forall x, y \in X, \forall t > 0, k \in (0, 1). \]

A mapping \(f : X \to X\) is called a C-contraction if there exists \(k \in (0, 1)\) such that for all \(F_{xy}(t) \geq 1\)
\[ -t \leq F(f(x)f(y)(kt)) - 1 - kt \quad \forall x, y \in X, t > 0. \]

Definition 3: Let \((X, M, T)\) be a fuzzy metric space. A sequence \(x_n\) in \(X\) is said to be point convergent to \(x \in X\) if there exists \(t > 0\) such that 
\[ \lim_{n \to \infty} M(x_n, x, t) = 1. \]

Theorem 1: Let \((X, M, T)\) be a George and Veeramani fuzzy metric space and \(A : X \to X\) be a B-contraction. Suppose that for some \(x \in X\) the sequence of \(A^n(x)\) has a \(p\)-convergent subsequence. Then \(A\) has a unique fixed point.

Theorem 2: Let \((X, M, T)\) be a George and Veeramani fuzzy metric space and \(A : X \to X\) be a C-contraction and \(sup \ 0 a^{-1} T(a, a) = 1\). Suppose that for some \(x \in X\) the sequence of \(A^n(x)\) has a \(p\)-convergent subsequence. Then \(A\) has a unique fixed point.

Theorem 3: Let \((X, M, T)\) be a George and Veeramani fuzzy metric space and \(A : X \to X\) be a generalized C-contraction and \(sup \ 0 a^{-1} T(a, a) = 1\). Suppose that for some \(x \in X\) the sequence of \(A^n(x)\) has a \(p\)-convergent subsequence. Then, \(A\) has a fixed point.

References

Numerical Solutions of nonlinear Volterra-Fredholm integro-differential-difference equations

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Abstract

In this paper, by using the theories and methods of mathematics analysis and computer algebra, a new reliable algorithm for solving high-order nonlinear Volterra-Fredholm integro-differential-difference equation

\[ \sum_{r=0}^{R} \sum_{j=0}^{m} p_{rj}(x) y^{(j)}(\alpha_{rj} x + \beta_{rj}) = f(x) + \lambda_1 \int_a^x K_1(x, t, y(t)) dt + \lambda_2 \int_a^b K_2(x, t, y(t)) dt, \]

with the mixed conditions

\[ \sum_{j=0}^{m-1} \left[ a_{ij} y^{(j)}(a) + b_{ij} y^{(j)}(b) + c_{ij} y^{(j)}(c) \right] = \mu_i, \quad i = 0, 1, \ldots, m-1, \quad a \leq c \leq b, \]

will establish, where \( f(x), K_1(x, t, y(t)), K_2(x, t, y(t)) \), \( p_{rj}(x), r = 0, 1, \ldots, R \) and \( j = 0, 1, 2, \ldots, m \) are functions that have suitable derivatives on an interval \( a \leq x, t \leq b \) and \( a, b, \lambda_1, \lambda_2, \alpha_{rj}, \beta_{rj}, \mu_i \) \( (i = 0, 1, 2, \ldots, m-1) \) are constants. The results of the examples indicated that this method is simple and effective, and could provide an accuracy approximate solution or exact solution of the high-order nonlinear Volterra-Fredholm integro-differential equation. This would be useful for solving integro-differential equation, integral equations and ordinary differential equation. Results of approximate solution to test problems are demonstrated.

References


Neural Networks in the Analysis of Nucleotide Genomic Signals

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Abstract

Converting nucleotide sequences to digital signals [1] allows to apply signal processing methods for the analysis of genomic data. The method reveals surprising regularities in the distribution of nucleotides, pairs of nucleotides and small groups of nucleotides along a chromosome, in both prokaryotes and eukaryotes. These features of nucleotide sequences would be difficult to find by using only symbolic genomic sequences and standard statistical and pattern matching methods [2].

The mapping we have used in our work [1, 3] is a one-to-one unbiased representation of nucleotide equivalence classes, which attaches quadrantal complex numbers to adenine, cytosine, guanine and thymine nucleotides:

\[ a = 1 + j, \quad c = -1 - j, \quad g = -1 + j, \quad t = 1 - j \]  

(1)

While conserving the information in the initial symbolic sequence, this mapping introduces no artefacts related to specific assumptions on the types of interaction that characterize the nucleotides. Two simple signatures can be used to synthetically describe the statistics along a nucleotide sequence:

- the nucleotide imbalance:
  \[ N_c = 3(n_G - n_C) + (n_A - n_T), \]  
  (2)

where \( n_A, n_C, n_G \) and \( n_T \) are the numbers of adenine, cytosine, guanine and thymine nucleotides in the sequence, from the first to the current entry, and

- the nucleotide pair imbalance:
  \[ P_n = n_+ - n_-, \]  
  (3)

where \( n_+ \) is the number of positive pairs \((A \rightarrow G, G \rightarrow C, C \rightarrow T, T \rightarrow A)\), and \( n_- \) the number of negative pairs \((A \rightarrow T, T \rightarrow C, C \rightarrow G, G \rightarrow A)\).

The genomic signal approach reveals large scale features of DNA sequences that are maintained over distances of \(10^8 - 10^9\) base pairs, including both coding and non-coding regions [4, 5]. The methodology is also adequate for the study of pathogen variability and the identification of multiple drug resistance, important for fast diagnoses and prompt socio-medical decisions in contamination with pathogens such as Human immunodeficiency virus (HIV) [6], Avian influenza virus (H5N1) [7] and Mycobacterium tuberculosis (MT) [8, 9, 10]. Some of the main features resulting from the analysis of the nucleotide sequences are [1, 3, 5]: (1) A remarkable good linearity of the nucleotide pair imbalance \(P_n\). The root mean square error per nucleotide of the linear fitting to \(P_n\) is typically very small (e.g., 0.0045 for MT), while the ratio of the linear per irregular variation is quite large (14.5 for MT), which corresponds to a smooth strait line at large scale. (2) An approximately piece-wise linear nucleotide imbalance \(N_c\), for prokaryotes. (3) The extremes of \(N_c\) correspond to the origin and the terminus of genome replication. Re-orienting all exons in a sequence along the same positive direction reveals some "hidden" features of a DNA sequence [11]: (1) A (perfect) invariance of the nucleotide pair imbalance \(P_n\), is invariant, as the direct \((n_+)\) and inverse \((n_-)\) numbers of pairs are conserved when reversing and complementing a segment of a DNA double helix. (2) An approximately linear shape of \(N_c\), after re-orientation, suggesting a highly regular ancestral genomic structure, from which the current nucleotide longitudinal structures have evolved under evolutionary pressure. The long range regularities show that, from the structural point of view, a genome resembles less to a "plain text", which simply expresses a semantics in accordance to certain grammar rules, but more to a "poem", which also obeys additional rules of symmetry, giving it "rhythm" and "rhyme". The correlations and regularities in the genomic signals can be used to predict nucleotides based on knowledge about the nucleotides preceding them in the sequence in a way similar to time series prediction. The efficiency of the nucleotide prediction can be improved by using a two step procedure comprising a PCA stage, which retains only the high variance components of the input signal, and an ANN, which performs the prediction based on these components. For signals satisfying some mild statistical regularities, the PCA stage performs an approximate DFT, passing from the time (space) domain to the frequency domain. The ANN implements the inverse DFT, generating the estimate of the next sample of the sequence in the time (space) domain using the Fourier coefficients. The prediction model shows a quite good efficiency, which is the effect of the multilevel regularities in the structure of genomic sequences.

References


2000 Mathematics Subject Classification. 92D20, 92B20, 62H25

Key words and phrases. Nucleotide Genomic Signals, Sequence Prediction, Neural Networks


Effect Of Feedback Mechanism Over Ad Hoc Network For Audio & Video Communications

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Abstract

An Ad hoc Network provides quick and easy networking under circumstances that require temporary network services or when cabling is hard to deploy. It can be adopted as a solution for coverage in rural areas, disasters and military applications. Ad hoc Networks can be used to extend the range of wireless service coverage. Providing quality of service in ad hoc networks is an extremely challenging task, due to several factors like the unrestricted mobility of nodes, dynamically varying network topology, and other ones. There are two approaches to audio and video transmission: single stream and multi stream. The former transmits a single transport stream of interleaved audio and video, while the latter treats the two media as separate transport streams. In this paper, we describe a novel scheme for audio and video transport over wireless ad hoc networks. The main idea of this work is based on selecting special nodes of transferring path as proxy nodes. In each of every transmitting routes only one node will select as audio & video proxy nodes based on an agreement between sender and receiver or network traffic status. The duty of these nodes is to receiving and recognizing audio and video streams, buffering of favorite streams and if possible managing errors locally. Choosing these nodes and employing them at network add to increasing network life time will result in reduced end to end delay between sender and receiver.
A Graph Coloring Approach To Airline Crew Scheduling Problem

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Abstract
The airline crew scheduling problem is well-known as one of the most difficult combinatorial problem. Crew scheduling for airlines requires an optimally scheduled coverage of flights with regard to given timetables. In this paper, in order to construct daily feasible flight sequence for an employee, we proposed an approach with graph coloring. Same colors determine daily feasible schedule which can be task with same crew. After daily composition of pairings with graph coloring approach, we modeled problem as crew assignment problem. So, we assembled pairings into monthly work schedules and assigned to individual crew member. While solving this problem, we used some data which belongs to a domestic airline company called Izair.

References

2000 Mathematics Subject Classification. 68R10, 05C15, 90C27, 90C35, 90B35
Key words and phrases. Graph Coloring, Crew Assignment.
On The Galerkin Method For Non-Linear Evolution Equation

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Abstract
Let $H_1$ be a Hilbert space densely and compactly embedded in a Hilbert space $H$. In the space $H$ we consider the Cauchy problem
$$u'(t) + A(t)u(t) + K(u(t)) = h(t), \quad u(0) = 0.$$ (0.1)
We assume that the operators $A(t)$ and $K(\cdot)$ have the following properties.
1) $A(t)$ is self-adjoint operator in $H$ with domain $D(A(t)) = H_1$. $A(t)$ is positive definite operator.
2) The operator $A(t)$ is strongly continuously differentiable on $[0, T]$. There is a constant $\beta \geq 0$ such that $(A'(t)v, v)_H \leq \beta (A(0)v, v)_H$.
3) The non-linear operator $K(\cdot)$ is subordinate to operator $A(0)$ with order $0 \leq \tau < 1$, i.e. $D(K(\cdot)) \supset D(A(0))$ and for any $v \in H_1$ the inequality $\|K(v)\| \leq \|A(0)v\|^{\tau} \varphi(\|v\|^2)$ holds, where $\varphi(\xi)$ is a continuous positive function on $[0, \infty)$. The operator $K(t)$ is compact.
4) There is given a positively definite self-adjoint operator $B$ which is similar to $A(0)$, i.e., $D(B) = D(A(0))$.
5) The operators $A(t)$ and $B$ satisfy the inequality $(A(t)v, Bv)_H \geq m \|A(0)v\|^{2} \|Bv\|$, where a constant $m > 0$ is independent of the choice $v \in H_1$ and $t$.

By $e_1, e_2, \ldots, e_n, \ldots$ we denote a complete orthonormalized system of eigenvectors of $B$ with the corresponding eigenvalues $\lambda_1, \lambda_2, \ldots, \lambda_n, \ldots$ so that $0 < \lambda_1 \leq \lambda_2 \leq \ldots \leq \lambda_n \ldots$ and $\lambda_n \to \infty$ as $n \to \infty$. Let $P_n$ be the orthogonal projection in $H$ onto the linear span $H^n$ of the elements $e_1, e_2, \ldots, e_n$. In $H^n$ we consider the problem:
$$u'_n(t) + P_n A(t)u_n(t) + P_n K(u_n(t)) = P_n h(t), \quad u_n(0) = 0.$$ (0.2)

Let $h(t) \in L_2(0, T; H)$. It was proved, that problems (1) and (2) have at least one solution at each $n$ and that from the sequence $u_n(t)$ it is possible to select the subsequence, which converges to the solution of problem (1) in strong norm.

