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Dear Colleagues ans Dear Guests,

On behalf of the organizing committee, welcome to 4. International Conference on Mathematics: An Istanbul Meeting for World Mathematicians, 27-30 October 2020, Istanbul, Turkey. The conference aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results about mathematical sciences. Thank you very much for your interest in International Conference on Mathematics: An Istanbul Meeting for World Mathematicians.

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(F,H) CONE UPPER CLASS ON FIXED POINT RESULTS IN QUASI–CONE METRIC SPACE FOR GENERALIZED α−ψ CONTRACTIVE MAPPINGS USING DIAMETER OF ORBITS

Eriola Sila[1], Arsalan Hojat Ansari[1], Silvana Liftaj[2]

[1]Mathematics, Tirana University, Tirana, Albania,
[1]Mathematics, Karaj Branch, Islamic Azad University, Karaj, Iran,
[2]Mathematics, "Aleksander Moisiu" University, Durres, Albania

E-mail(s): erjola.liftaj@fshn.edu.al, mathanalsisamir4@gmail.com, silvanaliftaj@yahoo.com

Abstract

In 2007, Huang and Zhang defined the concept of cone metric space replacing the real axis in the definition of distance by an ordered Banach space. They generalized some results of fixed point for contractive mappings in these spaces. Later, Abdeljawad and Karapinar defined quasi cone metric spaces, which generalize cone metric spaces because the cone metric distance doesn' have the symmetry condition. In 2014, N. Biglili et al. proved some fixed point theorems related $\alpha - \psi$ contractive mappings in quasi metric spaces. In 2015, E. Sila et al. extended these results in quasi cone metric spaces. In this paper we prove some results about fixed point of nonlinear $\alpha - \psi$ contractive mappings under (F, h) upper class of type I in a quasi cone metric space. Some of theorems are illustrated with examples. As $\alpha - \psi$ contractive mappings under (F,h) cone metric upper class form a bigger category than $\alpha - \psi$ contractive mappings, the goal of this paper is to generalize the results of E. Sila et.al, ect.

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A Characterization of the Involute Curves of Bézier Curves

Ayşe YILMAZ CEYLAN
Mathematics, Akdeniz University, Turkey,

E-mail: ayilmazceylan@akdeniz.edu.tr

Abstract

Bézier curves are significant geometrical representations of curves that is used in computer graphics and related areas. We want to develope planar Bézier curves, so the goal of this work is to characterize involute curve of a planar Bézier curve. We examine the involutes of the Bézier curve at the end points. Moreover, we provide an example for planar Bézier curve.

Key words: Bézier curve, Involute.

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A Class of Multivalent Harmonic Convex Functions Defined by Subordination

Sibel Yalçın[1], Hasan Bayram[1]

[1]Mathematics, Bursa Uludag University, Turkey,
E-mail(s): syalcin@uludag.edu.tr, hbayram@uludag.edu.tr

Abstract

We have introduced a generalized class of complex-valued multivalent harmonic convex functions defined by subordination. We study some properties of our class. The results obtained here include a number of known and new results as their special cases.

Keywords: Harmonic multivalent functions, convex functions, subordination.

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A General Theorem Involving Quasi Power Increasing Sequences

Hikmet Seyhan Özarslan[1], Bağdagül Kartal[2], Mehmet Öner Şakar[3]

[1,2,3]Mathematics, Erciyes University, Turkey,
E-mail(s): seyhan@erciyes.edu.tr, bagdagulkartal@erciyes.edu.tr, mehmethaydaroner@hotmail.com

Abstract

Let (φ_n) be a sequence of positive numbers. The series $\sum a_n$ is said to be summable $\varphi-|C,\alpha;\beta|_k$, $k\geq 1$, $\alpha>-1$ and $\beta\geq 0$, if (see [1])

$$\sum_{n=1}^{\infty}\varphi_n^{\beta k+k-1}n^{-k}\left|t_n^{\alpha}\right|^k<\infty,$$

where t_n^{α} is the n th Cesàro mean of order α, with $\alpha>-1$, of the sequence (na_n). For $\varphi_n=n$ and $\beta=0$, $\varphi-|C,\alpha;\beta|_k$ summability is the same as $|C,\alpha|_k$ summability method (see [2]).

In this study, a known theorem of Bor [3], which deals with $|C,\alpha|_k$ summability method, is generalized for $\varphi-|C,\alpha;\beta|_k$ summability using a quasi- f -power increasing sequence.

Keywords: Cesàro summability, infinite series, quasi-power increasing sequences.

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A Generalization of Zariski Topology

Eda Yildiz[1], Bayram Ali Ersoy[1], Unsal Tekir[2], Suat Koc[2]

[1]Department of Mathematics, Yildiz Technical University, Turkey,
[2] Department of Mathematics, Marmara University, Turkey,
E-mail(s): edyildiz@yildiz.edu.tr, ersoya@yildiz.edu.tr, utekir@marmara.edu.tr, suat.koc@marmara.edu.tr

Abstract

Let R be a commutative ring with $1 \neq 0$ and S be a multiplicatively closed subset of R. An ideal of R with $I \cap S = \emptyset$ is called S-prime if there exists $s \in S$ such that $xy \in I$ implies that $sx \in I$ or $sy \in I$. The set of all S-prime ideals of R is denoted by $Spec_S(R)$ and it is said to be S-prime spectrum of R. In [1], authors defined a topology on $Spec_S(R)$ and gave the relations between algebraic properties of the ring and topological properties of its S-prime spectrum. In this talk, we will give some results related to this topology which is a generalization of Zariski topology and investigate certain properties of this structure.

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A Mathematical Approach to Learning Problems

Manel Belksier[1], Hacène Boutabia[1] and Rania Bougherra[1]

[1] Mathematics, Badji-Mokhtar University, Algeria,

E-mail(s): manelbelksier@gmail.com, boutabiah@yahoo.fr, bougherrarania@gmail.com

Abstract

In the present paper, we introduce a new process called multivariate G-fractional Brownian Motion wherethe Hurst parameter H is a diagonal matrix. Then we give stochastic differential equations for orthogonaleigenvectors of (G,ε)-Wishart fractional process. An intermediate asymptotic comparison result concerning the eigenvalues is then obtained.

Key Words: G-Brownian motion, random matrices, eigenvalues and eigenvectors.

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A Maximum Principle For Infinite Horizon Delay Equations Of Mean-Field Type

Khaled Bahlali[1], Brahim Mezerdi[2], Mohamed Amine Mezerdi[1,3,] Roubi Abdallah[1,3]

[1] IMATH, UFR Sciences, USTV, B.P. 20132, 83957 La Garde, France,
[2] King Fahd University of Petroleum and Minerals,
Department of Mathematics and Statistics, P.O. Box 1916, Dhahran 31261, Saudi Arabia,
[3] Laboratory of applied Mathematics, University Med Khider BP 145, 07000 Biskra, Algeria.
E-mail(s): bahlali@univ-tln.fr, brahim.mezerdi@kfupm.edu.sa, mmezerdi93@gmail.com, roubi.abdallah2@gmail.com

Abstract

In this paper, we prove a maximum principle of optimal control of a mean-field stochastic delay equations on infinite horizon. We establish first and second sufficient stochastic maximum principles as well as necessary conditions for that problem.

Key words: Optimal control, Infinite horizon, mean-field type, Maximum principle, Hamiltonian, Adjoint process, Partial information.

A Multipurpose Filled Function Method for Unconstrained Optimization Problems

Ahmet Şahiner[1], Gamze Özkardaş[2], Gülden Kapusuz[3]

1,2,3Mathematics, Süleyman Demirel University, Turkey,
E-mail(s): ahmetsahgulden32@gmail.com

Abstract

In this study, a new global optimization technique is proposed. This technique is a filled function method developed as both a smoothing technique and a global minimum finding technique when required on unconstrained objective function. In particular, it has an advantage in terms of understandability and applicability of the technique created using the known functions (artan,cos) of mathematics. This feature of the technique is compared with other studies in the literature and the results are presented.

Key Words: Filled Function Method, Global Optimization, Smoothing

A New Approximate Stochastic Simulation Algorithm for Biochemical Systems

Selçuk Meriç Köstekci[1] , Vilda Purutçuoğlu[1],

[1]Statistics, Middle East Technical University, Turkey,

E-mail(s): merickostekci@gmail.com, vpurutcu@metu.edu.tr,

Abstract

A novel algorithm is proposed to model biochemical networks. In its present state, by using Kolmogorov-Smirnov test, Horizon Algorithm is able to simulate biochemical networks with a low concentration of molecular substance over a predetermined margin of error. Horizon Algorithm includes a control mechanism that prevents the populations falling into negative. Advantages and disadvantages of this algorithm has been tested and discussed on benchmark systems.

Acknowledgement: The Author thanks to the BAP Research grant (Project Number : 10282) supported by the Middle East Technical University.

A New Characterization of Dual Helices

Ahmet Yücesan[1], Gözde Özkan Tükel[2]

[1]Mathematics, Süleyman Demirel University, Turkey,
[2]Finance, Banking and Insurance, Isparta University of Applied Sciences, Turkey,
E-mail(s): ahmetyucesan@sdu.edu.tr, gozdetukel@isparta.edu.tr

Abstract

We derive a general differential equation satisfied by the distance function of every Frenet curve in dual space D3. By using this differential equation, we get a new characterization of a dual helix.

Key words: Dual space, Dual helix.

A New Dispersive Model for Open Channel and for Natural River Hydraulics

Mohamed ali Debyaoui[1], Mehmet Ersoy[1]
1Applied Mathematics, Toulon University, France,
E-mail(s): debyaoui@univ-tln.fr, ersoy@univ-tln.fr

Abstract

In this talk, I will present a new non-linear dispersive model for open channel and for natural river hydraulics. These equations are the second order approximation of the section-averaged (threedimensional) incompressible and irrotational Euler system. This new asymptotic model generalises the well-known one-dimensional Serre-Green-Naghdi (SGN) equations for rectangular section on uneven bottom to arbitrary channel/river section.

A New Representation of Fox-Wright Function

Asifa Tassaddiq

Department of Basic Sciences and Humanities, College of Computer and Information Sciences
Majmaah University, Al Majmaah 11952, Saudi Arabia
Email: a.tassaddiq@mu.edu.sa

Abstract

Confluence of distributions (generalized functions) with integral transforms has become a remarkably powerful tool to crack the important unsolved problems. The purpose of the present study is to investigate a distributional representation of the Fox-Wright function. Hence a new definition of these functions is formulated over a particular set of test functions. This is validated by using classical Fourier transform. This led to a novel extension of Fox-Wright functions by introducing them distributions in terms of delta function. A new version of the Fox-Wright integral transform is emerged as a natural consequence of this research. The relation of Fox-Wright function with the generalized hypergeometric and Mittag-Leffler functions is explored in order to study new identities for it.