2000 Mathematics Subject Classification. 12H20
Key words and phrases. Cauchy problem; Operator equation; Galerkin method; Hilbert space; Orthogonal projection
Characterization Properties Of Some Classes Of P-Valent Meromorphic Functions Involving Certain Convolution Structure

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Abstract

In this paper we investigate various characterization properties of some classes of p-valent meromorphic functions which satisfy certain subordinate condition under several different relationship that involve a convolution structure. Our study certainly unify several previously obtained results.

References


2000 Mathematics Subject Classification.30C45, 30C55.

Key words and phrases.p-valent meromorphic starlike(convex) functions, convolution, calculus operators, subordination.
The Initial Flow Past an Impulsively Started Oscillating Circular Cylinder

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Abstract

The initial flow past an oscillating circular cylinder is investigated numerically for different values of an oscillating frequency at a fixed Reynolds number $R = 200$. The numerical simulations are conducted at displacement amplitude-to-cylinder radius ratios of $A = 0.6$. Results show the development of the physical properties of the flow at early stages at different values of unsteady loading on the cylinder, which is characterized by the ratio of excitation frequency $f$, to Karman shedding frequency $f_0$. Previously computed results are compared to current visualizations and agreement is found to be excellent.
On Covering of Products of $T$-generalized State Machines

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Abstract

We introduce the concepts of $T$-generalized state machines, and coverings of products of them. Also some of algebraic properties of them are investigated. Some products such as direct sum and sum of $T$-generalized state machines are introduced. An interesting distributive property of cascade product over the sum of $T$-generalized state machines concern to covering of $T$-generalized state machines is established.
Bayesian Test for Homogeneity Hypothesis

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Abstract

Population which consist of several subpopulation with different properties is called heterogeneous. Hence homogeneity means not mixing population distribution. Modified likelihood ratio test and EM test which are based penalized likelihood function are usually used for testing homogeneity under the mixture models. In this paper we will show that efficiency of these tests is influenced by the shape of the chosen penalty function, Hence none of these tests is generally optimal. Parameters of poisson mixture models and parameter of determinative shape of the penalty function are estimated by a bayesian aproach and homogeneity test is implemented by using the criteria of the optimal model choice.

References

On Application Mathematical Procedures for Data Envelopment Analysis to Resource Allocation Strategy of Police Organization

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Abstract

In this paper our aims to build the measurement model of efficiency analysis and allocate efficiency of police organization by taking twenty city police bureaus in Iran as an example for the empirical study. This study applies Data Envelopment Analysis (DEA) to reinforce the single-index evaluation method of police organization performance currently, and the Frontier software is used to obtain the efficiency value of each decision making units.

References


2000 Mathematics Subject Classification: 65M15

Key words and phrases. Data Envelopment Analysis (DEA), Frontier software, efficiency.
Generalized Humbert Matrix Polynomials

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Abstract
In the present paper, we introduce and study the generalized Humbert matrix polynomials for a matrix that satisfies
an appropriate spectral property. We have presented, by means of the generalized hypergeometric matrix function, some
hypergeometric matrix representations of the generalized Humbert matrix polynomials. In addition to establishing struc-
tures of generating matrix functions, expansions of the generalized Humbert matrix polynomials in series of Hermite and
Laguerre matrix polynomials are obtained. The Gegenbauer matrix polynomials are here a particular case of the generalized
Humbert matrix polynomials.

References
82 - 92.

2000 Mathematics Subject Classification.
Key words and phrases. Gamma and Beta matrix function, Hermite, Laguerre, Gegenbauer and Humbert matrix polynomials
Contra-Gamma-Continuous Mappings in Topological Spaces

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Abstract
The notion of semi-convergence of filters was introduced by Latif (1999) who investigated some characterizations related to semi-open continuous functions. In the spirit of Latif (1999), Min (2002) used the idea of semi-convergence of filters to introduce a new class of sets, called $\gamma$-open sets, and the notions of $\gamma$-closure, $\gamma$-interior and $\gamma$-continuity and investigated some properties. In this paper, we apply the notion of $\gamma$-open sets in topological spaces to present and study certain properties and characterizations of contra-$\gamma$-continuity as a new generalization of contra-continuity [Dontchev, 1996].

References

2000 Mathematics Subject Classification. 54A05, 54C08
Key words and phrases. Topological Space, $\gamma$-open set, $\gamma$-closed set, contra-$\gamma$-closed, $\gamma$-compact, strongly $S$-closed, contra-$\gamma$-continuity
Abstract

An exact solution of the transient problem of potential flow past two identical circular cylinders is obtained. The two cylinders may be located at any distance from each other with the flow being perpendicular to the center-to-center line. The stream function formulation is used. The pressure distribution around the surfaces of the two cylinders is calculated and the effect of the center-to-center distance is studied. The exact solution is verified against that of the flow past a single cylinder by considering the limiting case when the center-to-center distance between the two cylinders increases indefinitely. Error bounds on the series solution show that the error decays exponentially.
The most accurate approximation for numerical solution of stochastic differential equation with Poisson white noise by Skew-Normal distribution

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Abstract

In this paper the stochastic differential equation (SDE) with Poissonian white noise (PWN) is considered. The parameter of Poisson distribution plays an important role in numerical solution for SDE with PWN. If this parameter be almost large, then we show that using the Skew-Normal distribution (SND) to approximate Poisson distribution is better than Normal distribution. We show, the accuracy of the present work, some example are considered.

2000 Mathematics Subject Classification. 60H10

Key words and phrases. Stochastic Differential Equation, Skew - Normal distribution, approximation, Poissonian white noise, Gaussian white noise, Euler method.
Spline Solution of Fourth-Order Obstacle Boundary-Value Problems

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Abstract

We use quintic spline function to develop numerical method for approximation to the solution of a system of fourth-order boundary-value problems associated with obstacle, unilateral and contact problems. The convergence analysis of the method has been discussed. Numerical examples are presented to illustrate the applications of method, and to compare the computed results with other known methods. We shown that the given approximations are better than collocation, finite difference and spline methods.

References


2000 Mathematics Subject Classification. 65L10

Key words and phrases. Quintic spline, Boundary formula, Convergence, Obstacle problems.

*This research was supported by Ilam University.
Existence Of Positive Solutions For A Discrete Boundary Value Problem

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Abstract

We study the existence and nonexistence of positive solutions of the discrete system with second-order differences

\[
\begin{align*}
\Delta^2 u_{n+1} + b_n f(v_n) &= 0, \quad n = 1, N-1 \\
\Delta^2 v_{n+1} + c_n g(u_n) &= 0, \quad n = 1, N-1, \quad (N \geq 2),
\end{align*}
\]

with \(m+1\)-point boundary conditions

\[
\begin{align*}
\beta u_0 - \gamma \Delta u_0 &= 0, \quad u_N - \sum_{i=1}^{m-1} a_i u_{\xi_i} = b, \\
\beta v_0 - \gamma \Delta v_0 &= 0, \quad v_N - \sum_{i=1}^{m-2} a_i v_{\xi_i} = b, \quad m \geq 3,
\end{align*}
\]

where \(\Delta\) is the forward difference operator with stepsize 1, \(\Delta u_n = u_{n+1} - u_n\). The arguments for existence of solutions are based upon the Schauder fixed point theorem and some auxiliary results from [1] and [2].

References


Classification of exceptional train algebras of rank 3 and type (4, 2): step 1

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Abstract

Let $F$ be a field with char$(F) \neq 2$, $A$ a commutative $F$-algebra, not necessarily associative and $\omega : A \to F$ a nonzero homomorphism. If there exists $\gamma \in F$ such that, for all $x$ in $A$, $x^3 - (1 + \gamma)\omega(x)x^2 + \gamma\omega(x)x = 0$, then the pair $(A, \omega)$ is called a (commutative) train algebra of rank 3. When we consider $2\gamma \neq 1$, there is an idempotent $e \in A$ relative to this element, $A$ has a Peirce decomposition $A = Fe \oplus U_e \oplus V_e$, where $U_e = \{ u \in Ker(\omega) : 2eu = u \}$ and $V_e = \{ v \in Ker(\omega) : ev = \gamma v \}$. The type of $A$ is the ordered pair of integers $(1+r, s)$, where $r = \dim(U_e)$ and $s = \dim(V_e)$.

If $A = Fe \oplus U_e \oplus V_e$ is a train algebra of rank 3 and dimension 6, the possible types of $A$ are $(5, 1), (4, 2), (3, 3), (2, 4)$ and $(1, 5)$. The train algebras of rank 3 and types $(n, 1), (3, n - 2), (2, n - 1)$ and $(1, n)$ had already been classified and so, in order to complete the classification of the train algebras of rank 3 and dimension 6, we have to analyse such algebras of type $(4, 2)$. Here we begin this classification.

References


Large probability models of access control security system architecture

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Abstract

This paper presents probability models of access control security system architecture. Access control is the process of screening objects: for example people, baggage, entering a secured area in order to detect and prevent entry by threats such as unauthorized personal firearms, explosives. A security system architecture consist of Device technologies, as well as operational policies and procedures for utilizing the technologies. The probability models are developed based on type 1 (a false alarm is given) and type 2 (a threat is not detected) errors. The concept of controlled sampling in which objects may take Different paths through the system, is introduced. New architectures consisting of Multiple devices and Controlled Sampling are Proposed and analyzed. The Results of this research show that for specific threats levels, Multiple device system can be identified which out perform single device systems for certain error probability measures.

References


2000 Mathematics Subject Classification. 94A15, 68U35
Key words and phrases. probability models, security system, statistical threats.
On the fuzzy minimal spaces

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Abstract

At the present paper, the concept of fuzzy minimal spaces is introduced and some basic properties of them is considered. Further, several types of fuzzy continuity are defined and some characterization of them are investigated. Moreover, to support our results many examples are constructed.

References


2000 Mathematics Subject Classification. Primary 54A40, Secondary 03E72, 54A05

Key words and phrases. Fuzzy set, fuzzy topology, fuzzy minimal space, fuzzy minimal continuity, fuzzy compactness
Fisher Information of a Single Qubit System

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Abstract

In this paper, we study the interaction between a single trapped ion with a laser field. The concept of quantum Fisher information (QFI) in terms of the atomic density operator is introduced. This quantity is used as a best estimation of entanglement compared with classical Fisher information (CFI) and von Neumann entropy of a single qubit system. We demonstrate connections between these measures. The results show the important roles played by the fluctuations of the laser phase and initial state setting in the evolution of the quantum and classical Fisher information.
Path Planning Algorithm for Mobile Robot Based on Multilayered Cellular Automata

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Abstract

In the present work, it is described Motion Planner for mobile moving on terrains. We describe the architecture base on the paradigm of Cellular Automata. It can be applied to Euclidean workspace. We have studied an algorithm based on a Euclidean distance from goal and the score of each cell. We have Multilayered Cellular automata, these properties impart us having more than one mobile robot and different goals. Also Attraction layer is separated from Obstacle’s layer. These characteristics plus giving score to each cell enable our algorithm to find a way for continuing. In the first practice, the algorithm calculates the cells scores and by learning in each iteration it cause the algorithm comes more efficient in next practices.

References


2000 Mathematics Subject Classification. 37B15 Cellular Automata

Key words and phrases. Cellular Automata, Learning, Robot path-planning
Frictionless contact problem on nonlinear elasticity

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Abstract

The subject of this work is the study of the contact problem with out friction between an elastic nonlinear body and a rigid foundation. Under suitable conditions, we extend the results given in [6] and [11] to our problem. For that, we present first associated variational problem as well as the study of existence and uniqueness of its solution. Secondly, we deal with some properties of this solution and its dependence with a given parameter. Finally, we shall introduce a penalized problem of the mechanical problem.