Key words: Fox-Wright function; Integral transform; Distributions (generalized functions)

A Note on Euler Totient Paranormed Sequence Spaces

Hacer Bilgin Ellidokuzoğlu

Mathematics, Recep Tayyip Erdoğan University, Turkey,

E-mail(s): hacer.bilgin@erdogan.edu.tr

Abstract

Let $\lambda \in \{c, c_0, l_\infty\}$. In this study, we introduce a new nonabsolute type paranormed sequence space $\lambda(\varphi, p)$ and show that $\lambda(\varphi, p)$ and $\lambda(p)$ linearly isomorphic, using the regular matrix given by Euler Totient function φ. Further, we give a number of results concerning inclusion relations of this sequence space and investigate some topological properties. Finally, we compute alfa, beta and gamma duals of this space and characterize certain matrix transformations on this sequence space.

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A note on generalized crossed modules

Gamze Aytekin Arıcı, Tunçar Şahan

Mathematics Department, Aksaray University, Turkey
E-mail(s): aytekingamze35@gmail.com, tuncarsahan@gmail.com

Abstract

At the end of the 1940s, the concept of crossed modules in the sense of the representation of homotopy 2-types appeared by Whitehead [1]. Later, Mac Lane and Whitehead used crossed modules to represent the third cohomology group (H^3) in group cohomology [2]. Hence, crossed modules have been used in homotopy theory, homological algebra, non-abelian cohomology, combinatorial group theory, algebraic k-theory, ring theory and applications of related algebras. The investigation of crossed modules as algebraic objects on their own is of interest.

Recently, Yavari and Selemkar thought that the arbitrary actions of A on itself and B on itself in a crossed module (A, B, ∂) generalized the concept of the crossed module [3]. Thus, they derived the category **GCM** from all generalized crossed modules and generalized crossed module morphisms between them and investigated some important categorical structures in this category. They also examined epimorphisms in the category **GCM** and investigated the relationship between epimorphisms and surjective morphisms.

In this study, the relationships between generalized crossed modules, internal categories and cat^1-objects in the category of self acting groups [4] are examined.

Keywords: Crossed module, internal category, self acting group.

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A Note on Soft Radicals in Ordered Semigroups

Emin Aygün[1], Betül Erdal[1]

[1,2] Mathematics, Erciyes University, Turkey,

E-mail(s): eaygün@erciyes.edu.tr, b-rdal@hotmail.com

Abstract

Soft set theory [1] has provided various solutions to the information systems and decision-making methods that are developed today. These solutions also have increased the value of the theoretical studies. Aktaş and Çagman [2] have defined soft groups and obtained the main properties of these groups. After that, the soft set theory has experienced rapid growth in algebraic structures. In this study, it is aimed to contribute to the literature by defining new soft structures. By considering soft ordered semigroups [3] and soft radicals [4] studies, we produce the soft radical for an ideal in ordered semigroups and the soft radical of an idealistic soft ordered semigroup. Moreover, the definitions are illustrated by several examples and the main theorems of a soft radicals are investigated.

Keywords: radical, soft radical, soft ideal, soft ordered semigroup

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A Note on the Commutativity of Riemann Differential Equation

Mehmet Emir Koksal

Department of Mathematics, Ondokuz Mayis University, 55139 Atakum, Samsun, Turkey
E-mail(s): mekoksal@omu.edu.tr

Abstract

In this study, commutativity conditions of Riemann differential equation are considered. Using commutativity conditions of second-order continuous time-varying linear systems [1], it is proved that the system described by a Riemann differential equation has commutative pairs, which depends on the parameters of the equation. An example is considered to find the commutative pair of Riemann differential equation.

A Numerical Approach to Solution of Nonlinear Riccati Differential Equation

Burcu Gürbüz[1,2]

[1]Institute of Mathematics, Johannes Gutenberg-University of Mainz, Germany,
[2]Department of Computer Engineering, Üsküdar University, Turkey,
E-mail(s): burcu.gurbuz@uni-mainz.de

Abstract

Nonlinear Riccati differential equations have been used in many fields in science, engineering and especially in applied mathematics. In this study, a numerical approach for the solution of Riccati differential equation is investigated. Numerical solutions are obtained with regard to a matrix method and compared with other techniques in literature. Besides, error analysis is given in order to obtain more efficient results for its approximation.

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A Numerical Approach to the Two Different Forms of Modified Kawahara Equation via SSP-RK43-Differential Quadrature Method

Ali Başhan[1], Güler Gürüz[2]

[1,2]Mathematics, Zonguldak Bülent Ecevit University, Turkey,

e-mail(s): alibashan@gmail.com, guler.3007@gmail.com

Abstract

In this study, two different forms of the modified Kawahara equation are going to be solved using an effective numerical method namely differential quadrature method. For space discretization, DQM is used and for time integration Strong Stability Preserving Runge-Kutta method is chosen. To observe the accuracy of the method, the error norms L_2 and L_∞ are calculated. The two smallest invariants and relative changes of invariants are computed and reported. Graph of all simulations are plotted.

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A Numerical Investigation on A Neural Field Model

Burcu Gürbüz[1,2]

[1]Institute of Mathematics, Johannes Gutenberg-University of Mainz, Germany,
[2]Department of Computer Engineering, Üsküdar University, Turkey,
E-mail(s): burcu.gurbuz@uni-mainz.de

Abstract

In this study, a dynamical system based on neural field model is studied. Numerical investigation is reached and stability of the system including approximated results of the solution are introduced. Some numerical results are given.

A P-adic Analytic Proof of Reflectivity of Twisted Finite Sums of Powers

Altan Erdoğan[1]

[1]Mathematics, Gebze Technical University, Turkey
E-mail(s): alerdogan@gtu.edu.tr

Abstract

The twisted sums of powers which is a generalization of the alternating sums of powers are studied through a p-adic integral transform. The reflectivity of twisted sums of powers is proved by the reflectivity of the corresponding p-adic integrals. In particular the polynomial expressions for the alternating sums of powers follows as a special case.

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A Robin Eigenvalue Problem Driven by the P(·)-Biharmonic Operator

Mohamed Laghzal, Abdelfattah Touzani

Department of Mathematics Faculty of Sciences Dhar El Mahraz University Sidi Mohamed Ben Abdellah P.O. Box 1796 Atlas Fez Morocco
E-mail address: mohamed.laghzal@usmba.ac.ma E-mail address: atouzani07@usmba.ac.ma

Abstract

We show the existence of infinitely many eigenvalue sequences for a Robin problem driven by the p(·)-biharmonic operator. Our approach relies on the variable exponent theory of generalized Lebesgue-Sobolev spaces, combined with adequate variational methods and Ljusternik-Schnirelman principle.

A Single Step Second Order of Accuracy Difference Scheme for the Nonlocal Boundary Value Schrödinger Problem

Ali Sırma

Industrial Engineering, Haliç University, Turkey,

E-mail: alisirma@halic.edu.tr

Abstract

In this study, nonlocal boundary value Schrödinger type problem in a Hilbert space with the self-adjoint operator is investigated. Single step stable second order of accuracy difference scheme for the numerical solution of this problem is presented. The main theorem on the stability of this difference scheme is established. In applications, theorems on the stability of difference schemes for several nonlocal boundary value problems for Schrödinger equations are proved. Numerical results are given.

Keywords: Difference schemes, stability, Schrödinger problem.

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A stability and existence-uniqueness results for the system of fractional order mathematical model of COVID-19 disease

Mehmet Fatih Karaaslan[1], Muhammet Kurulay[2]

[1]Statistics, Yildiz Technical University, Turkey,
[2]Mathematical Engineering, Yildiz Technical University, Turkey,
E-mail(s): mfatih@yildiz.edu.tr, mkurulay@yildiz.edu.tr

Abstract

We provide a mathematical model reflecting the spread of COVID-19 epidemic using the fractional order Caputo derivative. The feasibility region and the stability of the equilibrium points for the proposed model system are investigated. We also obtain some necessary and sufficient conditions ensuring the existence of a unique solution of the suggested model.

A STUDY OF STATISTICAL REASONING ABILITIES USING COOPERATIVE LEARNING FOR MATHAYOMSUKSA IV STUDENTS

Chanika Chawong

Mathematics Education, Srinakarinwirot University, Thailand
E-mail: Chaw7891@gmail.com

Abstract

The purpose of this research was to study the statistical reasoning abilities in students from grade 10 (Mathayomsuksa IV) by using cooperative learning. The study was conducted with 40 students, working in groups of 3-4 with different relative ability. The participants were assessed in statistical reasoning by comparing the scores from a designed pre-test and post-test, and the satisfaction survey.

It was hypothesized that the statistical reasoning ability scores of the students would increase after participating in the study project. The result shows that

1. Statistical reasoning was higher than the criterion of 60% at the .05 level of significance.
2. Satisfaction of Mathayomsuksa IV students towards cooperative learning was at a high level.

Acknowledgement: I would like to express a gratitude to a number of people – friends, colleagues, professors, and family –have contributed to making this successful. I would like to thank you my advisors and the professors at the science faculty, Asst.Prof.Dr. Khawn Piasai, Asst.Prof.Dr. Sukanya Hayeesala, Asst.Prof. Anek Janjaroon who have been my great mentors along this journey.

References:

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A study on Radio Number of AVL trees

Laxman Saha[1], Alamgir Rahaman Basunia[1] and Kalishankar Tiwary[2]

[1]Department of Mathematics, Balurghat College, Balurghat 733101, India,
[2]Department of Mathematics, Raiganj University, Raiganj 733134, India ,
E-mail(s): laxman.iitkgp@gmail.com, alam.basunia@gmail.com, tiwarykalishankar@yahoo.com

Abstract

In wireless networks, an important task is the management of the radio spectrum that is the assignment of radio frequencies to transmitters in a way that avoid interferences. Interferences can occur if transmitters with close locations receive close frequencies. The problem, often modeled as a coloring problem on the graph where vertices represent transmitters and edges indicate closeness of the transmitters, has been studied by several authors under different scenarios. A radio labelling of a simple connected graph is variation of Frequency Assignment Problem. For a simple connected graph G = (V (G),E(G)), a radio labeling is a mapping $|f(u)-f(v)|\geq d+1-d(u,v)$ for each pair of distinct vertices u and v of G, where $d(u,v)$ is the distance between u and v in G. The span of a radio labelling f is the maximum integer assigned for some vertex v. The radio number of is the minimum span of radio labellings. A non-empty binary tree T with T_L and T_R as its left and right sub-tree is called AVL tree if and only if (a) $|h_L-h_R|\leq 1$, where h_L and h_R are the heights of T_L and T_R, respectively, and (b) T_L and T_R are AVL trees. In this s article, we study the radio number of AVL trees with two degree centroid. These trees are chosen due to their many applications in computer science.

Acknowledgement: The first author is thankful to the National Board for Higher Mathematics (NBHM), India for its financial support (Grant No. 2/48(22)/R & D II/4033).

An Approach to Symmetric Polynomials

Nazan Akdoğan

Mathematics, Istanbul Technical University, Turkey,
E-mail: nakdogan@itu.edu.tr

Abstract

In this work, we consider the associative algebra of rank 2 in the variety generated by the Grassmann algebra. The symmetric polynomials in the algebra, that is invariant under every permutations of its variables, form a subgroup. We obtain a finite generating set for this subgroup.

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An Evaluation of the Albanian Electricity Market Through Optimization Models

Aurora Ferrja[1], Eralda Gjika (Dhamo)[2], Besiana Hamzallari[3], Arbesa Kamberi[4]

[1,2]Department of Applied Mathematics, Faculty of Natural Science, University of Tirana, Albania
[3]Department of Mathematics, Faculty of Natural Science, University of Tirana, Albania
[4]Albanian Power Coorporation, Tirana, Albania

Email:[1]aurora.simoni@fshn.edu.al; [2]eralda.dhamo@fshn.edu.al; [3]besiana.hamzallari@fshn.edu.al; [4]akamberi@kesh..al;

Abstract

The electrical energy system in Albania is toward the development and approval of the Albanian Market Model (AMM). As a Mediterranean country this is the moment where Albania should take advantage of its geographical position as an asset of the hydropower system and take lead position in the development of the regional market. Hydropower system plays an important role in the domestic produced energy and the country's production capacities are still unused. In this work we will discuss on the benefits of a larger common market which will improve the investment climate and will be more attractive to potential investors. Optimization and time series models are presented to give an overview of the potential production in hydropowers of the largest cascade in Albania (drin cascade). This analysis will help to evaluate the importance and capacity of hydropower as an excellent natural resource with the ability to adapt to demand with appropriate quantitative optimization and enhance competition.

Keywords: electrical energy, market, hydropower, optimization, forecast .

An Explicit Order 2 Scheme for the Strong Approximation of Stratonovich Stochastic Differential Equations with Scalar Noise

Hande Günay Akdemir[1]

[1]Mathematics, Giresun University, Turkey,
E-mail: hande.akdemir@giresun.edu.tr

Abstract

A new class of stochastic Runge-Kutta (SRK) methods for the strong approximation of Stratonovich stochastic ordinary differential equations is presented. The proposed method is an alternative to the method of Xiao and Tang (Numer. Algor. 72: 259-296, 2016) and converges with order 2 in the strong sense. To validate the efficiency and to compare with some known methods, numerical simulations which involve generating Stratonovich stochastic integrals of level 3, are finally given.

Acknowledgement: This study is supported by the Scientific Research Project Fund of Giresun University under the project number [FEN-BAP-A-230218-49].

References:
Xiao, A., & Tang, X. (2016). High strong order stochastic Runge-Kutta methods for Stratonovich stochastic differential equations with scalar noise. Numerical Algorithms, 72(2), 259-296.

An invariant subspace theorem for positive almost L-weakly compact operators

Barış Akay

Department of Mathematics , Science Faculty , Istanbul University, Turkey,
E-mail: baris.akay@istanbul.edu.tr.

Abstract

The class of almost L-weakly compact operators was first introduced in [3]. In this talk, we present an invariant subspace result for this class of operators.

Keywords: invariant subspace, almost L-weakly compact operator, Banach lattice

References:

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An investigation of exact traveling wave solutions of the nonlinear partial differential equation arising in plasma physics using two different methods

Yeşim Sağlam Özkan[1]

[1]Art and Science Faculty,Department of Mathematics, Bursa Uludag University, Turkey,
E-mail(s): ysaglam@uludag.edu.tr

Abstract

In this work, a variety of solitary wave solutions of the nonlinear partial differential equation arising in plasma physics with the help of two efficient and reliable methods is investigated. Many explicit wave solutions are found by using the analytical techniques. These solutions consisting of trigonometric, hyperbolic and rational functions allow studying the physical properties of underlying model. Moreover, the graphical demonstrations for some of the obtained solutions are given.

Analysis of Fractional Differential Equations with Integral Boundary Conditions

Fulya Yoruk Deren, Tugba Senlik Cerdik

[1]Mathematics, Ege University, Turkey,
[2]Mathematics, Beykent University, Turkey,
E-mail(s): fulya.yoruk@ege.edu.tr, tubasenlik@beykent.edu.

Abstract

In this talk, we establish the existence of positive solutions for a fractional boundary value problem with integral boundary conditions. First, we present the Green's function for the boundary value problem and we derive some inequalities of the Green's function. Then we come to the existence result of positive solutions by means of a fixed point theorem on cones. Finally we derive an example to demonstrate the validity of our existence result.

Analysis of the effects of certain parameters on heat transfer and the correlation of Nusselt numbers

Ahsène Lanani[1], Rahima Benchabi[2]
[1]Department of Mathematics, Brothers Mentouri University, constantine 1, 25000, Algeria
[2]Department of Mechanical Engineering, Brothers Mentouri University, constantine 1, 25000, Algeria
E-mail(s): alanani1@yahoo.fr; rbenchabi@yahoo.fr

Abstract

This paper presents a new statistical approach to study correlations between the Nusselt and Reynolds numbers. Also, the work is devoted to the study of the laminar fluid flow in corrugated channel and to determine the influence of certain parameters on the heat transfer. The governing equations of flow and energy were solved numerically by using volume finite method (SIMPLE algorithm and CFD code).

Keywords: Correlations, Finite volume method, Numerical study, Heat transfer, Nusselt and Reynolds numbers

Analyzing Divorce in Turkey by Using 2016 TBNA Survey Data

Duygu Varol1, Vilda Purutçuoğlu[1]
[1] Statistics, Middle East Technical University, Turkey,
E-mails: dvarol@metu.edu.tr, vpurutcu@metu.edu.tr

Abstract

Family is the first type of the community that begins along with the human life. The structure of the family highly depends on the social, economic and cultural developments that occur in the community. Accordingly, the marriage is the base organization for starting a family and it is a legal union of spouses to establish a life partnership. The ending of a marriage based on one statutory reason except the death is called as the divorce. The reasons of the divorce are investigated from different aspects by sociological and psychological sciences. The sociological studies consider the age, gender, socioeconomic status, social structure and the age of marriage of the individuals as probable reasons while the psychology evaluates the situation in terms of the communications of the individuals during the marriage process and the personal characteristic of the individuals. Hereby, in this study, to have knowledge about the situation and the reasons of the divorce in Turkey, we statistically analyze the survey data, called the Research of Divorce Causes in Turkey 2016 (TBNA). This dataset covers comprehensive questions about the divorce and a detailed research on reasons of the divorce in Turkey from sociological and psychological aspects. It also includes an evaluation of the divorce and its legal dimension through the history of the republic. In our analyses, we evaluate these outputs under certain statistical tests by using both indiviaul effect and interaction effects leading to divorce.

Keywords: Divorce in Turkey, Statistical Analyses, social statistics.
Acknowledgement: The authors thank to Turkish Statistical Institute for their permission to analyze this dataset.

Application of the homotopy analysis method for solving a fourth-order boundary value problem

Youssouf Massoun

Mathematics, Department,University of Algiers 1 - Benyoucef Benkhedda -,
e-mail: youcef.ens@hotmail.fr

Abstract

In this paper, we apply the homotopy analysis method to numerically solve the fourth-order boundary value problem. We obtain the analytic result in term of convergent series with easily computable coefficients. We give several examples illustrating the implementation and the efficiency of the method.

Key words: fourth-order boundary value problem; homotopy analysis

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Applications Of A Pascal Distribution Series On The Certain Subclasses Of Analytic Functions

Hasan Bayram[1], Sibel Yalçın[1]

[1]Mathematics, Bursa Uludag University, Turkey,
E-mail(s): hbayram@uludag.edu.tr, syalcin@uludag.edu.tr

Abstract

In the present paper, we consider a generalized distribution with the Pascal model defined by

$$P(\mathcal{X} = j) = \binom{j+t-1}{t-1} p^j (1-p)^t, \quad j \in \{0,1,2,3,\dots\}$$

for the analytic function classes $D(\lambda, \alpha)$ and $S^* C(\alpha, \delta; \lambda)$. Furthermore, we derive some conditions for functions in these classes.

Keywords: Analytic functions, univalent functions, the Pascal distribution.

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Applications of Almost Increasing Sequences to Infinite Series

Hikmet Seyhan Özarslan[1], Mehmet Öner Şakar[2], Bağdagül Kartal[3]

[1,2,3]Mathematics, Erciyes University, Turkey,
E-mail(s): seyhan@erciyes.edu.tr, mehmethaydaroner@hotmail.com, bagdagulkartal@erciyes.edu.tr

Abstract

A positive sequence (b_n) is said to be almost increasing if there exist a positive increasing sequence (c_n) and two positive constants K and M such that $Kc_n \le b_n \le Mc_n$ (see [1]). Let $\sum a_n$ be an infinite series with the partial sums (s_n). Let $A=(a_{nv})$ be a normal matrix, i.e., a lower triangular matrix of nonzero diagonal entries.The series $\sum a_n$ is said to be summable $|A,p_n|_k$, $k \ge 1$, if (see [2])

$$\sum_{n=1}^{\infty}\left(\frac{P_n}{p_n}\right)^{k-1}|A_n(s)-A_{n-1}(s)|^k<\infty,$$

where

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

In this study, two theorems on absolute Riesz summability (see [3]) are generalized to $|A,p_n|_k$ summability method via almost increasing sequences.

Keywords: absolute matrix summability, almost increasing sequences, infinite series.

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Approximate Analysis of two dimensional fractional partial differential equations

Sahar Altaf[1], Syed Inayatullah[2],Sumaira Yousuf Khan[3]

[1]College of Humanities and Sciences, Karachi Institute of Economics and Technology,Karachi, Pakistan,
[2]Department of Mathematics,University of Karachi, Pakistan
[3]Dawood University of Engineering and Technology, Karachi, Pakistan

E-mail(s): sahar@pafkiet.edu.pk, inayat@uok.edu.pk, sumaira.khan@duet.edu.pk

Abstract

This study presents an analysis of two dimensional fractional partial differential equations by semi-analytical algorithm, reduced differential transform method (RDTM). The order of derivative is defined in the sense of Caputo fractional derivative. To validate the efficiency of the proposed semi analytical algorithm, two fractional order problems are examined. The solutions obtained, shows that the algorithm can be executed easily with less computation and efficient in finding solutions of many other fractional order partial differential equations.

Keywords: Reduced differential transform Method, Caputo fractional derivative, Fractional partial differential equations.