2000 Mathematics Subject Classification. 74M15, 74S05, 65M60.

Key words and phrases. Elastic body, Contact without friction, Operator strongly monotone, Penalized problem.
Experimental Approach of Flux Estimation in Real Time for Induction Motors Drives

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Abstract

This paper deals with an experimental approach of flux estimation in real time for induction motors drives. Based on the real currents stator, voltages and rotor speed measurements, the rotor fluxes are estimated using different methods. The reduced order model of induction motor is used to offer many advantages for real time identification parameters of the induction machine. The major contributions of this work are: first, avoid the use sensors of direct rotor flux to increase the installation cost and degrade the mechanical robustness. Second, by reducing the order of the induction machine model, the implementation of the proposed real time estimation flux has a good dynamic behavior and therefore is well suited for high performance applications. Third, the estimation of rotor and stator flux can be performed even at variable regime flux and at low loads. Further, the estimation algorithm involves no derivative terms. Finally, we show that the proposed experimental scheme is not sensitive to disturbances parametric errors and it is robust against load variations. The experimental results and the estimated values of fluxes are compared and shown in real time application.

References

Heat Conduction Equation At Micro And Nano Scale: Approximation Methods

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Abstract

In the classical theory of diffusion, Fourier law of heat conduction, it is assumed that the heat flux vector and temperature gradient across a material volume occur at the same instant of time. It has shown that if the scale in one direction is at the microscale (of order 0.1 \( \mu m \)), then the heat flux and temperature gradient occur in this direction at different times. In the so-called non-Fourier heat conduction equation a second-order derivative of temperature with respect to time and a third-order mixed derivative of temperature with respect to space and time will appear. Among the frameworks to study the non-Fourier heat conduction equation, the dual-phase-lag framework is employed. In this talk, some numerical approaches for solving the heat conduction equation in various domains are presented.

2000 Mathematics Subject Classification.
35K05, 65M70, 65M06, 74K35

Key words and phrases. Heat conduction equation; Spectral methods, Finite difference methods; Thin film.

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Fixed Point Of Mappings In Fuzzy 2-Metric Spaces

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Abstract

Fixed point theory has important applications in approximation theory, game theory, mathematical economics, potential theory, etc. A number of fixed point theorems have been obtained by various authors in fuzzy metric spaces [1,2,3,4,5]. The aim of this paper is to define the notion of different types of a pair of compatible self maps \((f, g)\) in a fuzzy 2-metric space and prove some common fixed point theorem for them.

References


2000 Mathematics Subject Classification. 47H10, 54H25.
Key words and phrases. fuzzy 2-metric space, compatible map, common fixed point.
Armijo Rule and Strong Wolfe line search in Generalized Newton Method

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Abstract

The line search method is one of the two fundamental strategies to solve unconstrained optimization problem that have been developed up to now. The second strategy is trust region method. In the line search method, the success of the algorithm not only depends on well-chosen search direction but also well-chosen step length.

In this paper we compare the Armijo step size regulation and Strong Wolfe conditions in generalized Newton algorithm to minimizing a piecewise quadratic convex function. This function arises from dual exterior penalty problem for the problem of finding normal solution of the system of linear equalities. Numerical experience for systems which are selected in NETLIB indicates the behavior of the two inexact line searches differs markedly.

2000 Mathematics Subject Classification. 90C06, 90C20

Key words and phrases. piecewise quadratic programs, generalized Newton method, Armijo rule, Strong Wolfe inexact line search, alternative method
Hash Function Based on Chaos

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Abstract

Data encryption has an important role in communication security, hash function in a kind of encryption of data and the famous hash functions like SHA, MD4, MD5, WHIRPOOL need a great deal of computations even for the small messages. There are some other methods based on chaos which are in fact the art of security achievement by encoding the messages to make them non-readable, the chaos based encryptions are widely extended since last ten years, because of chose relations between chaos and cryptography and chaotic systems having some properties such as sensitivity to the initial conditions, and control parameters, and randomized behavior which can be connected with some conventional properties of good ciphers such as confusion/diffusion, secures the communications[1]. The algorithms are mostly constituted on a linear or nonlinear mapping [2, 3] as the random encryptions are performed in this algorithms, the algorithms posses a high level of security. In this paper we introduce a one-sided hash function algorithm is constructed on exponential scores with a changeable parameter say p. A section of this function is given, in each run block ciphers encryption procedure produces the parameter p then the value of hash function is obtained by randomized setting of the first few sequences of iterations. Statistical analysis and computer simulation indicates a good performance of Hash function and is reliable with high potential.

References


2000 Mathematics Subject Classification: 68XX
Key words and phrases: Hash Function, Data encryption
Different convergences in approximation of evolution equations

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Abstract

Consider the semilinear equation in Banach space $E$

$$u'(t) = Au(t) + f(u(t)), \ t \geq 0,$$
$$u(0) = u^0 \in E,$$  (0.1)

where $f(\cdot) : E^\alpha \subseteq E \to E, 0 \leq \alpha < 1$, is assumed to be continuous, bounded and continuously Fréchet differentiable function. The problem (0.1) in the neighborhood of the hyperbolic equilibrium can be written in the form

$$v'(t) = A u^* v(t) + F u^* (v(t)), \ v(0) = v^0, \ t \geq 0,$$  (0.2)

where $A u^* = A + f'(u^*)$, $F u^* (v(t)) = f(v(t) + u^*) - f(u^*) - f'(u^*) v(t)$. We consider approximation of (0.2) by the following scheme

$$V_n(t + \tau_n) - V_n(t) = \tau_n A u^* n V_n(t) + F u^* n (V_n(t)), \ t = k \tau_n,$$

with initial data $V_n(0) = v^0$. The solution of such problem is given by formula

$$V_n(t + \tau_n) = (I_n - \tau_n A u^* n)^{-1} V_n(t) + \tau_n (I_n - \tau_n A u^* n)^{-1} F u^* n (V_n(t)) =$$

$$(I_n - \tau_n A u^* n)^{-k} V_n(0) + \tau_n \sum_{j=0}^{k-1} (I_n - \tau_n A u^* n)^{-k-j-1} F u^* n (V_n(j \tau_n)), \ t = k \tau_n,$$

where $V_n(0) = v^0$. We consider different kind of consistency of generators under which one can get convergence of solutions in the vicinity of hyperbolic stationary point.

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2000 Mathematics Subject Classification. 65J, 65M, 65N, 35J, 35K

Key words and phrases. Abstract differential equations, theory of shadowing, abstract parabolic problem, analytic $C_0$-semigroups, Banach spaces, hyperbolic equilibrium point, semidiscretization, discretization in space, fractional powers of operators, compact convergence of resolvents

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Using Fractional Factorial Design And Its Application To Study Of Effective Factors On Amount Of Chest Drainage By Gomco Suction Pumps After Cardiac Surgery

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Abstract

Because of the nature Cardiac surgery, the bleeding during and after surgery are inevitable. Chest drainage is the removal of excess fluid, air, blood, pus, or other secretions from the chest cavity and space surrounding the lung(s). The accumulated drainage is very dangerous and can stop the heart beat. The amount of chest drainage is depends on some body factors. These factors, their relation to each other and CD, the amount of their effects are important for experts. The DOE methods (Design Of Experiment) can solve these problem. Factorial designs are most efficient methods for experiments involve in the study of the effects of two or more factors. In this paper, we consider fractional factorial design for an amount of Chest Drainage with Gomco suction pumps after Cardiac Surgery which is a medical pump device that help doctors to exit patient’s chest drainage with negative pressure. The objective of this problem is examining factors of the human body that suppose to influence the amount of Chest Drainage "CD". There is one response variable for this problem: amount of chest drainage. The fractional factorial design is applied for this problem and then with the normal probably plot we determine the significant factors that influence the chest drainage and finally we analysis the main effect and the relationship between factors and response variable and interaction between factors.

References


2000 Mathematics Subject Classification. 62K15, 94C30, 62B15

Key words and phrases. Factorial design, application of design of experiment, Statistical Analysis, health care
Improving Energy Relaxation of Hopfield Network With Augmented Lagrange Multipliers

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Abstract

The convergence property for energy relaxation of Little-Hopfield neural network using the Augmented Lagrange Multipliers is shown to be better than using Hebbian learning. This paper proposes a new method, called the Augmented Lagrange Hopfield method, to improve method of doing logic programming in neural network. In this paper, it has been proven by computer simulations that the new approach provides good solutions.

2000 Mathematics Subject Classification.

Key words and phrases. Little-Hopfield neural networks, Augmented Lagrange Multiplier, logic programming
Weakly Continuous modules

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Abstract

Let $R$ be a commutative ring with identity and $M$ be an unitary $R$-module. In this article we investigate the concept of weakly continuous modules as a natural generalization of weakly continuous rings. $M$ is called weakly continuous if the annihilator of each element of $M$ is essential in a summand of $R$, and $M$ satisfies the $C_2$-condition. Also $M$ is called $F$-semiregular if for every $x \in M$, there exists a decomposition $M = A \oplus B$ such that $A$ is projective, $A \leq Rx$ and $Rx \cap B \leq F$. If $M$ is a module, the following conditions are equivalent for $m \in M$: (1) $\text{Ann}(m) \subseteq \text{ess}eR$ for some $e^2 = e \in R$. (2) $mR = P \oplus S$ where $P$ is projective and $S$ is singular submodule.

$M$ is called ACS module if the above conditions are satisfied for every element $m \in M$. We investigate some equivalent conditions of weakly continuous multiplication modules. An $R$-module $M$ is a multiplication module if for every submodule $K$ of $M$ there is an ideal $I$ of $R$ such that $K = IM$. A submodule $N$ of $M$ is idempotent if $(N : M)N = N$. Let the following statements:

(1) $M$ is semiregular and $J(M) = Z(M)$.
(2) $M$ is $Z(M)$-semiregular.
(3) If $T$ is a finitely generated multiplication submodule of $M$, then $T = \gamma(M) \oplus S$ where $\gamma^2 = \gamma$ and $S$ is a singular submodule.
(4) $M$ is a ACS-module and every multiplication projective submodule is a summand.
(5) $M$ is a ACS-module which is also a $C_2$-module.

we prove that $(1) \implies (2) \implies (3) \implies (4) \implies (5)$ for projective multiplication faithful modules. Also $(5) \implies (1)$ is hold, if $M$ be a faithful multiplication module in which every cyclic submodule is idempotent.

References


\textbf{2000 Mathematics Subject Classification.} 13C10, 13C99

\textbf{Key words and phrases.} Weakly Continuous Module, Semiregular Submodule
New Algorithms Based On The Interior Point Method
For Convex Quadratic Programming

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Abstract

This paper presents three new algorithms for solving convex quadratic programming problems subject to the linear constraints. These algorithms are based on the general theory of Karmarkar interior points techniques. The first one uses the Karmarkar idea and linearization of the objective function. The second and third algorithms are modification of the first algorithm using the Schrijver and Malek-Naseri approaches respectively. These three new schemes are tested against the algorithm of Kebbiche-Keraghel-Yassine (KKY). It is shown that these three new algorithms are more efficient and converge to the correct optimal solution, while the KKY algorithm does not converge in some cases. Numerical results are given to illustrate the performance of the new algorithms.

2000 Mathematics Subject Classification. 90C20, 90C25, 90C51

Key words and phrases. Convex quadratic programming, Karmarkar’s algorithm, Schrijver’s algorithm, Malek-Naseri’s algorithm.
Čech Homology Groups of Šostak Fuzzy Topological Spaces

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Abstract

By using the covering of Šostak fuzzy topological spaces, inverse system of simplicial complexes is constituted. Čech homology groups are defined via the inverse system. It is proved that Čech homology groups are a functor. Later, axioms of homology theory are checked for this homology groups. To prove homotopic invariant of homology groups, we give new homotopy relation in the category of Šostak fuzzy topological spaces.