Approximating fixed points for generalized non-expansive mappings with an application

Javid Ali
Department of Mathematics, Aligarh Muslim University, Aligarh, India
E-mail: javid.mm@amu.ac.in

Abstract

In this talk, we show that the classes of generalized non-expansive mappings due to Hardy and Rogers and the mappings satisfying Suzuki's condition (C) are independent and study some basic properties of generalized non-expansive mappings. Further, we introduce a new iterative scheme, called JF iterative scheme, and prove convergence results for generalized non-expansive mappings due to Hardy and Rogers in uniformly convex Banach spaces. Moreover, we show numerically that JF iterative scheme converges to a fixed point of generalized non-expansive mappings faster than some known and leading iterative schemes. As an application, we utilize newly defined iterative scheme to approximate the solution of a delay differential equation. Also, we present some nontrivial illustrative numerical examples to support main results. Finally, we also approximate common fixed points of the generalized non-expansive mapping via one step iterative scheme in uniformly convex Banach space. We utilize the result to solve image recovery problem in Banach space. Some examples are furnished in the support of the results.

Approximation by Generalized Lupas Operators Based on q-Integers

Mohd Qasim

Mathematics, Baba Ghulam Shah Badshsh University Rajouri, Jammu & Kashmir, India E-mail(s): bgsbuqasim@gmail.com

Abstract

The purpose of this paper is to introduce q-analogues of generalized Lupas operators, whose construction depends on a continuously differentiable, increasing, and unbounded function ρ. Depending on the selection of q, these operators provide more flexibility in approximation and the convergence is at least as fast as the generalized Lupas operators, while retaining their approximation properties. For these operators, we give weighted approximations, Voronovskaja-type theorems, and quantitative estimates for the local approximation.

Acknowledgement: This is a joint work with Prof. M. Mursaleen

Approximation Properties of Some Bernstein Type Operators

Faruk Özger

Department of Engineering Sciences, İzmir Katip Çelebi University, İzmir, Turkey
E-mail: farukozger@mail.com

Abstract

Bernstein polynomials were fisrt used to obtain an alternative proof of Weierstrass's fundamental theorem [1]. Approximation properties of Bernstein operators and their applications in Computer Aided Geometric Design and Computer Graphics have been extensively studied in many articles [2-5]. In this study, we give a survey of these kind of operators and investigate their approximation properties.

Keywords: Rate of convergence, Bernstein operators, Voronovskaja-type theorem

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Arithmetic Development in Problem-Solving Among Primary and Secondary School Age Children

Birgul Damla BABER ELBISTAN[1]

[1]Social Science, The University of Göttingen, Germany,

E-mail: birgueldamla.baber@stud.uni-goettingen.de

Abstract

Basic arithmetics skills, which are necessary for mathematical problem-solving, are expected to develop faster after starting school. These basic skills help improving the level of mathematical operation during the classes. When this development is insufficient, there may be occur mathematics learning difficulties or dyscalculia. This research has been conducted to examine these basic calculating skills in problem situations from a developmental perspective. The Cognitive Developmental aRithmetics (CDR) tests, was used for this aim. These tests have prepared at 3 different levels based on the grade level. In this research, problems section in the tests was compared in terms of different grade levels. For this purpose, the CDR1 test was applied to the 2nd and 3rd grade, the CDR2 test to the 4th and 5th grade, and the CDR3 test to the 6th and 7th grade levels. There are 1203 participants in total. In the statistical analysis, a significant difference was found in terms of the classes in the CDR1 test in terms of development of arithmetics in short problem situations. There is not any significant difference in other grade levels for CDR2 and CDR3.

Keywords: arithmetic development, problem-solving, mathematics, calculating skills

Asymptotic Analysis Of The Signorini Problem With Coulomb Friction Law For Piezoelectric Shallow Shells

Mohammed El Hadi Mezabia[1], D. A. Chacha[1]

[1]Laboratoire de Mathématiques Appliquées, Université Kasdi Merbah Ouargla,
B.P. 511, 30000 Ouargla, Algérie
E-mail(s): hadimzabi@gmail.com, chachajamel@gmail.com

Abstract

The objective of this work is to study the asymptotic justification of a new twodimensional model for the equilibrium state of a piezoelectric linear shallow shell in frictional contact with a rigid foundation. More precisely, we consider the Signorini problem with Coulomb friction law of piezoelectric linear shallow shell in contact with a rigid foundation. Then, we establish the convergence of the mechanical displacement and the electric potential as the thickness of the shell goes to zero.

Keyword(s): Asymptotic modeling , Signorini problem , anisotropic , piezoelectric, linear elastic

Asymptotic Formulas of Eigenvalues and Eigenfunctions of a Boundary Value Problem

Khanlar R. Mamedov[1], Gülseren Eroğlu[1], Ulviye Demirbilek[1]

[1]Mathematics, MersinUniversity, Turkey,

E-mail(s): hanlar@mersin.edu.tr, glsrn_3306@hotmail.com, udemirbilek@mersin.edu.tr.

Abstract

In this study, it is considered a Sturm-Liouville equation and a boundary value problem containing nonlinear spectral parameter. The eigenvalues and eigenfunctions of the problem are investigated. The zeros of the eigenfunctions are obtained and the oscillation properties are investigated.

Keywords: Eigenvalue, Eigenfunction, Asymptotic Expression.

Authentication and Anomaly Detection System based on Behavioral Biometrics

Nursah Cevik[1], Halil Ibrahim Celenli[1]

[1] IBSS Consulting, Research and Development Department, Istanbul, Turkey ,

E-mail(s): nursah.cevik@ibss.com.tr, halilibrahim.celenli@ibss.com.tr

Abstract

In the public and private sectors, many companies use physical and behavioral authentication systems based on biometric technologies. The accuracy of behavioral authentication systems has increased considerably with the use of machine learning methods in this area. For this reason, many companies have started to use behavioral biometric technologies in the second stage of two-factor authentication. In this study, we focus on the keystroke dynamics among behavioral methods. We collected information of name, surname, e-mail address, password, gender, age, and right or left-hand usage information from 50 different users. In addition to this information, each user entered the specified password "tie5Roanl" five times. This system occurs in two phases. Firstly, in the enrolment phase, while the user registers in the system, the keystroke dynamics are recorded in the database. Secondly, in the authentication and anomaly detection phase, the system checks whether the user keyboard pattern in the database matches the user pattern that wants to log in to the system. In the authentication phase, we used five different machine learning algorithms: Support Vector Machine, Random Forest, XGBoost, Decision Trees, and K Nearest Neighbor. In conclusion, we observed that the Random Forest algorithm gives the most successful results for this database with an accuracy rate of 0.994 and a standard deviation of 0.004. The system, which does not require an instant message fee and does not request additional information from the user, is an alternative to against Shortest Message Services. Therefore, we believe our system is suitable for use in the banking and finance sector, where two-factor authentication is required.

Basic properties of standard single valued neutrosophic metric space

Omar Barkat

Laboratory of Pure and Applied Mathematics, University of Msila, Algeria
E-mail(s): omar.bark@gmail.com

Abstract

Recently, J. R. Kider and Z.A. Hussain have introduced the notion of standard fuzzy metric space. Later on, Barkat et al. have extended this notion to the setting of single valued neutrosophic sets. In this work, we introduce the notion of some fundamental properties of standard single valued neutrosophic metric space such as the continuity, compactness and completeness. Moreover, we give a several of the properties of these notions and relationship between them.

Keywords: Single valued neutrosophic set; Metric space; Continuity; Compactness, Completeness.

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Bayesian Sequential Stopping rule for Multi-Stages Experimental Trials

Zohra Djeridi[1], Hayet Merabet[2]

[1]Mathematics, Mohamed Séddik Ben yahia University, Jijel Algeria,
[2]Laboratoire de Mathématiques Appliquées et Modélisation., Constantine 1 University, Algeria,

E-mail(s): zdjeridi2002@yahoo.fr, merabet hammadi@outlook.com

Abstract

Sequential stopping rules are often used during the conduct of experimental trials in order to attain more ethical treatment of patients and to better address efficiency concerns. Bayesian predictive procedures give the researcher a very appealing method to evaluate the chances that the experiment will end up showing a conclusive result, or on the contrary an inconclusive result [1]. The prediction can be explicitly based on either the hypothesis used to monitoring the experiment expressed in terms of prior distribution, or on partial available data, or on both. Because the use of such stopping rules materially affects the frequentist operating characteristics of the hypothesis test, it is necessary to choose an appropriate stopping rule during the planning of the study. The implementation of the predictive stopping rule must allow for flexible determination of the schedule of interim analyses [3]. In this paper we consider the use of the prediction of satisfaction in the implementation of stopping rules in multi-stage setting which guarantees the type I error rate and plays a critical role in the determination of the sample size with respect to a prespecified power [2].

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Bayesian Two-Stage Designs With Frequentist Test in Experimental Trials

Ahlam Labdaoui

Laboratory of Applied Mathematics and Modeling, Department of Mathematics,
University Constantine1 25000 Constantine, Algeria
E-mail: 1ahlem_stat@live.fr

Abstract

Prediction provides discipline and pragmatic importance to empirical research. The design with the predictive probability approach provides an excellent alternative for conducting multi-stage phase II trials; it is efficient and flexible and possesses desirable statistical properties. . In this paper we consider the Bayesian predictive procedures within the experimental design, for this, we define indices of satisfaction related to a test as a decreasing function of the p-value and satisfaction is higher than the null hypothesis is rejected wider. This design possesses good frequentist properties and allows early termination of the trial. We treated our applications in experimental planning and sequential designs with binary outcomes.

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Best Proximity Point Results via Bianchini-Grandolfi Gauge Functions on Partial Metric Spaces

Mustafa Aslantaş[1], Raid Abdulhadi Abdulquader Abdullah [2]

[1,2]Mathematics, Çankırı Karatekin University, Turkey,

E-mail(s): maslantas@karatekin.edu.tr, raidabdulhadi26@gmail.com

Abstract

The applications of fixed point theory comprise different disiplines of mathematics, statistics, engineering and mathematical economics in deal with various problems such as differential equations, approximation theory, control systems, nonlinear analysis and game theory. Hence, many authors have studied to improve fixed point theory. In this sense, it is proved the Banach contraction principle which is considered the beginning of the fixed point theory on metric spaces [1].Because of its applicability, many authors generalize and extend this principle. One of the these generalizations was obtained by Bianchini and Grandolfhi [3]. Recently, taking into account nonself mappings, Basha and Veeremani introduced a concept of best proximity point [2]. Since every best proximity point is a fixed poin, there are many works on this topic. On the other hand, Matthews introduced a notion of partial metric space to study of denotational semantics of dataflow networks. In this paper, we obtain some best proximity point via Bianchini-Grandolfi gauge functions

Keywords: Best proximity point, Bianchini-Grandolfi gauge functions, partial metric space

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Bifurcation Analysis of a Leslie-Gower Model Including Allee Effect

Figen Kangalgil[1], Seval Işık[2]

[1]Bergama Vocational High School, Dokuz Eylül University, Turkey,
[2]Mathematics and Science Education, Sivas Cumhuriyet University, Turkey,
E-mail(s): figen.kangalgil@deu.edu.tr, skaracan@cumhuriyet.edu.tr

Abstract

The studies on the dynamical behaviours of the predator-prey models which show relationships between two species are one of the most important topics in the population ecology. These models were first investigated by Lotka [1] and Volterra [2]. In 1948, Leslie [3] introduced a new model where the carrying capacity of the predator's environment. In recent times, many researchers have considered the complex dynamical behaviours of the predator-prey models. By using differential equations the dynamics of predator-prey models can be investigated. Another possible way to be interpret these models is by using difference equations. The continuous-time model are converted to discrete-time models by applying the Euler scheme methods. Because, they have more efficient in computer calculations for numerical simulations. Also, they exhibit more rich dynamical behaviours than continuous-time models. In literature, there are many studies on discrete-time models obtained by using the Euler scheme methods. On the other hand, Allee effect [4], which can be caused significant changes on model dynamics has been neglected in the studies. In recent times, a few number of articles in literature has focused on bifurcations of predator-prey interaction with Allee effect. So, in this work, we consider the predator-prey model of Leslie type including Allee effect. İnitially, it is dealed with the existence conditions for fixed point of considered the model and its stability criterion. Then, it is presented bifurcation analysis for the model. Finally, it is implemented that numerical simulations of the model.

Keywords: Predator-Prey Model, Allee Effect, Stability, Bifurcation.

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Blow up of Solution for a Viscoelastic Wave Equation with m-Laplacian and Delay Terms

Erhan Pişkin[1], Hazal Yüksekkaya[2]

[1]Mathematics, Dicle University, Turkey,
[2]Mathematics, Dicle University, Turkey,
E-mail(s): episkin@dicle.edu.tr, hazally.kaya@gmail.com

Abstract

In this paper, we deal with a viscoelastic wave equation with m-Laplacian and delay terms. We study the blow up of solutions with positive initial energy. Time delay effects arise in many applications and practical problems such as physical, chemical, biological, thermal and economic phenomena.

Key Words: Blow up, Delay term, m-Laplacian**.**

Bounds for a new subclass of bi-univalent functions with respect to symmetric conjugate points related to Fibonacci numbers

Meryem Yıldız[1], Şahsene Altınkaya[2]

[1,2]Department of Mathematics, Bursa Uludağ University,
16059 Bursa, Turkey.
E-mails: [1]mrymyildiz.001@gmail.com
[2]sahsene@uludag.edu.tr

Abstract

In the present investigation, we use the Fibonacci numbers to derive estimates on the initial coefficients for a new subclass of bi-univalent functions with respect to symmetric conjugate points. Also, we derive Fekete-Szegö inequalities for functions belonging to the newly-defined class.

Acknowledgement: This work is supported by the Scientific and Technological Research Council of Turkey (TUBITAK 1002-Short Term R&D Funding Program) Project Number: 118F543.

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Capacity Optimization of MIMO Systems Involving Conformal Antenna Arrays using a Search Group Algorithm

Abdelmadjid Recioui

Laboratory of Signals and Systems, Institute of Electrical and Electronic Engineering, University M'hamed Bougara of Boumerdes, Algeria
E-mail: a_recioui@univ-boumerdes.dz

Abstract

MIMO systems represent a key technology of the fourth and fifth generations of wireless communication systems. The purpose of this paper is to use the search group algorithm to optimize the capacity of MIMO systems employing arrays having cylindrical and conical shapes at both ends (Transmitter; Tx and Receiver; Rx). These shapes have been adopted as they constitute the basic geometries of the well-known conformal antenna arrays and this paper aims at introducing them into the MIMO technology. The results reveal the proposed geometries outperform their counterparts that are commonly utilized such that the linear and 2D arrays. Furthermore, they promise higher capacity values which motivate their employment in future MIMO communication systems.

Keywords: MIMO, optimization, conformal arrays, Capacity, Search Group Algorithm.

Characterization of compatibility in terms of traces

Omar Barkat[1], Lemnaouar Zedam[2] and Bernard De Baets[3]

1 Laboratory of Pure and Applied Mathematics, University of Msila, Algeria,
2 Laboratory of Pure and Applied Mathematics, University of Msila, Algeria,
3 KERMIT, Department of Data Analysis and Mathematical Modelling, Gent, Belgium.
E-mail(s): omar.barkat@univ-batna2.dz, lemnaouar.zedam@univ-msila.dz, bernard.debaets@ugent.be

Abstract

The notion of compatibility is witnessing increasing attention and appears in various studies on binary fuzzy relations. The compatibility property has been extensively studied by Kheniche et al. for arbitrary binary fuzzy relations. As an application on the traces, they have shown that Fodor's notion of traces of a binary fuzzy relation facilitates the characterization of the compatibility of fuzzy relations in terms of fuzzy relational inclusions. In the same direction, this work focuses on the characterization of left-, middle- and right-compatibility of a ternary relation with a binary fuzzy relation in terms of inclusions of the binary fuzzy relation in the traces of the given ternary relation.

Keywords: Ternary relation; binary fuzzy relation; traces of a ternary relation; compatibility.

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Commutativity Associated with Confluent Hypergeometric Differential Equation

Mehmet Emir Koksal

Department of Mathematics, Ondokuz Mayis University, 55139 Atakum, Samsun, Turkey
E-mail(s): mekoksal@omu.edu.tr

Abstract

In this study, commutativity conditions of general Confluent hypergeometric differential equation are considered. In the sense of theoretical results for the commutativity of second-order analogue time-varying linear systems, it is proved that the system described by a general Confluent hypergeometric differential equation has commutative pairs which depend on the parameters of the equation.

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Comparing the efficiency of hierarchical cluster algorithms

MUÇA Markela[1], PUKA Llukan[2]
[1,2]Department of Applied Mathematics, Faculty of Natural Science, University of Tirana, Albania

E-mail(s): [1]markela.muca@fshn.edu.al ; [2]llukan.puka@fshn.edu.al

Abstract

In this paper we use some known hierarchical methods in order to organize observations (in our case, students) method in order to cluster cases (in our case, students) into homogeneous groups based on some criteria (in our case, their preferences). A student can be classified in one of favourite studies programs according to the results in State Matura Exams. The results of analysis are compared with the real results.

Most of the clustering algorithms are very sensitive to their input parameters. For example, by the hierarchical clustering, the number of clusters is defined a priory or at the end of the algorithms based on some criteria. Therefore, it is very important to evaluate the result of the clustering algorithms. It is difficult to define when a clustering result is acceptable. Thus, in this paper the most commonly used validity internal and external measures are compared to each other in order to determine the most appropriate method and an optimal number of clusters for this dataset.

The analysis is based on a sample taken from the database of the MSH 2013 (State Matura). All analysis is performed using SPSS statistics 20.

Keywords: Hierarchical cluster analysis, external, internal and distance measures.

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Complete Second Order Moment Convergence of Kernel Density Estimator

Meriem Madi[1], Ilhem Laroussi[1]
[1]Mathematics, Constantine University, Algeria,
E-mail(s): madimeriem80@gmail.com, 33laroussi@gmail.com

Abstract

Among the different methods used to estimate the probability density, the one that seems most appropriate is the kernel method introduced by Rosemblatt (1956) and Paesen (1962), who proposed a class of kernel estimators of univariate density as a function of two parameters, the kernel K and the bandwidth h. We establishes the convergence in almost complete moment of the second order with the rate of convergence of this estimator. This mode of convergence was introduced by Chow (1988) and it implies an almost sure convergence and an almost complete convergence.

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Computational modeling of turbulent fluid flow and comparison with experimental data

Amin Tabatabaei[1]

[1] Compueter engineering department, Azad Univesity, Tehran, Iran
E-mail: amintabatabaei77@gmail.com

Abstract

In this article, Numerical lattice Boltzmann model has been developed to investigate three dimensional,incompressible turbulent flow through the turbine blade. The lattice Boltzmann numerical scheme is a new approach for modeling heat and mass transfer. It reproduces the Navier-Stokes equations in the hydrodynamic limit. In this study, the numerical model has not only developed but also the numerical results have been compared with experimental data to validate our numerical model. It is concluded that Lattice Boltzmann method is promising as the numerical results corroborate the experimental one.

Configurations of SDM Methods Proposed between 1999 and 2012: A Follow-up Study

Tuğçe Aydın, Serdar Enginoğlu

Department of Mathematics, Faculty of Arts and Sciences, Çanakkale Onsekiz Mart University, Turkey
E-mail(s): aydinttugce@gmail.com, serdarenginoglu@gmail.com

Abstract

Recently, the concept of fuzzy parameterized fuzzy soft matrices (*fpfs*-matrices) [2] has become a prominent mathematical tool to cope with decision-making problems, where both parameters and alternatives are fuzzy. Therefore, many soft decision-making methods [1,3,4], constructed by the substructures of this concept, have been configured faithfully to the original to render them operable in *fpfs*-matrices space and successfully applied to decision-making problems. In this study, we complete the configurations of the soft decision-making (SDM) methods constructed with soft sets, soft matrices, and their fuzzy hybrid versions between 1999 and 2012. Afterwards, we apply the configured methods herein to a performance based-value assignment (PVA) intended for the known filters used in image denoising, so that we can compare their ranking performances. Finally, we discuss the need for further research.

Keywords – Fuzzy sets, soft sets, soft matrices, *fpfs*-matrices, soft decision-making, PVA problems

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Consensus of Discrete-time Multi-agent Systems with Nonlinear Dynamics via Long Lasting Impulsive Protocols

Snezhana Hristova[1], Kremena Stefanova[1]

[1]Faculty of Mathematics and Informatics, Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria

,

E-mail(s): snehri@mail.com, kvstefanova @gmail.com

Abstract

The second-order consensus problem of discrete-time multi-agent systems with fixed and switching topology is considered. Long lasting impulsive protocols are introduced for such multi-agent systems with non- linear dynamics. The consensus problem of the systems is studied. Sufficient conditions for the achievement of the second-order consensus of multi-agent systems are obtained. Numerical simulations are presented to support the theoretical results.

Acknowledgement: The research is supporeted by the Project FP19-FMI-002 "Innovative ICT for Digital Research Area in Mathematics, Informatics and Pedagogy of Education" of the Scientific Fund of the University of Plovdiv Paisii Hilendarski, Bulgaria.

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Controllability of Impulsive Stochastic Fractional Integro-differential Equations with Infinite Delay

Meghnafi Mustapha

Department of Mathematics, University of Bechar, Bechar , Algeria.
Email:megnafi3000@yahoo.fr

Abstract

This paper is concerned with the controllability of impulsive stochastic fractional integro-differential equations with infinite delay.