2000 Mathematics Subject Classification. 54A40, 55U10, 55U40

Key words and phrases. Šostak fuzzy topological space; simplicial complexes, homology theory, homotopy relation
Convergence To Common Fixed Points For Asymptotically Nonexpansive Mappings By A Modified Iteration Process

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Abstract
We modify an iteration scheme of Agarwal et al to the case of two asymptotically nonexpansive mappings and prove some weak and strong convergence theorems. We will also point out that this scheme cannot be used for three mappings in its existing form. We have to impose an extra condition to get convergence. We will mention the condition and give an example to show that there exist two nonexpansive mappings satisfying that condition.

2000 Mathematics Subject Classification. 47H05, 49M05.

Key words and phrases. Asymptotically nonexpansive mappings, Kadec-Klee property, weak convergence, strong convergence, iteration process.
A modified nonlinear conjugate gradient algorithm for unconstrained optimization

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Abstract

Conjugate gradient (CG) algorithms have played special roles in solving large scale nonlinear optimization problems with smooth objective functions $f : \mathbb{R}^n \to \mathbb{R}$. Search directions in the CG algorithms are generated by the sequence $d_1 = -\nabla f(x_1)$ and $d_k = -\nabla f(x_k) + \beta_k d_{k-1}$, for $k \geq 2$. By introducing different conjugacy conditions, researchers proposed different formulas for $\beta_k$. The related CG algorithms may have quite different behaviors for general functions. Recently, Dai and Liao [1] proposed some new formulas for $\beta_k$ based on the standard secant equation. On the basis of the idea proposed by Dai and Liao, researchers made some efforts to obtain new formulas for $\beta_k$ [2, 4, 5]. Here, we first make a modification on the secant equation proposed by Zhang and Xu [3], and then, using our modified secant equation and Dai-Liao’s approach, we propose a new conjugacy condition and obtain a new formula for $\beta_k$. It can be shown that under some proper conditions our CG algorithm is globally convergent for general functions. Numerical results showed that our algorithm is competitive and sometimes preferable to some recently proposed CG algorithms.

References


2000 Mathematics Subject Classification. 90C30, 65K05

Key words and phrases. Unconstrained optimization, Nonlinear conjugate gradient algorithm, Secant equation.

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Claims Validation System Fuzzy Approach

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Abstract

The markets are dynamically changing with changing consumer behavior. End users in all sectors, be it product or service find themselves empowered with wide range of options available to them. And therefore in today’s world nothing exists like monopoly. Insurance today is not what it used to be decade ago. It has evolved now, where consumers are more concerned about the quality, customer handling, transparent and easy process and proactive value added customer service. Insurance claim settlement process tops the priority list of all policy holders. From insurance company perspective, it is one of the most tedious business processes which directly impacts profit margins, policy holder satisfaction and business growth in turn. In order to reduce turnaround time of claim settlements besides settling the claim, claims need to be verified and validated. Till now it is ensured by human adjusters and this process makes claim settlement vulnerable to subjective judgment and the use of discretion while finalizing a claim. Trends show adjusters get biased to claimants and settle claims in their favor and impact monetary gains of insurers, to counter this growing trend and limiting cost on human expertise, companies are in need of reliable expert systems that can help them in validating or authenticating processed claims. This work presents a model (of Claims Validation System) which is designed by using fuzzy mathematics and expert system. This model will provide indicative result on the authenticity of claim in process and the result from this system will also help Auditors during settlement process. The methodology is also supported with the help of an example.

References


2000 Mathematics Subject Classification. 03B52.
Key words and phrases. Fuzzy logic, Insurance, Inference system, Claim validation, MATLAB.
An algorithm for solving the fractional Burgers equations

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Abstract

In this paper, a scheme is developed to study numerical solution of the space- and time fractional Burgers equations with initial conditions by the homotopy perturbation method (HPM). The fractional derivatives are considered in the Caputo sense. The solutions are given in the form of series with easily computable terms. Numerical solutions are calculated for the fractional Burgers equation to show the nature of solution as the fractional derivative parameter is changed.

2000 Mathematics Subject Classification. 35C10

Key words and phrases. Caputo sense, Fractional calculus, Time- and space- fractional Burgers equation, Homotopy perturbation method.

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On Generalized Paranormed Statistically Convergent Sequence Spaces Defined By Orlicz Function

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Abstract

In this paper, we define generalized paranormed sequence spaces \( -c(\sigma, M, p, q, s) \), \( -c_0(\sigma, M, p, q, s) \), \( m(\sigma, M, p, q, s) \) and \( m_0(\sigma, M, p, q, s) \) defined over a seminormed sequence space \((X, q)\). We establish some inclusion relations between these spaces under some conditions.

References


2000 Mathematics Subject Classification. 40A05,46A45

Key words and phrases. Seminorm, paranorm, statistical convergence, invariant means.
General Weyl-Heisenberg Frames

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Abstract
Every function $f \in L^2(R)$ can be written as an infinite linear combination of translates and modulates versions of the fixed function $g \in L^2(R)$ as Weyl-Heisenberg (W-H) frames $(E_{mb}D_{kc}T_{na}g)_{m,n,k \in \mathbb{Z}} = (\mathfrak{E}^{imb}(0)g(0 - na))_{m,n,k \in \mathbb{Z}}$. For a sharp signal $f$ we needed many coefficients of W-H frames to reconstruction $f$ as a superposition of translation and modulation. Now in the present paper we introduce the general W-H frame as the translates, dilation and modulates versions of the fixed function $g \in L^2(R)$. We find sufficient condition for $(E_{mb}D_{kc}T_{na}g)_{m,k,n \in \mathbb{Z}}$ to be a frame for $L^2(R)$.

References

2000 Mathematics Subject Classification.
Key words and phrases. Frame, Frame sequence, Averaging frame, W-H frame.
Necessary conditions for singular controls in systems with nonlocal boundary conditions

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Abstract

Let it be required to minimize the functional:

$$J(u) = \varphi(x(t_0), x(t_1))$$

(0.1)
on the restrictions:

$$\dot{x} = f(x, u, t), \quad t \in T = [t_0, t_1],$$

(0.2)
$$Ax(t_0) + \int_T h(t) x(t) dt + Bx(t_1) = c,$$

(0.3)
$$u(t) \in V \subset \mathbb{R}, \quad t \in T$$

(0.4)

The given functions \( \varphi \in \mathbb{R}^1, \quad f \in \mathbb{R}^n \) are supposed to be continuous by the collection of arguments and have continuous second derivatives with respect to \( x, y; \quad c \in \mathbb{R}^{n \times 1}; \quad A, B, h(t) \in \mathbb{R}^{n \times n} \) are given matrices, \( V \subset \mathbb{R} \) is an open set.

Firs constructive sufficient conditions for existence and uniqueness of the solution for boundary problem (2)-(3) are found.

The formula of second order increment of functional (1) is calculated. The necessary condition of optimality for singular controls in classic sense is obtained in optimal control problem (1)-(4) on the basis of control variation.

2000 Mathematics Subject Classification. primary: 49J15; secondaries: 49K15, 34B10

Key words and phrases. optimal control, boundary value problem, necessary condition of optimality

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Why Magnetic Monopoles Are Not Seen?

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Abstract

Dual symmetry of Maxwell’s equations predicts the existence of magnetic monopoles which are not detected until now. As an important consequence of this prediction, the quantization of electric charge is obtained by P.A.M. Dirac. In this paper I show the uncertainty in the phase space quantum mechanics could be the responsible of the non-visibility of magnetic monopoles.

2000 Mathematics Subject Classification.
81V10

Key words and phrases. Magnetic Monopoles, Uncertainty, Phase Space Quantum Mechanics, Charge Quantization
Modelling The Effect Of Vaccination Policy On Epidemics With Time Delay

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Abstract

The spread of communicable diseases depends on rate of transmission or contact rate, removal rate, mode of transmission, latent and incubation period, age-specific susceptibility and immunity of individuals to the disease. The immunity to the specific disease in the individuals can be artificially developed with the help of vaccination. It is understood that the vaccination leads to complete protection and vaccinated individuals are immune but this is not true and in general vaccination only leads to partial protection. The role of latent period in the dynamics of communicable diseases is also an important factor and should be considered in the epidemic models. Further, while studying age-structured epidemic models, maturation period should also be considered in the model, because in the case of several infectious diseases the populations of certain age-groups are immune from diseases for some finite period and after that they become susceptible.

In view of the above, therefore, in this paper a delay epidemic model has been studied to investigate the effect of age-based vaccination policy on the dynamics of a communicable disease incorporating latent period and maturation delay. For the model, the disease-free and endemic equilibrium points have been obtained and their local and global stability analysis have been carried out.

2000 Mathematics Subject Classification.

Key words and phrases. Incubation period, Immunity, Maturation delay, Global Stability
Algebraic Method Applied To Solving Inversion Problem Of Single Layered Rigid Pavements

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Abstract

Surface waves can be used to determine the mechanical and physical properties of the materials of a layered structure such as soil sites and highway pavements. The elastic properties and thicknesses of the component materials are derived from measurements of the frequency and the phase velocity of vibrations generated along the surface of the ground. The phase velocity is not constant, but varies with the frequency, enabling an experimental dispersion curve of the system to be plotted. The experimental dispersion data is then used to back calculate the unknown parameters of the system through an inversion process by employing one of the available inverse methods.

For many years, the numerical inverse procedure has been extensively used for determination of the layers moduli and thicknesses of a layered structure. However, this technique is complex, time consuming and requires experienced person and engineering judgment. Ideally, the inverse should be obtained by means of a true mathematical inverse. The frequency equation for the system is expanded as a polynomial, and is solved for the unknown parameters of the system. In this research a direct symbolic solution for determination of the thickness of a free plate model, using "Mathematica" computer software, has been developed. It is used to calculate the thickness of the uniform free plate corresponding with pairs of the values of phase velocity and frequency as data. The wave propagation in elastic plates is analogous to propagation in layered spaces and therefore the free plate system can be used to model the surface layer of a single layered rigid pavement structure. Single layered rigid pavements are extensively and increasingly used in highways and airport runways. The characteristic equation of the system which corresponds with surface waves can be represented by power series. By making power series, the equation is expanded symbolically in terms of the layer thickness parameter. Inverse series performs reversion of the series, which gives a series for the inverse of the function. The normal expression now is a polynomial representing the thickness of the surface layer in terms of the velocities of waves in the surface layer and of the measured values of the frequency and the corresponding phase velocity. The frequency and the phase velocity are obtained from the results of the measurements made in the field on the ground surface of the structure.

In order to evaluate the effectiveness and reliability of the proposed technique, the application of the method to a number of published set of data obtained in the field has been investigated and assessed. The comparison between the experimental results and the developed algebraic solutions show very good agreement, indicating that the proposed method can be used as an economic and effective technique to determine the thickness of the rigid pavements surface layer.
Trapezoidal Fuzzy Data In Possibility Linear Regression Analysis

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Abstract

Fuzzy linear regression was proposed by Tanaka et al. [3] in 1982. Many different fuzzy regression approaches have been proposed by different researchers since then [1],[2] and also this subject has drawn much attention from more and more people concerned.

Definition: A symmetric fuzzy number $\tilde{A}$, denoted by $\tilde{A} = (\alpha, c)_L$ is defined as $\tilde{A} = L((x - \alpha)/c), c > 0$, where $\alpha$ and $c$ are the center and spread of $\tilde{A}$ and $L(x)$ is a shape function of fuzzy numbers.

In this paper, we aim to extend the constraints of Tanaka’s [3] model. Applied coefficients of the fuzzy regression by them is the symmetric triangular fuzzy numbers, while we try to replace it by more general asymmetric trapezoidal one. Possibility of two asymmetric trapezoidal fuzzy numbers is explained by possibility distribution. Two different models are presented and a numerical example is given in order to compare the proposed models with previous one. Error values show advantage of the presented models with respect to constraints of Tanaka’s model. For the possibility distribution with asymmetric trapezoidal fuzzy numbers, we prove the following theorem.

Theorem: If $A = (a^{(1)}, a^{(2)}, a^{(3)})$ and $B = (b^{(1)}, b^{(2)}, b^{(3)})$, then

$$
\text{POS}(\tilde{A} = \tilde{B}) = \begin{cases} 
L\left(\frac{a^{(2)} - b^{(2)}}{a^{(2)} - a^{(1)}} + b^{(3)} - b^{(2)}\right) & a^{(2)} \geq b^{(2)} \\
L\left(\frac{a^{(2)} - b^{(2)}}{a^{(3)} - a^{(2)}} + b^{(2)} - b^{(1)}\right) & a^{(2)} \leq b^{(2)} \\
L\left(\frac{a^{(2)} - b^{(2)}}{b^{(2)} - a^{(1)}} + b^{(2)} - b^{(1)}\right) & \text{o.w}
\end{cases}
$$

References


2000 Mathematics Subject Classification. 90C70

Key words and phrases. Trapezoidal fuzzy numbers, Fuzzy linear regression, Possibility distribution, Mathematical programming
The \( k-\epsilon \) Model in Turbulence

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Abstract

We prove analytically the existence of self-similar solutions for the \( k-\epsilon \) model arising in the evolution of turbulent bursts by employing a topological shooting technique where \( \alpha > \beta \) with different conditions.

2000 Mathematics Subject Classification. 76F60

Key words and phrases. \( k-\epsilon \) modeling

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**He is also thankful to the Oxford Center for Nonlinear PDE, and to the Mathematical Institute of the University of Oxford, for the hospitality they offered him during his visit.
Trapezoidal approximation based on middle of maxima and middle of support

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Abstract

In many fuzzy logic applications, the calculations strongly depend on the fuzzy number membership functions. Less regular membership functions lead to calculations that are more complicated. A natural need is to approximate fuzzy numbers with the simpler shapes which are easy to handle and have natural interpretations. Since one can easily propose many other approximation methods, a natural question arises: how to construct a good approximation operator? Defuzzification methods have been widely studied for some years and were applied to fuzzy expert system. The major idea behind these methods was to obtain a typical value from a given fuzzy set according to some specified characters. In other words, each defuzzification method provides a correspondence from the set of all fuzzy sets into the set of real numbers. Obviously, in defuzzification methods that replace a fuzzy set by a single number, we generally lose too much important information. The aforementioned explanation shows that the trapezoidal approximation of a fuzzy number is meaningful topic. Since trapezoidal approximation could be also performed in many ways, there are a number of criteria such as translation invariance, scale invariance, identity which the approximation operator should or just can possess. In this paper, we introduce a trapezoidal approximation of an arbitrary fuzzy number, which preserves its the middle of maxima and middle of support. The operator is called trapezoidal approximation based on middle of maxima and middle of support. In case that the middle of maxima and middle of support are identical the trapezoidal approximation is symmetric. We then discuss properties of the approximation strategy including translation invariance, scale invariance and identity. The advantage is that the presented method is simpler than other methods computationally. The method is illustrated by some numerical examples.

References


2000 Mathematics Subject Classification. 93C42

Key words and phrases. Approximation, Core, Fuzzy number, Trapezoidal fuzzy number, Support

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Frobenius $Q$-Groups and 2-Transitive Frobenius $Q$-Groups

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Abstract

A finite group whose complex characters are rationally-valued is called a $Q$-group. For example, all of the symmetric groups and finite elementary abelian 2-groups are $Q$-groups. The property of being a $Q$-group is characterized by saying that the generators of every cyclic subgroup are conjugate. Depending upon the group, by using this characterization, it may be easier to say that the group is a $Q$-group or not. Kletzing's lecture notes present a detailed investigation into the structure of $Q$-groups. In group theory, general classification of $Q$-groups has not been able to be done up to now, but some special $Q$-groups have been classified. In this study, we find the structure of Frobenius $Q$-groups with a new proof and all 2-transitive Frobenius $Q$-groups.

References


2000 Mathematics Subject Classification. 20C15

Key words and phrases. Frobenius groups, rational groups.
Order Norm Completion of Cone Metric Spaces

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Abstract

In this paper a completion theorem for cone metric spaces and a completion theorem for cone normed spaces are proved. The completion spaces are constructed by means of an equivalence relation defined via an ordered cone norm on the Banach space $E$ whose cone is strongly minihedral and ordered closed. This order norm has to satisfy the generalized absolute value property. In particular if $E$ is a Dedekind complete Banach lattice then together with its absolute value norm they satisfy the desired properties.

References


Stability, bifurcations and non-linear eigenvalue problems in physics

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Abstract

A major number of physics problems related to the study of the stability of solutions of differential equations can be interpreted as nonlinear eigenvalue problems. In this study we offer an effective numerical method for solving such problems. This method is based on the continuous analog of Newton’s method. The linearized equations occurring at every iteration are solved using a spline-collocation scheme. Concrete examples of applying the method to various physical problems are demonstrated.

2000 Mathematics Subject Classification. primary: 65L07, 65L15; secondaries: 65Z05

Key words and phrases. Stability, bifurcations, Newton method, Josephson junctions

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The properties of fuzzy submodules of a R-module and their radicals

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Abstract

In this paper we show that properties of fuzzy submodule of a R-module and their radicals (R is a commutative ring with identity) connected with fuzzy quotient modules and radical of a fuzzy submodules, characterization of notherian and artinian modules in terms of the set of values of fuzzy submodules.

References

Analytical Solution Of The Heat Conduction Equation
In One-Dimensional Spherical Coordinates At Nanoscale

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Abstract

Heat conduction equation at microscale has been widely applied to thermal analysis of thin metal films. The microscopic heat flux equation developed from physical and mathematical reasoning is different from the traditional heat equation. Here a second-order derivative of temperature with respect to time and a third-order mixed derivative of temperature with respect to space and time will appear in the heat equation. An approximate analytical solution to the non-Fourier heat conduction equation in one-dimensional spherical coordinates based on the dual-phase-lag framework is obtained by employing the Adomian decomposition method (ADM). The application of ADM to partial differential equations, when the exact solution is not reached or existed, demands the use of truncated series. The major reduction in computational effort associated with the ADM is the main factor behind their popularity while other numerical methods require extensive computation. The ADM does not discretize variables and gives an analytical solution in the form of truncated series. If there are nonlinear factors in an equation, ADM gives the analytical solution without any need for linearization. In this presentation, the reliability and efficiency of the solution were verified using the ADM.

2000 Mathematics Subject Classification. 65M99, 35K05, 35C10, 74K35.

Key words and phrases. Adomian decomposition; heat conduction equation; nanoscale; spherical coordinates.
On the symmetry of Hamiltonian systems

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Abstract

In this paper, we use the formalism of Hamiltonian system on symplectic manifold due to Reeb[2] given in Abraham and Marsden[6] and Arnold[7] to derive the equation of motion for (1) A particle on a line in a plane with a spring force and (2) A free particle in n-space. The time flows for both the problems mentioned above are also determined and proved that the determined flow is a Hamiltonian flow, i.e., the symmetry of a Hamiltonian system. A non-Hamiltonian flow is also considered and it is shown that by changing the symplectic form and the phase space of the system we can convert it into a Hamiltonian flow. The translation and rotational symmetry related to linear and angular momentum respectively for the motion of a free particle in n-space is also considered, which is useful in reducing the phase space of a mechanical system.

References

Solving Singular Initial Value Problems of Emden-Fowler and Lane-Emden Type

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Abstract

In this paper, Singular initial value problems are investigated by using Taylor series method. The solutions are constructed in the form of a convergent series. The method is applied to Emden-Fowler and Lane-Emden equations.

References


2000 Mathematics Subject Classification. 34B15, 34B16

Key words and phrases. Taylor series method, Emden-Fowler equation, Lane-Emden equation

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Some Spectral Properties Of Linear Operators In UMD Spaces And Applications

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Abstract

In this paper the general spectral properties of linear operators in Banach spaces are studied. We find sufficient conditions on structure of Banach spaces and resolvent properties that guarantee completeness of roots elements of Schatten class operators. It is generalizes the well known result for linear operators in Hilbert spaces (see [1], Theorem XI. 6.29 ). The main result is:

Theorem 1. Let the following conditions hold:
(1) $E$ is a Banach space with base satisfying the Parsewall condition and $A$ is an operator in $\sigma_p(E)$, $p \in (1, \infty)$;
(2) $\gamma_1, \gamma_2, \ldots, \gamma_s$ is non overlapping, differentiable arcs in the complex plane starting at the origin. Suppose that each of the $s$ regions into which the plans is divided by these arcs is contained in an angular sector of opening less then $\frac{\pi}{s}$;
(3) $m > 0$ is an integer so that the resolvent of $A$ satisfies the inequality
$$||R(\lambda, A)|| = O((|\lambda|^{-m})$$
(0.1)
as $\lambda \to 0$ along any of the arcs $\gamma_i$. Then the subspace $spA$ contains the subspace $A^mE$.

In applications the nonlocal BVPs for the degenerate abstract equation of second order with variable coefficients
$$(L + \lambda)u = a(x)u''(x) + B(x)u'(x) + A(x)u(x) = f(x), x \in (0, 1)$$
(0.2)
is studied, where $u' = (x^{-\frac{1}{2}} \frac{d}{dx})^2 u(x)$, $A_\lambda = A + \lambda$, $A = A(x)$, $B = B(x)$ are linear operators in a Banach space $E$.

The principal part of the appropriate differential operator $Q$ is not self-adjoint. The discreetness of spectrum and completeness of root elements of this operator is obtained.

Let $I = I(E(A), E) denote the embedding operator from $E(A)$ to $E$ and $s_j(I(E(A), E)) denote the approximation numbers of the operator $I$. Let $C$ be a set of complex numbers and
$$S_\varphi = \{\xi; \xi \in C, |\arg \xi| \leq \varphi \}, 0 \leq \varphi < \pi.$$ (0.4)

Theorem 2. Let the following conditions be satisfied:
(1) $E$ is an UMD space with base;
(2) $A$ is an $R$-positive in $E$ with $\varphi \in [0, \pi)$, $A(x) A^{-1}(x) \in C([0, 1]; L(E)), x \in (0, 1)$ and $BA(\frac{1}{2} - \nu) \in L_\infty(0, 1; B(E))$ for $0 < \nu < \frac{1}{2}$, $|\alpha_{km}| + |\beta_{km}| > 0$;
(3) $-\alpha \in S(\varphi_1) \cap C$, $\alpha \neq 0, \eta(x) \neq 0, 0 \leq \varphi_1 < \pi, \lambda \in S(\varphi_2), \varphi_1 + \varphi_2 < \varphi, 0 \leq \gamma < 1 - \frac{1}{p}$
(4) $s_j(I(E(A), E)) \sim j^{-\frac{3}{2}}$.

Then;
(a) $s_j\left((Q + \lambda)^{-1}(L_p(0, 1; E))\right) \sim j^{-\frac{3}{2}}$ (0.6)
(b) the system of root functions of differential operator $Q$ is complete in $L_p(0, 1; E)$.

References


2000 Mathematics Subject Classification. 34G10, 34B10, 35J25

Key words and phrases. Uniformly convex Banach spaces; Abstract functions; Schatten class of operators; Completeness of root elements; Separable boundary value problems; Differential-operator equations.