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Controlled Hodgkin-Huxley Neuron vs Controlled Qubit: Pros and Cons of Their Applications

Sergey Borisenok[1.2]

[1] Department of Electrical and Electronics Engineering, Faculty of Engineering, Abdullah Gül University, Kayseri, Turkey,
[2] Feza Gürsey Center for Physics and Mathematics, Boğaziçi University, Turkey,
E-mail(s): sergey.borisenok@agu.edu.tr, borisenok@gmail.com

Abstract

Nonlinear multidimensional dynamical systems presented in the form of ordinary differential equations with free control parameters cover the variety of regular and chaotic regimes and can be used for computational purposes and data analysis. To demonstrate the chaotic regime the dimension of the phase space for the deterministic system should me at least 3. Here we compare two famous multidimensional systems: 4-dimensional Hodgkin-Huxley neuron and 3-dimensional quantum bit (in its real ODE representation) in the external field. Both systems can be driven via the free parameters towards the necessary dynamical state (stabilization or tracking goal). There are many famous examples how to use quantum bits in the computations. We compare the efficiency of qubit mathematical model with the classical model of mathematical neuron to analyze pros and cons of both systems to be applied for the computational purposes.

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Curvatures of the Translation Hypersurface in 4-Space

Erhan Güler[1], Ömer Kişi[1]

[1] Department of Mathematics, Faculty of Sciences, Bartın University, Turkey,

E-mail(s): eguler@bartin.edu.tr, okisi@bartin.edu.tr

Abstract

We study the curvatures H_i *(i = 1,2,3)* of the translation hypersurface in the four dimensional Euclidean space. We also give some relations on H_i of a translation hypersurface.

Keywords: 4-space, curvatures H_i *(i = 1,2,3),* translation hypersurface

Design Optimization of PMU Anti-Aliasing Filters using Taguchi Method

Fatma Zohra Dekhandji

Laboratory of Signals and Systems, Institute of Electrical and Electronic Engineering, University M'hamed Bougara of
Boumerdes, Algeria
E-mail: fzdekhandji@univ-boumerdes.dz

Abstract

A Phasor Measurement Unit (PMU) is a monitoring device, which serves in checking the power system condition by measuring voltage and current phasors along with frequency at a particular node. The basic structure of PMU consists of Synchronization Unit, Measurement Unit and Data Transmission Unit. The Measurement Unit has three components: Anti-aliasing filters, Analog-to-Digital Converter and Phasor measurement Unit/ Processor. An anti-aliasing filter ensures that all the analog signals have the same phase shift and attenuation thus assuring that the phase angle differences and relative magnitudes of the different signals are unchanged. Anti-aliasing filters made up of an analog front end and a digital decimation filter are far more stable as far as aging and temperature variations are concerned. IEEE C37.118 standard stipulates that it is mandatory to use the filter for avoiding any aliasing errors. Out of various analog filters, the Butterworth has been preferred due to its flat response in pass-band as compared to other filters. In this work, it is attempted to design anti-aliasing filters to be used in PMUs. The design problem is formulated as an optimization task that is solved using the Taguchi method. The results show better performance in terms characteristics compared to the conventional filters. The designed filters may be employed as building blocks in modern PMUs.

Keywords: Anti-Aliasing filters, optimization, Taguchi method, PMU.

Determining the Relation Between Reasoning Skills and Critical Thinking Disposition of Pre-Service Science Teachers

Seda Okumuş[1], Oylum Çavdar[2], Yasemin Koç[3]

[1]Science Education, Atatürk University, Turkey,
[2]Science Education, Muş Alparslan University, Turkey,
[3]Science Education, Mustafa Kemal University, Turkey,
E-mail(s): seda.okumus@atauni.edu.tr, o.cavdar@alparslan.edu.tr, yaseminkoc@mku.edu.tr

Abstract

In this study, it was aimed to determine the relation between reasoning skills and critical thinking dispositions of pre-service science teachers. Correlational research design was used in the study. The sample of the study consists of 50 teacher candidates studying in the 3rd grade of science teaching program at Atatürk University Kazım Karabekir Education Faculty. Appropriate sampling method was used in determining the sample. The Hypothetico-creative Reasoning Skills Inventory (HRSI) developed by Duran (2014) and the Critical Thinking Disposition Scale (CTDS) developed by Semerci (2016) were used to collect data. The reliability of the scales was determined as $\alpha = .89$ and $\alpha = .96$, respectively. HRSI consists of 23 items and five sub-factors, and CTDS consists of 49 items and five sub-factors. During the analysis of the data, first of all, normality analyzes were made for each scale and sub-factors in the scales. Pearson's product moment correlation coefficients was calculated to determine the relation between reasoning skills and critical thinking disposition. Accordingly, no significant was found between the reasoning skills and critical thinking disposition of prospective science teachers ($p > .05$).

Keywords: Critical thinking disposition, pre-service science teachers, reasoning skills.

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Different Solution Method for Fuzzy Boundary Value Problem with Fuzzy Parameter

Tahir Ceylan[1], Nihat Altınışık[2]

[1]Mathematics, Sinop University, Turkey,
[2]Mathematics, Ondokuz Mayıs University, Turkey,
E-mail(s): tceylan@sinop.edu.tr, anihat@omu.edu.tr

Abstract

In this paper Titchmark's method is proposed for finding the fuzzy eigenvalues and fuzzy eigenfunctions of a fuzzy boundary value problem under generalized Hukuhara differentiability (gH-differentiability). The states of the obtained fuzzy eigenvalues are examined. In addition, this method is illustrated by solving fuzzy problem.

Keywords: gH-derivative, Fuzzy parameter, Fuzzz boundary value problem

Dynamical mixed boundary-transmission problems for composite layered elastic structures containing interfacial cracks

David Natroshvili
Georgian Technical University,
natrosh@hotmail.com

We investigate dynamical mixed type boundary-transmission problems of the generalized thermo-electro-magneto elasticity theory for complex elastic anisotropic layered structures containing interfacial cracks. This type of problems are described mathematically by systems of partial differential equations with appropriate transmission and boundary conditions for six dimensional unknown physical field (three components of the displacement vector, electric potential function, magnetic potential function, and temperature distribution function). We apply the potential method and the theory of pseudodifferential equations and prove uniqueness and existence theorems of solutions to different type mixed boundary-transmission problems in appropriate Sobolev spaces. We analyze smoothness properties of solutions near the edges of interfacial cracks and near the curves where different type boundary conditions collide.

Dynamics of a Class of Viral Infection Models With Diffusion

Saida Bakht[1], Khalid Hattaf[2], Nadia Idrıssı Fatmi[1]

[1]Laboratory LIPIM, Ecole Nationale des Sciences Appliquées (ENSA), Khouribga, Morocco
[2]Centre Régional des Métiers de l'Education et de la Formation (CRMEF), Casablanca, Morocco

Abstract

The aim of this work is to study the dynamics of a class of viral infection models with diffusion and loss of viral particles due to the absorption into uninfected cells. We prove the global stability of equilibria by constructing suitable Lyapunov functionals for two cases: continuous and discrete. Also, some examples are given to illustrate the theoretical results.

ECC in special ring and cryptographic application

Bilel Selikh[1], Abdelhakim Chillali[2], Douadi Mihoubi[1] and Nacer Ghadbane[1]

[1]Laboratory of Pures and Applied Mathematics, Department of Mathematics,
Mohamed Boudiaf University of Msila, Algeria,
[2]Sidi Mohamed Ben Abdellah University, FP, LSI, Taza, Morocco,
E-mail(s): bilel.selikh@univ-msila.dz, abdelhakim.chillali@usmba.ac.ma
douadi.mihoubi@univ-msila.dz, nacer.ghadbane@univ-msila.dz

Abstract

Let F3 d is the finite field of order 3d with d be a positive integer, we consider A4 := F3 d[ε] = F3 d[X]/(X4) is a finite quotient ring, where ε4 = 0 [5]. In this paper, we will show an example of encryption and decryption. The motivation for this paper came from the observation that communications, industrial automation and many more. On the other hand, cryptography is the study of mathematical techniques related to aspects of information security [6]. Firstly, we study the elliptic curve over this ring. Furthermore, we study the algorithmic properties by proposing effective implementations for representing the elements and the group law. Finally, we give an example cryptographic (encryption and decryption) with a secret key.

Keywords : Cryptography, Elliptic Curves, Finite Rings, Finite Field.

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Effect of CuO-water nanofluid on the thermal - hydraulic behavior of triangular corrugated channel

Rahima Benchabi[1], Ahsène Lanani[2]

[1] Department of Mechanical Engineering, Freres Mentouri UniversityConstantine1, 25000, Algeria,
[2] Department of Mathematic, Freres Mentouri University, Constantine 1, 25000, Algeria,
E-mail(s): rbenchabi@yahoo.fr, alanani1@yahoo.fr

Abstract

The Aim of the present study is the modelling and numerical simulation of two-dimensional incompressible laminar flow and heat transfer in a triangular-corrugated channel filled with a mixture of CuO–water nanofluid. The considered Reynolds number and the nanoparticles volume fraction range from 100 to 800 and from 0 to 5%, respectively. Concerning the governing equations, they were discretized by the finite volume method. The dynamic and thermal fields were obtained as well as Nusselt number. Also, the influence of certain parameters (Reynolds number, nanoparticles volume fraction) was considered. We noted that the average Nusselt number increases with increasing Reynolds numbers and nanoparticles volume fraction. For the numerical resolution, we have used the FLUENT code. Finally, we noted that the obtained results are in good agreement with the existing experimental results in the literature.

Keyword(s): Heat transfer, Nanofluid, Corrugated channel, Numerical simulation, Fluent

Ackowlegments:
We would like to express our sincere thanks to the conference chairman and to the organizers of this conference.

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Effects of water waves.

Study of water wave breaking through equations and experiments

L. Bezat[1], Sh. Hajrulla[2], F. Hoxha[2]

University of Vlora, Albania[1,]
Epoka University, Albania[2]
University of Tirana, Albania[2]

E-mail(s): leonard.bezati@univlora.edu.al, shajrulla@epoka.edu.al, fatmir.hoxha@fshn.edu.al

Abstract

This letter describes water wave breaking. We introduce a class of nonlinear water waves. We deal with the space-time measurements study of solution in the absorption regions combined with the estimates of the solutions in the smooth regions.

Our article presents an experimental study on the propagation of nonlinear water waves. In shallow water, the damping of water waves is highly influenced by the bottom friction. Moreover, the contact line and perfect wave absorption play a significant role on the shallow water and water wave breaking. The final part of article covers the measurement of wave absorption. We conclude with experiments and some important conclusions.

Key words: shallow water waves, wave breaking, wetting, absorption, nonlinearity problem

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Equivalence Classes of Implications on Bounded Lattices

Funda Karaçal[1], M. Nesibe Kesicioğlu[2], Ümit Ertuğrul[3]

[1,3]Mathematics, Karadeniz Technical University, Turkey,

[2]Mathematics, Recep Tayyip Erdogan University, Turkey,

E-mail(s): fkaracal@yahoo.com, uertugrul@ktu.edu.tr, nesibe.kesicioglu@erdogan.edu.tr

Abstract

In this paper, an equivalence relation is defined by implications. An implication on the bounded lattice of the equivalence classes of implications is introduced. Some basic properties of the generated implication are studied. A set is introduced by the linear combination of implications on bounded lattices and the lattice theoretical structure of the mentioned set is investigated.

Estimation of parameters and reliability function of poisson quasi lindley distribution for progressive typeII censored data

Grine Razika, Chadli Bendjedid

University El Tarf Algeria E-mail: grinerazika@hotmai.com

Abstract

In this work, we propose maximum likelihood and bays estimators of parameters and Reliability function under general Entropy loss function and squared error for progressive typeII censored data The maximum likelihood estimators and bays estimators are compared in terms of their risks based on simulated samples from poison quasi lindley distribution. Acknowledgement: Maximum likelihood estimators; lindley distribution; bays estimators, entropy loss function; progressive typeII censored data.

Evaluation of family tourism services in the old quarters of Berat city, Albania, using AHP and VIKOR

Robert Kosova[1], Markela Muça[2], Blerina Boçi[1], Dorina Guxholli[1], Taulant Kullolli[3]

1Mathematics. University "A. Moisiu". Durrës. Albania,
2Mathematics. University of Tirana. Tirana. Albania,
3Marketing. University "A. Moisiu". Durrës. Albania,
E-mail: robertko2000@gmail.com,

Abstract

The tourism industry has become one of Albania's most important and profitable industries. From a country where tourism almost did not exist, Albania has emerged as an attractive country, where tourism is booming, contributing to the growth of the economy and the benefits to its citizens. The annual increase in the number of visitors and revenues from tourism is about 10-20%, (INSTAT 2003 - 2018). That is, more tourists are coming, more customers are to be satisfied and there is more pressure to better performance and better quality services. The tourism industry as a service industry is always looking for improvements in order to become more competitive and to respond to the expectations of local and foreign customers. The city of Berat is more than 2500 years old, it is declared a museum city in 1961 and it is included in the 2008 UNESCO World Heritage List. During the last decade, we have seen a very successful activity of family tourism businesses, which are specially established in the three old quarters of Berat; Kala, Gorica, and Mangalam, which are the main quarters visited by tourists. These quarters include dozens of old and characteristic houses, over 100 years old, some of which have been transformed into small guesthouses, hotels, restaurants, bars, and resorts for domestic and foreign tourists with remarkable success. These transformations from old houses to tourist businesses are created by the investments of their owners, immigrants, city businessmen, and foreigners.This study aims to analyze, study and compare the family tourism businesses, created and managed by family businesses. We will compare the quality of family tourism services in these three quarters, based on the ratings of foreign and domestic clients who have visited them. The data are obtained from Trip Advisor and local data. The criteria that will evaluate the quality of tourist business services of these three neighborhoods are generally location, cleanliness, rooms, service, price, value, distance, performance, atmosphere, etc. The AHP method will be used to calculate the weight of the criteria and the rating of the three alternatives will be performed with the VIKOR method.

Keywords: Mcda, Tourism, Vikor, Ahp, Evaluation, Rating.

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Evaluation on the parameters of PSO algorithm using analytic tools

Besiana Çobani[1], Aurora Simoni[2], Rigena Sema[3]

1)Department of Mathematics, University of Tirana
2)Department of Applied Mathematics, University of Tirana
3)Department of Mathematics, University of Tirana
E-mail: besiana.hamzallari@fshn.edu.al, aurora.simoni@fshn.edu.al, rigena.sema@fshn.edu.al

Abstract

The PSO algorithm is used nowadays in nonlinear optimization problems. As an algorithm it is an evolutionary heuristic one which aims to a global solution. Numerically, it is one of the most successful method, but there is still to work on the theorical part of the algorithm. In this work we deal with the convergence of the algorithm based on the matrices and differential equations. We perturbed the dynamical system that models the particle movement and we evaluate the parameters of perturbation based on theorical restrictions.

Keywords: PSO algorithm, parameters, convergence, differential equation

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Exact and Numerical solution for Pseudo- Parabolic Differential Equation Defined by Atangana-Baleanu Fracional Derivative

Mahmut Modanlı [1]

[1]Mathematics, Harran University, Turkey,
E-mail(s): mmodanli.harran@edu.tr

Abstract

In this paper, the finite difference scheme method is applied to Pseudo-parabolic differential equation. Stability estimates are given for this method. The exact solution is obtained for this equation. Error analysis is calculated by comparing the exact and approximate solution for this problem.

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Exact Solutions of Perturbed Gerdjikov-Ivanov Equation

Esma Ates

[1]Electronics and Communication Engineering, Faculty of Technology, Karadeniz Technical University, Turkey,
E-mail: esmaates@ktu.edu.tr

Abstract

This study consider Gerdjikov- Ivanov equation where the perturbation terms appear with full nonlinearity. The Jacobi elliptic functions ansatz method is implemented to obtain exact solutions of this equation that models pulse dynamics in optical fibers. Bright and dark optical soliton solutions are obtained as well as Jacobi elliptic function solutions. The constraint conditions are acquired for the existence of solitons.

The optical soliton perturbation is considered as an essential feature to meet essential requirements of communication. The most familiar equation is the nonlinear Schrödinger (NLS) equation in the field of optics. There are few other models that describe pulse dynamics in the literature. The Gerdjikov-Ivanov equation considered in this study is one of these equations.

The Gerdjikov-Ivanov equation in dimensionless form

$$iq_t + aq_{xx} + b|q|^4 q + icq^2 q_x^* = 0,$$

where q is the complex valued function. The parameters a, b and c are all real-valued constants.

In presence of perturbation terms, the equation that is discussed in this paper extends to

$$iq_t + aq_{xx} + b|q|^4 q + icq^2 q_x^* = i[\alpha q_x + \lambda(|q|^{2m} q)_x + \mu(|q|^{2m})_x q]$$

where α is the inter-modal dispersion, μ is the higher-order dispersion coefficient, λ shows self-steepening with short pulses and m is the full nonlinearity parameter.

Keywords: Jacobi elliptic functions, optical solitons, Gerjikov-Ivanov equation

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Existence of solutions for p(x)-Solitons type equations in Several Space Dimensions

Abdelkader Dellal[1], Abdelghani Ouahab[2]

[1]Department of Mathematics, Ecole Normale Superieure, Kouba, Algiers, Algeria
[2]Laboratory of Mathematics, University of Sidi Bel Abbes, Sidi-Bel-Abbes, Algeria
E-mail: adellal@yahoo.fr agh ouahab@yahoo.fr

Abstract

In this paper we study a class of Lorentz invariant nonlinear field equations in several space dimensions. The main purpose is to obtain soliton-like solutions with twice (r; p)-Laplacian. The fields are characterized by a topological invariant, which we call the charge. We prove the existence of a static solution which minimizes the energy among the configurations with nontrivial charge.

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Existence Results Systems Coupled Impulsive Neutral Functional Differential equations driven by a Fractional Brownian Motion and Wiener Process

Tayeb Blouhi[1] and Mohamed Ferhat[1]

[1]Departement of Mathematics, Usto University, Oran 31000, Algeria
Emails:ferhat22@hotmail.fr, blouhitayeb@yahoo.com

Abstract

In this paper, we prove some results on the existence and uniqueness of mild solutions for system of semilinear impulsive differential with infnite fractional Brownian motions and Wiener process. Our approach is based on a new version of fixed point theorem due to Krasnoselskii theorem in generalized Banach spaces.

Exponential stability for second-order dynamic equations

Fayçal Bouchelaghem[1], Abdelouaheb Ardjouni[2]

[1]Laboratory of Analysis and Control of Differential Equations, Guelma University, Algeria
[2]Department of Mathematics and Informatics, Souk Ahras University, Souk Ahras, Algeria,
E-mail(s): fyb1500@gmail.com, abd_ardjouni@yahoo.fr

Abstract

In this work, we establish the existence of positive periodic solutions for second-order dynamic equations on time scales. The main method used here is the Schauder's fixed point theorem. The exponential stability of positive periodic solutions is also studied. The results obtained here extend some results in the literature. An example is also given to illustrate this work.

.

Keywords: Exponential stability, Schauder's fixed point theorem, Dynamic equations

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Extended *q*-Daehee Polynomials and Its Applications via Mahler Expansion

Ugur Duran[1], Mehmet Acikgoz[2]

[1]Iskenderun Technical University, Turkey,
[2]University of Gaziantep, Turkey,
E-mail(s): mtdrnugur@gmail.com, acikgoz@gantep.edu.tr

Abstract

In the present paper, we firstly consider novel *q*-extensions of the Daehee polynomials named as the generalized twisted *q*-Daehee polynomials with weight (α,β) and generalized twisted *q*-Daehee polynomials of the second kind with weight (α,β). For the aforementioned polynomials, we derive various interesting and new formulas and identities covering correlations and recurrence relations associated with the Apostol type Stirling numbers of the second kind, the generalized twisted *q*-Bernoulli polynomials with weight (α,β) and Stirling numbers of the both kinds. Moreover, we provide two relationships for the two types of generalized twisted *q*-Daehee polynomials with weight (α,β). Then, we examine some connections with the *p*-adic gamma function with its derivative via Mahler expansion for the aforesaid polynomials. Furthermore, we prove an exciting explicit formula for the *p*-adic Euler constant thanks to the generalized twisted *q*-Daehee polynomials with weight (α,β).

Key words: *p*-adic gamma function, Mahler expansion, Bernoulli polynomials, Daehee polynomials, *q*-numbers, *p*-adic numbers.

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Extension of Leap Condition in Approximate Stochatic Simulation Algorithms of Biological Networks

Saliha Yıldırım Demirbüken[1], Vilda Purutçuoğlu[2*]
[1] Institute of Applied Mathematics, Middle East Technical University, Turkey,
[1, 2] Department of Statistics, Middle East Technical University, Turkey,
E-mails: salihademirbuken@gmail.com, vpurutcu@metu.edu.tr

Abstract

The stochastic simulation of the biolgical systems is the realizatin of the actual biological process by using some Monte Carlo approches. The *direct method* [1], *first reaction method* [2] and the *next reaction method* [3] are three major methods in this area. Although these algorithms are successful to generate the systems exactly, they are computationally demanding for large systems. So, the approximate stochastic simulation algorithms (SSA) are the alternative approaches to generate the complex biological systems with a loss in accuracy by gaining from computational demand. The main idea of these methods is to provide a generation of the system via the leap-condition [4]. Basically, this condition implies that the movement in the state of the system should be very slight for the selected time step □ in the sense that the hazard functions do not change considerably during the change in time from time *t* to *t*+□ . By this way, we can compute how many times each reaction can be realized in each small time interval □ so that we can move along the system's history axis from one time step to the next, instead of moving along from one reaction to the next. Hereby, in this study, we extend the underlying leap condition by deriving a realistic confidence interval for the selection of the number of reactions in every .□ For this purpose, we specifically deal with the poisson □ -leap [4] and the Langevin methods [4] as these are two fundamental approximate SSA in the literature, as well as the approximate Gillespie algorithm [5] as the extension of them. We derive the maximum likelihood estimators and the moment estimators of the simulation parameters and construct confidence interval estimators at a given significance level □ for these three algorithms. From the derivations, we observe theoretically more precise interval for the plausible values of parameters.