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The Metallic Means Family (MMF)

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Abstract

The main purpose of this presentation is to introduce a new family of quadratic irrational numbers. This family was introduced by the author in 1997 as the Metallic Means Family (MMF). Its more prominent member is the well known Golden Mean. Among its relatives, let us mention the Silver Mean, the Bronze Mean, the Copper Mean, the Nickel Mean, etc. They are a family because, aside from carrying the name of a metal, they enjoy common mathematical properties. For example, they are subdivided into two subfamilies:

a) the subfamily of the positive irrational numbers that have a purely periodic continued fraction expansions
b) the subfamily which members have a periodic continued fraction expansion.

The members of the first subfamily are fundamental in the actual research on the stability of micro- and macro-physical systems, going from the DNA internal structure to the astronomical galaxies. The main results of this new research are:

1) The members of the MMF intervene in the determination of the quasiperiodical behavior of non linear dynamical systems, being therefore an invaluable key in the search of universal ways on the roads to chaos.

2) The numerical sequences based on the members of the MMF satisfy many additive properties and simultaneously are geometric sequences, having been in consequence chosen as basis of different systems of proportions, particularly the Golden Mean and the Silver Mean.
Rao-blackwellized Estimates for the Multivariate Bayesian Inference

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Abstract

In Bayesian inference the summary statistics of the parameter estimates are generally chosen as the mean and standard deviation of the posterior distribution after the burn-in period. If we know the conditional distribution of each parameter $c_j$ ($j = 1, \ldots, r$) given other parameters $c_k$ ($k \neq j$), the mean of the estimates can be improved via Rao-blackwellization estimator which is the conditional probability of $c_j$ averaged over the conditional probability of $c_k$’s via $E(c_j) = \frac{1}{n} \sum_{k=1}^{n} E(c_j | \Theta^{(k)}_{-j})$. Here $\Theta^{(k)}$ denotes the $r$-dimensional parameter vector $\Theta = (c_1, \ldots, c_r)$ at the $k$th iteration after the burn-in period, thereby $\Theta^{(k)}_{-j}$ states all the components of $\Theta^{(k)}$ except for $c_j$. Finally $n$ represents the number of samples chosen from the conditional posterior distribution of the parameter after burn-in. From empirical results, it is shown that due to the consequence of the Rao-blackwell theorem, the given equation above typically gives better estimate than the mean of the posterior distribution of $c_j$ in terms of accuracy.

In Rao-blackwellization where the direct computation of $\Theta$ component is not possible, whereas the full conditional distribution of $c_j$ is known, the sampler for $c_j$ can be generated via Gibbs sampling from the MCMC outputs (Gelfand and Smith, 1990; Boys et al., 2000). On the other hand if the conditional distribution of $\Theta$ is unknown, hereby Gibbs is not applicable, an $\varepsilon$-neighbourhood of $\Theta$ is defined in such a way that a sufficiently small sphere with radius $\varepsilon$ can cover $n$ samples of $c_j$ (Tanner and Wong, 1987). Although this idea works for small set of variables, it is difficult to find such an $\varepsilon$-radial sphere for high dimensional multivariate estimation unless we reduce the dimension of $\Theta$.

For calculating a Rao-blackwellized estimate for the model parameters in which the Gibbs and $\varepsilon$-neighbourhood techniques cannot be plausible, we propose an alternative solution in such a way that the unknown normalizing constant of the transition probability from the full conditional distribution of parameters is calculated by numerical integration. By using the available MCMC results, we approximate a specific normalizing constant for each $c_j$ considering the possible interval of $\Theta$ without reducing any dimension. Then these findings are combined with the computations of the conditional distribution of $\Theta$ which are updated by either Gibbs or Metropolis-Hasting algorithms.

To evaluate the performance of our approach, we implement it to estimate the Rao-blackwellized estimates of model parameters of a large biological network where the known methods cannot be utilized.

References


The Guelph Expansion: 
A Special Mathematical Formulation for Polynomial Expansion

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Abstract

\[
\prod_{i=1}^{n} (\omega + \lambda_i) = \sum_{k=0}^{n} \omega^{n-k} \sum_{T \in \mathcal{G}} \lambda_{T-k} \ldots \lambda_{T-1} \lambda
\]

Such polynomial expansion helped in developing a new compact polynomial formula for the characteristic equation of a nuclear reactor model with \( n \) groups of delayed neutrons which is known as the inhour equation, Hetrick (1971), Duderstadt and Hamilton(1976), and Lewins (1978). The coefficients of the new form of the inhour equation (the polynomial form) can be impeded in an algebraic solution for the solution of the point reactor kinetic model, Ratemi (2001). An Analytical Exponential Mode (AEM) method has been developed by Aboanber(2003) which is based on the developed formulation of the polynomial expansion and its application to the inhour equation for the solution of the point reactor model which includes delayed neutron groups as well as photo-delayed neutron groups associated with beryllium, and heavy water in some types of nuclear reactors. Such new polynomial expansion (The Guelph expansion) with the new introduced Tripoli indexing (T) has already an application to the solution of nuclear reactor models and helped in getting solutions which overrided system stiffness with better accuracy as well as the advantage of using larger numerical sampling time, Aboanber (2003). It is suggested in this paper for researchers to consider such polynomial expansion for other application in other disciplines.

2000 Mathematics Subject Classification. 12-06

Key words and phrases. Guelph Expansion, Tripoli Index, Polynomial Expansion, Inhour Equation, Point Reactor Kinetics
On The Solvability Of Abel-Poisson Integral Equation In Downward Continuation For Gravity Field Modeling

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Abstract

The problem of downward continuation of the gravity field from the Earth's surface to the reference ellipsoid arises from the fact that the solution to the boundary value problem for geoid determination without applying Stokes formula is sought in terms of the disturbing potential on the ellipsoid but the gravity observations are only available on the Earth’s surface. Downward continuation is achieved via Abel-Poisson integral and its derivatives. Before solving downward continuation problem it should be checked the solvability of the problem. The solvability of the problem is guarantied if Picard condition is satisfied. The topic of this paper is the study of solvability of downward continuation problem via Picard condition.

References


2000 Mathematics Subject Classification. 45Q05

Key words and phrases. Boundary Value Problem, Abel-Poisson Integral, Inverse Problem, Picard Condition
Non linear boundary value problem: Faedo-Galerkin methode of the non linear boundary value problem

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Abstract

In this note, we consider a nonlinear boundary value problem. The use of Faedo-Galerkin techniques and a compactness result, while passing to the limit, we prove the existence of the variational solution of the considered problem. A new result is given by showing the uniqueness of the solution basing on the hypotheses which are weaker than those considered by (6) : J.L. Lions, Quelques méthodes de résolution des problèmes aux limites non linéaires, Paris, Dunod, (1969)), for a similar problem. We will finish by studying the regularity of the gotten solution.
The Average Chebyshev Distance In A Grid

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Abstract
Chebyshev distance has been an interesting topic in mathematics so far; for both theoretical attractions and practical applications which spread from warehouse logistics to the game of chess in plane geometry. Through the presented study we will examine and discover certain enumerative properties of a grid which is associated with Chebyshev distance, and then we will calculate the mean value of the distance between two randomly chosen points. While mentioned mean value plays an important role in further probabilistic methods, this study will also develop our structural knowledge of those grids which are associated with Chebyshev distance.
Symmetry classes of tensors associated with Young subgroups

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Abstract

Let \( V \) be an \( n \)-dimensional complex inner product space and \( G \) be a subgroup of the full symmetric group \( S_m \). Let \( V^\otimes m \) denote the tensor product of \( m \) copies of \( V \) and for any \( \sigma \in G \), define the permutation operator

\[
P_{\sigma} : V^\otimes m \rightarrow V^\otimes m
\]

by

\[
P_{\sigma}(v_1 \otimes v_2 \otimes \cdots \otimes v_m) = v_{\sigma^{-1}(1)} \otimes v_{\sigma^{-1}(2)} \otimes \cdots \otimes v_{\sigma^{-1}(m)}.
\]

Suppose \( \chi \) is a complex irreducible character of \( G \) and define the symmetrizer

\[
T(\chi, G) = \frac{\chi(1)}{|G|} \sum_{\sigma \in G} \chi(\sigma)P_{\sigma}.
\]

The symmetry class of tensors associated with \( G \) and \( \chi \) is the image of \( T(\chi, G) \) and it is denoted by \( V_\chi(G) \). So

\[
V_\chi(G) = T(\chi, G)(V^\otimes m).
\]

The aim of this paper is to study symmetry classes of tensors associated with Young subgroups of the symmetric group. We will discuss the dimension as well as \( * \)-bases of these types of symmetry classes.

References


2000 Mathematics Subject Classification. Primary: 15A69 Secondary: 20C15

Key words and phrases: Symmetry classes of tensors, Young subgroup, Irreducible characters
Necessary conditions of second order optimality for systems with three-point boundary conditions

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Abstract

In this report the object of investigation is an optimal control problem in systems of nonlinear first order ordinary differential equations with three-point boundary conditions:

\[ \dot{x} = f(x, u, t), \quad x(t) \in \mathbb{R}^n, \quad t \in T = [t_0, t_1], \] (1)

\[ Ax(t_0) + Bx(t_1) + Dx(t_2) = c, \quad t_1 \in (t_0, t_2). \] (2)

Here \( f \in \mathbb{R}^n \) is continuous by collection of variables together with its partial derivatives with respect to \( x \) and \( u \) up to the second order inclusive, \( A, B, D \in \mathbb{R}^{n \times n}, \ c \in \mathbb{R}^{n \times 1} \) are constant matrices. It is supposed that control action satisfy restriction \( u(t) \in V, \ t \in T \), where \( V \) is a convex compact set from \( \mathbb{R}^r \).

The goal of optimal control problem is optimization of the functional:

\[ J(u) = \varphi(x(t_0), x(t_2)) \] (3)

defined on the solutions of boundary problem (1)-(2) at admissible controls where it is supposed that function \( \varphi(x, y) \) is continuous by \( x \) and \( y \) up to the second order inclusive. The formula of the second order increment of functional (3) is calculated.

On the basis of control variations there are obtained new necessary conditions of optimality for quasi-singular controls for systems which are described by a set of differential equations with three-point boundary conditions.

2000 Mathematics Subject Classification. 49J15, 49K15, 34B10

Key words and phrases. optimal control, boundary value problem, necessary condition of optimality
On $D_{12}$ Modules

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Abstract

In this paper we introduce $Rad_{D_{12}}$ modules as a generalization of $D_{12}$ modules. We also investigate some properties of $Rad_{⊕}$-supplemented modules relative to $Rad_{D_{12}}$ modules. Necessary and sufficient conditions for a module to be $Rad_{D_{12}}$ are obtained.

References


2000 Mathematics Subject Classification. 16D10, 16D70

Key words and phrases. Small submodule, $Rad_{⊕}$-supplemented, $Rad_{D_{12}}$ module

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FPGA Implementation of Vedic Signed Multiplier

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Abstract

Vedic mathematics is the name given to the ancient Indian system of mathematics. To be precise, a unique technique of calculations based on simple rules and principles with which any mathematical problems related to arithmetic, algebra, geometry or trigonometry can be solved. The system was rediscovered in the early twentieth century from ancient Indian sculptures (Vedas). The system is based on 16 Vedic sutras or aphorisms \cite{1}, which are actually Vedic mathematical formulae describing natural ways of solving a whole range of mathematical problems. The Vedic mathematics approach is totally different and considered very close to the way a human mind works. A large amount of work has so far been done in understanding various methodologies (sutras). The need for high speed processing has been increasing as a result of expanding signal processing and computer applications. Higher throughput arithmetic operations are important to achieve the desired performance in many real time signal and image processing applications. One of the important arithmetic operations in such applications is to perform a large number of mathematical calculations in a very less time. Since in performing mathematical calculations especially multiplication, a computer spends a considerable amount of its processing time, an improvement in the speed of a math coprocessor for performing multiplication will increase the overall speed of the computer. There are several multiplier algorithms that can be implemented such as: Array, Booth, Carry save, modified Booth algorithms and Wallace tree. The most significant aspect of the multiplier architecture of ancient Indian Vedic mathematics is that it is based on vertical and crosswise structure of ancient Indian Vedic mathematics as in \[1\] and \[7\].

In this paper a signed binary multiplication algorithm is presented based on ancient Indian Vedic mathematics. The signed multiplication algorithm is realized using verilog coding, simulated with Modelsim and implemented on Xilinx Spartan2 XC2S100-PQ208 Field Programmable Gate Array (FPGA). The paper explains 8X8 multiplication of signed binary numbers, its realization and implementation, which can be extended to a NXN signed binary numbers. The system works satisfactorily under ideal condition and is tested for multiplying various combinations of signed and unsigned 8 bit binary numbers. From the synthesis report of both the proposed algorithm and the booth algorithm \cite{8} it is observed that the maximum combinational path delay was found to be 47.706 ns which are found to be less than Modified Booth’s algorithm that requires 67.961ns implemented on the same device. Not only the time required for the multiplication is less but also the hardware utilization is also found to be less by 2% which is very significant in case of VLSI design. The signed multiplier algorithm discussed in this paper can be substituted in \[2\] – \[7\] in case if it is really required to use signed and unsigned numbers.

References


2000 Mathematics Subject Classification. 00

Key words and phrases. Vedic mathematics; FPGA; Signed binary multiplication


On Generalized Weak Subdifferentiability of Vector Valued Functions from $\mathbb{R}^n$ to $\mathbb{R}^m$

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Abstract

In this work, by using special ordering cones ($\mathbb{R}^m_+, \mathbb{R}^m_{\text{lex}}$) on $\mathbb{R}^m$ and a special vectorial norm, it is shown that Lipschitz-ness of a vector valued function from $\mathbb{R}^n$ to $\mathbb{R}^m$ implies generalized lower Lipschitzness of this function. Then by using this notion necessary and sufficient conditions for generalized weak subdifferentiability of a vector valued function at a point are given.

References

A new management approach to optimize the use of the operating room

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Abstract

The surgery is a highly strategic for hospitals because it is at the heart of medical and concentrated 10 to 15% of the budget of the institution for its operation. It is therefore important for hospitals to assess the performance of organizational strategies, programming and management procedure on the sector to improve service to patients and reduce operating costs. Currently, health centres’ Algerian private or public, and especially surgical suffers from a lack of quality care and high cost of interventions. One reason is the poor organization of the management of the logistics chain of various actors involved in the care of the patient. The main objective of this work is to propose a provisional scheduling surgery to optimize the management of operating units, and therefore reduce the waiting time for patients the report of the interventions surgery. To carry out this delicate task, we undertook the following approach:
- Study the existing analysis of the different activities and tasks of the operating process to identify the strengths and weaknesses of the existing as well as different management problems,
- Modelling of different management problems procedure process,
- Proposal of a new management approach to optimize the use of the operating room.
A note on Reidemeister torsion and period matrix of Riemann surfaces

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Abstract

We consider compact Riemann surfaces $\Sigma_g$ with genus at least 2. We explain the relation between the Reidemeister torsion of $\Sigma_g$ and its period matrix.

References


2000 Mathematics Subject Classification. 32G20, 57M99

Key words and phrases. Reidemeister torsion, period matrix.
Numerical Solution Of A Non-Classical Hyperbolic-Parabolic Problem

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Abstract

This paper is a joint work with Prof. Allaberen Ashyralyev, Fatih University. Stable difference schemes of the first and second orders of accuracy for solving multidimensional hyperbolic-parabolic partial differential equations with the nonlocal boundary condition are presented. A procedure of modified Gauss elimination method is used for solving these difference schemes in the case of a one-dimensional hyperbolic-parabolic partial differential equations. The method is illustrated by numerical examples.

References


2000 Mathematics Subject Classification.65N12, 65M12, 65J10.
Key words and phrases.hyperbolic-parabolic equation, difference schemes, stability.
Smoothing the Global Mean Based on Functional Principal Component Analysis

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Abstract

There are many cases in almost all application fields where the estimation of population parameters is carried out using sparse data. The data may be time or space \(t\) dependent. When such data comes from a set of \(n\) trajectories (subjects), the Functional Principal Component Analysis (FPCA) is used to process the data for estimation purposes. In this study, the estimation and smoothing of global mean is considered. Sparse functional data from many different trajectories are assumed to be independent realizations of a smooth random function with mean function \(E[X(t)] = \mu(t)\) and covariance function \(\text{Cov}[X(s), X(t)] = C(s, t)\). Any subject can be expressed as \(X_i(t) = \mu(t) + \sum_k \xi_{ik} \phi_k(t)\). Here \(\xi_{ik}\) are the functional principal component scores.

Evidently in the functional representation of a trajectory, the global mean function \(\mu(t)\) has a major role. Therefore, an accurate and robust estimation of \(\mu(t)\) is essential. This estimation is based on the \(j\)th observation of the \(i\)th trajectory represented at time \(T_{ij}\), \(j = 1, ..., N_i\). Since the number of observations \(N_i\) made on each of the \(i\) subjects is random, are assumed to be i.i.d. and independent random variables. Observations will inherently include some measurement errors \(\epsilon_{ij}\) that are also assumed to be i.i.d. with \(E[\epsilon_{ij}] = 0\) and constant variance \(\sigma^2\).

Local linear smoothers employing weighted least squares for the estimation of \(\mu(t)\) is used. Estimated is carried out using all available data from \(n\) subjects. The smooth estimator \(\hat{\mu}(t)\) is found by minimizing the smoother function with respect to related parameters.

This theory was applied to a data set on variable funds belonging to 12 banks from Turkey to estimate the smooth mean. Daily changes were recorded as data values, and obtained smooth mean for the whole data as well as on daily bases was found to be in close agreement with the corresponding true data averages.

References


2000 Mathematics Subject Classification. 62H11, 62H12, 62H25, 62P05, 91B28

Key words and phrases. Smoothing, functional, sparse data, covariance

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Sensitivities in Determining the Slope Parameter in Functional Regression

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Abstract

In multivariate linear regression analysis the slope parameter is defined as \( \beta_1 = \frac{\text{Cov}(X, Y)}{\text{var}(X)} \). Based on the fact that the predictors are uncorrelated the slope function in the functional case becomes

\[
\beta(s, t) = \sum_{k=1}^{\infty} \sum_{m=1}^{\infty} \frac{E[\zeta_m \xi_k]}{E[\xi_m^2]} \theta_m(s) \phi_k(t)
\]

The process involves the obtaining of an estimate \( \hat{C}(s, t) \) for the cross-covariance \( C(s, t) = \text{cov}(X(s), y(t)) \). This necessitates the smoothing of the raw cross-covariance. As a result an estimate for the cross covariance \( \hat{\sigma}_{km} = E[\zeta_m \xi_k] \) between the \( k^{th} \) predictor and \( m^{th} \) response functions is obtained. Then the estimated slope function becomes.

\[
\hat{\beta}(s, t) = \sum_{k=1}^{K} \sum_{m=1}^{M} \hat{\sigma}_{km} \hat{\theta}_m(s) \hat{\phi}_k(t)
\]

While in theory everything appears perfect, in the application to sparse and irregular data special care must be given to the level of smoothing as well as the number of eigenfunctions to be included in the estimation process. Another sensitive point is the computation of the canonical correlation. One has to show extreme care in selecting the canonical weighting functions, so that the right choice can be made out of the many canonical correlations to be computed. The sensitivity shown to the estimation of the slope function will certainly reflect in the prediction of the response trajectory \( Y \) in the functional regression process.

References


2000 Mathematics Subject Classification. 62H11, 62H12, 62H25

Key words and phrases. smoothing, functional regression, sparse data, slope parameter

*This research was supported by EMU
Kaplansky’s Construction And The Classes Of The Weak Hopf Algebra In 2,3 Dimension

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Abstract

In this paper, we study the weak bialgebras and the weak Hopf algebras. These algebras form a class wider than the bialgebras respectively the Hopf algebras. The corresponding algebraic varieties are considered. We give some constructions and we establish this classification for isomorphism meadows the bialgebras and the weak Hopf algebras of dimension of n 3. We will determine then the stabilizer and the representative of these classes, the action being that of the linear group.

References


2000 Mathematics Subject Classification. 16W30
Key words and phrases. bialgebras, Hopf algebras.
Quadrature Formula For Semi-Bounded Solution Of Characteristic Singular Integral Equation Of Cauchy Type

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Abstract

It is known that the solutions of characteristic singular integral equations (SIEs) are expressed in terms of singular integrals of Cauchy type with weight functions of the form \( w(x) = (x-a)^\nu (b-x)^\mu \), where \(-1 < \nu, \mu < 1\). In this paper new quadrature formulas are presented to approximate singular integrals of Cauchy type for half bounded solution of characteristic SIEs on the interval \([-1, 1]\). Linear interpolation spline and modification discrete vortices method (MMDV) are used to construct quadrature formula. Estimations of error are obtained in the classes of functions \( H^\alpha([-1, 1]) \) and \( C^1([-1, 1]) \). Numerical experiments are presented to show the validity of the method presented.

References


Some Results On Products Of Conjugacy Classes

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Abstract

Let $G$ be a finite group, $A$ and $B$ be conjugacy classes of $G$. Then for some integer $\eta (AB) > 0$, $AB = \{ab | a, b \in G\}$ is the union of $\eta (AB)$ distinct conjugacy classes of $G$. In this note we study $\eta (AA^{-1})$ for some classes of finite groups.

References


2000 Mathematics Subject Classification. 20D15.

Key words and phrases. Conjugacy classes, Products, Nilpotent.
Pairwise Semiregular Properties on Generalized Pairwise Regular-Lindelöf Spaces

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Abstract

In this paper we study pairwise semiregular properties of pairwise nearly regular-Lindelöf, pairwise almost regular-Lindelöf and pairwise weakly regular-Lindelöf spaces. We prove that pairwise almost regular-Lindelöf and pairwise weakly regular-Lindelöf are pairwise semiregular properties. We also show that pairwise nearly regular-Lindelöf satisfy the pairwise semiregular invariant property.

2000 Mathematics Subject Classification. 54D20, 54E55

Key words and phrases. Bitopological space, pairwise nearly regular-Lindelöf, pairwise almost regular-Lindelöf, pairwise weakly regular-Lindelöf, \((i, j)\)-semiregular property, pairwise semiregular property
Efficient block method for solving directly third order ordinary differential equations

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Abstract

In this research, a two point block direct implicit method is developed for solving directly the third order ordinary differential equations (ODEs) using variable step size. This method will estimate the solutions of initial value problems (IVPs) at two points simultaneously of the form

\[ y''' = f(x, y, y', y'') , \quad y(a) = y_0, \quad y'(a) = y'_0, \quad y''(a) = y''_0, \quad a \leq x \leq b \]  (1)

Eq.(1) arises from many physical phenomena in a wide variety of applications especially in engineering such as the motion of rocket or satellite, fluid dynamic, electric circuit and other area of application. A higher order ODEs can also be reduced to a system of first order equations and then solved using any numerical methods. This approach is very well established but it obviously will enlarge the system of first order ODEs. The approach for solving the higher order ODEs directly has been suggested in (Suleiman, 1989) and (Omar, 1999). Block method for numerical solution had been introduced by several researchers such as (Shampine & Watts, 1969) and (Rosser, 1976). A block method will computes simultaneously the solution values at several distinct points on the x-axis in the block. There are many existing methods for solving the ODEs as in (1) but those methods will only approximate the numerical solutions at one point sequentially. Therefore we need a faster method that can give faster solution to the problem and yet manage to produce better accuracy. The current multistep method for variable step (VS) or variable step and order (VSVO) technique for solving the higher order ODEs will involve tedious computations of divided difference and the integration coefficients in the code. The idea of the code developed in this research is to avoid those computations that can be very costly. Hence, the code will store all the coefficients of the method. The propose block method in this paper is presented as in a simple form of Adams Moulton method. The method is in a simple form but we intend for efficiency and economically. Numerical results show that the propose block method is efficient than the existence block method in (Omar, 1999).

References

Three Point Block Backward Differentiation Formula For Solving Stiff Ordinary Differential Equations

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Abstract

In this paper, a 3-point block method based on Backward Differentiation Formulas (BDF) which is called 3BBDF for solving first order Ordinary Differential Equations (ODEs) using fixed step size is presented. This method will compute the solutions of Initial Value Problems (IVPs) at three points simultaneously on the x-axis. The zero stability of the derived 3BBDF is also investigated. The efficiency of the 3BBDF is compared with the classical fixed step size BDF method. Numerical results indicate that the resulting 3BBDF method outperform the BDF method in terms of execution times and less number of steps taken to complete the integration in the given interval.

2000 Mathematics Subject Classification.

Key words and phrases. Backward Differentiation Formulas, block, ordinary differential equations.
Processing of cyclic graphs with recursive neural networks

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Abstract

Recursive neural networks are a powerful tool for processing structured data. They are filling the gap between connectionism, which is usually related to poorly organized data, and a great variety of real-world problems such as document processing, where the information is naturally incoded in the relationships among the basic entities. More precisely recursive neural networks can deal only with directed ordered acyclic graphs (DOAGs), in which the children of any given node are ordered. While this assumption is reasonable in some applications, it introduces unnecessary constraints in others. Example of such applications is classification of HTML pages. In this paper, we explain a methodology, which allow us to process any cyclic directed graph. The computational power of recursive neural networks is established.

2000 Mathematics Subject Classification
68T05

Key words and phrases.
Graph processing by neural networks, recursive neural networks, cyclic graphs.
A Note On The Solution Of The General Linear Matrix Differential Equations

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Abstract

In this paper, we extend the use of connection between the Hadamard product and diagonal extraction (vector) operator to produce a computationally efficient solution of the general linear matrix differential equations. The analysis indicates that the Hadamard structure method can achieve good efficient when the unknown matrices are diagonal. Several matrix systems can be solved by the new approach as special cases.

2000 Mathematics Subject Classification. 15A24; 15A69; 44A35

Key words and phrases. Matrix Products, Coupled Matrix Differential Equations, Diagonal extraction operator.
Solving the Boundary Value Problem of the Wind Turbine Blade Equation (Calculation of the Mode Shape Functions)

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Abstract

Rotor blades are the most flexible part of the wind turbine, and their modal behavior has a great influence on the overall dynamics and energetic performance of the turbine. Consequently, the calculation of mode shapes and frequencies of the blades is essential to predict the structural problem of the rotor such as blade fatigue (which is one of the major concerns of the designers) and to estimate the energetic performances of the turbine as well. This analysis can result in a substantial saving of the system cost of energy. Recently more attention is given to modal analysis and many experimental and numerical studies were carried out. The calculation of mode shapes is in fact a difficult task due to the complex nature of the blade movement. In this work, a numerical approach is used to solve the blade motion equation. The solution of this fourth order differential equation is complicated by its special boundary conditions. This boundary problem is characterized by two initial values (the displacement and the slope are nil, at the fixed end) and two final values (the shear force and the bending moment must be zero at the free end). In order to start any numerical solution of the equation the boundary problem must be converted to an equivalent problem having four known initial values. For this task, an iterative algorithm was developed to estimate the right initial-value problem that matches the specified boundary problem. This algorithm starts from a first guess of the initial values, to allow the mode equation to be solved in order to obtain the final values (at the free end of the blade). These initial values are then corrected by means of secant formula. This procedure is repeated till the calculated final values coincide with those specified by the original boundary problem. It has been verified that this algorithm converges when the predictor corrector method (Adam’s formula) is used to solve the equation, whereas convergence is not achieved when the Runge-Kutta method is employed. A Fortran computer program was implemented to perform these computations. This modal analysis can be used to determine dynamic stresses and to estimate thereafter the fatigue of the blades.

References


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Key words and phrases. Wind Energy, Structural Dynamics, Aerodynamics, Numerical Analysis
Similarity Solution Of The Coagulation Equation In An Electro-Rheological Colloidal Suspension

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Abstract
Aggregation phenomena are met in a wide variety of physical, chemical and biological processes; for example the formation of aerosols, micelles and vesicles, polymers, and even celestial bodies on astronomical scales. The irreversible aggregation of colloidal particles is of interest, both from a fundamental point of view, and because of its industrial applications. Electrorheological (ER) fluids are colloidal suspensions of conducting particles in an insulating fluid. The particles acquire an electric dipole under the action of an external electric field. We present the analysis of a model for the aggregation of colloidal particles which arises in an electrorheological system. Linear clusters grow upon the application of an AC electric field. We consider coagulation kernels involving as negative powers of cluster sizes. We investigate the reduction of the governing equations to a similarity solution in the large time limit. Comparison between the experimental results and the theory shows a good agreement.

References

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Key words and phrases. Aggregation, similarity, electro-rheology.
On Additive Self-Dual Codes Over GF(4) And Their Applications

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Abstract

After the publication [1], additive self-orthogonal codes over GF(4) under a trace inner product became of interest because of their correspondence to additive (or stabilizer) quantum error-correcting codes. Several papers were devoted to classifying or constructing additive self-dual codes over GF(4). It was shown [2] that certain vectors in some additive self-dual codes over GF(4) hold generalized $t$-designs as well as classical $t$-designs with possibly repeated blocks. Also, every additive self-dual code over GF(4) can be uniquely represented as an undirected graph, and conversely. These facts motivate the construction of additive self-dual codes over GF(4).

In this work we consider some constructive algorithms for additive self-dual codes over GF(4). We use these algorithms to construct new codes. Also, we describe the relations between this class of codes and other combinatorial structures.

References


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Key words and phrases. additive self-dual codes, block designs, quantum codes, constructive algorithms
8. ABOUT MALTEPE UNIVERSITY, İSTANBUL AND TURKEY

ABOUT MALTEPE UNIVERSITY

Maltepe University is the latest chain of the successful educational history of Marmara Education Institutions, which initiated its education with the motto "From Kindergarten to University" in 1991. The University, which was founded by Istanbul Marmara Education Foundation (IMEV) in accordance with the law number 4282, is subject to the terms pertaining to the Foundation and Higher Education Institution law number 2547, and it has the status of a legal entity. The University initiated its education in the buildings provided by the Foundation by admitting late-registered students in 1997. The Administrative Structure of the University was set up in the historical pavilion at 39, Feyzullah Street. The University, which is made up of 9 faculties, 2 vocational schools and 3 institutes, 2 vocational schools and 3 institutes, is currently rendering an invaluable service with its scientific researches and publications. The University has brought together distinguished and experienced academics to form its academic staff, and thanks to their efforts it has taken its place in the Turkish University system in high esteem.

ABOUT MALTEPE

Maltepe is a district in the suburbs of Istanbul, Turkey between Kadıköy and Kartal. Its neighbors are Kadıköy to the west and Kartal to the east. The coast of Maltepe has been a retreat from the city since Byzantine and Ottoman times, and right up until the 1970s was a rural area peppered with summer homes for wealthy Istanbul residents. Being on the suburban railway line Maltepe was a favorite spot for day-trippers or weekenders to visit the beach and many summer houses were built there. The sea-front is still pleasant to sit, drink tea and enjoy the views of the Princes Islands. The population grew rapidly from the 70’s onwards when, following the building of the Bosphorus Bridge, it became possible to commute from here to the European side of the city. Buses along the E5 highway to the bridge, and minibuses to the ferry docks at Kadıköy now carry lower-middle class commuters (the wealthier preferring to live in smarter areas nearer the city, in Kadıköy itself). These people live either in quiet tree-lined streets of four- to six-storey apartment building with gardens around them, or in modern housing complexes with tennis-courts, children’s playgrounds and security guards on the gate. The E5 highway cuts through Maltepe and north of the highway is the area of Başıbüyük, a tree-covered hill with a hospital on it (Istanbul’s tuberculosis isolation hospital) and also a large cemetery. Maltepe is also home to one of the largest Mosques in Istanbul. Below the Mosque there are a bookshop and supermarket. The Mosque has been built according to the traditional standard shape of a Turkish Mosque (rounded shape with 4 minarets) but internally it is particularly impressive with a tall high dome, a large gallery and balcony where women may pray (which many do 5 times a day, it is now becoming more and more common to find women attending the Mosque to pray particularly on Fridays but more and more for all of the five daily prayers especially amongst the young) The galleries have carved wood frames and there are several large tiled mosaics around the Mosque of various sights of importance to Islam and Muslims (for example the al-Aqsa Mosque in Jerusalem. The Mosque has become something of a central point for Maltepe as it both can be seen from a considerable distance and is a central stop for buses and minibuses taking commuters from Kadıköy to the outskirts of the city.

ABOUT İSTANBUL

The city which bridges two continents European side of Istanbul and Asian side of Istanbul, İstanbul which was known as capital of the capital cities, and created huge peace geographies with reigning to first Roma, and then Eastern Roman (Byzantium) Empire and continents, and was the capital city of Ottoman Empire, is going to be a modern future with preserving magnificence of history with proud. Variety in Istanbul is really charming the visitors. It is serving nice infinite nuances with its museums, churches, palaces, mosques, bazaar
places and natural beauties. When you lean against backside at the coast of the strait, you feel Istanbul as "center of the world" and understand why people select this extraordinary place centuries with watching the reflection of the red at sun set from the houses at the coast. It is the only city in the world to straddle two continents, and the only one to have been a capital during two consecutive empires - Christian and Islamic. Once capital of the Ottoman Empire, Istanbul still remains the commercial, historical and cultural pulse of Turkey, and its beauty lies in its ability to embrace its contradictions. Ancient and modern, religious and secular, Asia and Europe, mystical and earthly all co-exist here. Its variety is one of Istanbul’s greatest attractions: The ancient mosques, palaces, museums and bazaars reflect its diverse history.

ABOUT TURKEY

The Republic of Turkey, founded by Atatürk in 1923, has its roots in two historical sources deep in the depths of the past. One of these resources inherited by modern Turkey is the successful and shining history of the Turks over a time frame of more than 4,000 years. The other is the fact that Turks have been settled in Anatolia since the 11th century. Atatürk coined the phrase "The truest guide in life is science".

General Outline

Capital City: Ankara

Population: 68,893,918 (July 2004 est.)

The lands of Turkey are located at a point where the three continents making up the old world, Asia, Africa and Europe are closest to each other, and straddle the point where Europe and Asia meet. Geographically, the country is located in the northern half of the hemisphere at a point that is about halfway between the equator and the north pole, at a longitude of 36 degrees N to 42 degrees N and a latitude of 26 degrees E to 45 degrees E. Turkey is roughly rectangular in shape and is 1,660 kilometers wide. Because of its geographical location the mainland of Anatolia has always found favour throughout history, and is the birthplace of many great civilizations. It has also been prominent as a centre of commerce because of its land connections to three continents and the sea surrounding it on three sides.

Area

The actual area of Turkey inclusive of its lakes, is 814,578 square kilometers, of which 790,200 are in Asia and 24,378 are located in Europe.

Boundaries

The land borders of Turkey are 2,573 kilometers in total, and coastlines (including islands) are another 8,333 kilometers. Turkey has two European and six Asian countries for neighbours along its land borders. The land border to the northeast with the commonwealth of Independent States is 610 kilometers long; that with Iran, 454 kilometers long, and that with Iraq 331 kilometers long. In the south is the 877 kilometer-long border with Syria. Turkey’s borders on the European continent consist of a 212-kilometre frontier with Greece and a 269-kilometre border with Bulgaria.