Keywords: Approximate stochastic simulation algorithms, leap condition, biological networks
Acknowledgement: The authors thank to the Scientific Research Project of Middle East Technical University (Project no: BAP-01-09-2017-002) for their suppport.

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Fixed point results using compatibility in Complex Valued G_b metric space

Vishal Gupta[1], Rajani Saini[2]

[1,2]Department of Mathematics, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana 133207, India.
E-mail(s): vishal.gmn@gmail.com, vgupta@mmumullana.org

Abstract

In this paper, some common fixed point theorems of compatibility in complete complex valued G_b metric space have been proved. Here, we have given some new common fixed point results by using rational inequality. We also give an example to show the validity of obtained theoretical results.

Fractional hybrid differential equations with boundary hybrid conditions

Abdelkader Amara[1]

[1] Laboratory of Applied Mathematics, University of Kasdi Merbah, Ouargla 30000, Algeria,
E-mail(s): amara.abdelkader@univ-ouargla.dz, amara.abdelkaderdz@gmail.com

Abstract

In this paper, we investigate the existence and uniqueness of solutions for a kind of hybrid fractional differential equations in addition to boundary hybrid conditions. The results are based on a hybrid fixed point theorem of Dhage for three operators. The main result is excellently expressed by an example.

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Galerkin method for the higher dimension non linear Boussinesq equation with integral condition

Draifia Alaeddine[1,2]
[1]Ecole Normale Supérieure-Mostaganem-Algeria
[2]Laboratory of mathematics, Informatics and Systems (LAMIS), Larbi Tebessi University, 12002 Tebessa, Algeria
E-mail drai.a1991@gmail.com

Abstract

This paper deals with the solvability of a higher dimension mixed non local problem for a non linear Boussinesq equation. Galerkin.s method is the main used tool for proving the solvability of the given non local problem.

Generalized Parabolic Marcinkiewicz integral operators related to surfaces of revolution

Mohammed Ali
Department of Mathematics and Statistics,
Jordan University of Science and Technology, Irbid, Jordan
E-mail: myali@just.edu.jo

Abstract

In this note, the generalized parametric Marcinkiewicz integral operators with mixed homogeneity related to surfaces of revolution are studied. By an extrapolation argument, the boundedness of the aforementioned operators from Triebel-Lizorkin spaces to Lp spaces under some weak conditions on the kernels are established, which represents significant improvements and natural extensions of what was known previously.

Generalized Szász-Mirakjan type operators via q-calculus and approximation properties

Mohd. Ahasan[1], M. Mursaleen[1,2]

[1]Mathematics, Aligarh Muslim University, Aligarh, India
[2]Medical Research, China Medical University, Taichung, Taiwan,
E-mail(s): ahasan.amu@gmail.com, mursaleenm@gmail.com

Abstract

The aim of this paper is to construct q-analogue of generalized Szász-Mirakjan type operators whose construction depend on a real valued function ρ. We prove that the new operators provide better weighted uniform approximation over $[0,\infty)$. In terms of weighted moduli of smoothness, we obtain degrees of approximation associated with the function ρ. Also a Voronovskaya type result is obtained. Finally, we give some graphical examples for these operators and show that the new operators are more flexible in view of rate of convergence to the function f which depends on the selection of ρ, u_(n,q) and v_(n,q).

Genetic algorithms models for time series

Ramdane Rahal

University of Bechar Department of Mathematics Bechar, Algeria
E-mail(s): rahalramdane@yahoo.fr

Abstract

This paper presents a new method for determining the order and parameters of moving average in ARMA model, using a robustness method, is traditional genetic algorithms, by minimizing Akaike information criterion AIC and MSE. After we performing our models by iterative to reducing the average relative error(used in forecasting phase) calling genetic algorithms, considers the output error and uses it as input again after reducing and normalizing the errors rate until the error rate is very small by this method. Application of this method on airline data the plane, the results show that the performance of iteration is better than the model before iteration and Box-Jenkins model.

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Global existence of the wave equation with polynomial source and damping terms

Boulmerka Imane[1], Hamchi Ilhem[1]

Laboratory of Partial Differential Equations and its Applications,
Department of Mathematics, University of Batna 2, Algeria
Email : i.boulmerka@univ-batna2.dz, i.hamchi@univ-batna2.dz

Abstract

In this work, we consider the wave equation with polynomial source and damping terms. By the stable set method, we prove that under some conditions on the parameters in the system the global solution exists.

Keywords: Wave equation, Source term, Damping term, Global solution.

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Golden para-Sasakian manifold

Gherici BELDJILALI[1], Habib BOUZIR[2]

[1,2]Laboratory of Quantum Physics and Mathematical Modeling (LPQ3M),
University of Mascara, Algeria ,
E-mail(s): gherici.beldjilali@univ-mascara.dz
habib.bouzir@univ-mascara.dz

Abstract

The Golden section or Golden mean ϕ is the positive root of the polynomial equation $x^2 - x - 1 = 0$; i.e., $\phi = \frac{1+\sqrt{5}}{2}$. The Golden ratio has been used in many different areas, particularly, in arts and architecture. Being inspired by the Golden ratio, the notion of Golden manifold M was defined in Crasmareanu and Hretecanu [1] by a tensor field Φ on M satisfying $\Phi^2 = \Phi + I$ where I is the identity transformation. The authors have studied properties of Golden manifolds and they have showed that Φ is an automorphism of the tangent bundle TM and its eigenvalues are ϕ and $\phi^* = 1 - \phi$. They also defined Golden Riemannian manifolds and investigated their submanifolds.

The notion of almost para-contact manifolds (respectively, almost paracontact Riemannian manifolds) as analogue of almost contact manifolds (respectively, almost contact Riemannian manifolds) was introduced by Sato in [2] and [3]. Remarkable that an almost contact manifold is always odd dimensional but an almost para-contact manifold could be even dimensional as well.

Our goal in this talk, is to show that there is a correspondence between the Golden Riemannian structures and the almost para-contact metric structures, this is what prompts us to define a new structure that blends the golden structure with the almost para-contact metric structure namely, Golden para-contact metric manifold. Then, we are particularly interested in a more special type called Golden para-Sasakian manifold, where we will study their fundamental properties and we present many examples which justify their study

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Improved Hybrid Methods for Direct Integration of Oscillatory Problems

Yusuf Dauda Jikantoro[1], Aliyu Ishaku Ma'ali[1], Yahaya Badeggi Aliyu[1], Abdulkadir Abubakar[1], Ismail Musa[1]

1Department of Mathematical Science, Ibrahim Badamasi Babangida University, Lapai, Nigeria
E-mail(s): jdauday@yahoo.ca, aai_maali@yahoo.com, aybadeggi@ibbu.edu.ng, aabubakar01@yahoo.com, ismailamusa45@yahoo.com

Abstract

Presented in this paper is a set of improved numerical schemes for integration of a class of special second order ordinary differential equations (ODEs) whose solutions exhibit oscillatory behavious. The methods are derived with special attention on oscillatory properties of the solutions, where the phase and amplication errors of the methods are studied. The performance of the proposed methods is assessed via a numerical experiment. Results obtained reveal remarkable improvements achieved with the set of the proposed methods on the solutions of the problems in question.

Impulsive Stochastic Fractional Integro-differential Inclusions with State-Dependent Delay

Aissani Khalida

University of Bechar, Mathematics, Bechar 08000, Algeria
E-mail(s): aissani_k@yahoo.fr

Abstract

This paper deals with the existence of mild solutions for impulsive fractional order stochastic integro-differential inclusions with state-dependent delay. The existence result is obtained by using a fixed point technique on a Hilbert space.

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Inextensible Flow of Non-Null Curves with Type-3 Bishop Frame in Lorentz 3-space

Tunahan TURHAN

Isparta University of Applied Sciences, Turkey,
E-mail: tunahanturhan@isparta.edu.tr

Abstract

Recently, Bishop frame and inextensible flow of curves have studied by many researchers in Euclidean space and non-Euclidean spaces ([3], [8], [2]). Bishop frame which is known alternative or parallel frame of the curve, was firslty presented by Bishop [1]. Also, the evolution of space curves introduced by Lamba, [4]. The author defined the evolution for the tangent, normal and binormal vectors of curve with respect to arc length parameter of curve and time parameter t. In [6], the authors described type-3 Bishop frame and gave time evolution equation of space curves with respect to such frame.

In this work, we present type-3 Bishop frame for a non-null curves with respect to normal vector field of a non-null curve in Lorentz 3-space. Then, we get the inextensible flow equation for non-null curves with respect to type-3 Bishop frame and type-3 Bishop frame curvatures. Finally, we give an example for our results.

Keywords : Inextensible flow, Non-null curve, Type-3 Bishop frame.

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Influence of Discretization Step on the Positivity of a 2D Continuous-Discrete Linear System Described on the Roesser Model

Mohammed Amine Ghezzar
Dept. of Maths. and Comp. Science, ACSY Team LMPA, FSEI
Abdelhamid Ibn badis de Mostaganem University
Mostaganem, Algeria
E-mail(s): amine.ghezzar@univ-mosta.dz

Abstract

In this paper we discuss the influence of the discretization step on the positivity of the 2D linear continuous-discrete time systems described by the Roesser model. We have shown that even if the model is analytically positive, it can lose its positivity when switching to numerical simulation. A result guaranteeing the preservation of positivity has been established and numerical example is illustrated.

Integration of TAM model in Students Acceptance of Google Classroom context Using Partial Least Squares -Structural Equation Model

Phd. Evgjeni Xhafaj1, Phd. Daniela Halidini Qendraj2

[1]Department of Mathematics, Faculty of Mathematics and Physics Engineering, Polytechnic University of Tirana, Albania,
[2]Department of Mathematics, Faculty of Information Technology, Aleksander Moisiu University Durres, Albania.
E-mails: genaxhafa@yahoo.com, daniela_qendraj@hotmail.com

Abstract

The development of information technology has an integral role to the promotion of new alternatives in relation to improve teaching and learning for universities. This study has the main aim that through the structure of the Technology Acceptance Model (TAM)to analyse how the model factors can predict the behavioral intention towards Google Classroom. The data were collected through an online questionnaire for 194 students from Alexander Moisiu University, who used the Google Classroom platform. The data evaluations have been realized using the Partial Least Square-Structural Equation Model (PLS-SEM) method. The results show that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) significantly influence behavioral intention towards google classroom and both of these constructs influence in the actual usage of Google classrooms

Keywords: Technology Acceptance Model, Partial Least Square-Structural Equation Model, Google classroom, factors.

Invariant algebraic curves and limit cycles for a class of polynomial differential systems

Rachid BOUKOUCHA

Department of Technology, Faculty of Technology, University of Bejaia, Algeria.
E-mail: rachid_boukecha@yahoo.fr

Abstract: In this work, we consider the family of the polynomial differential system of the form

$$x' = x + (\alpha y - \beta x)\left(hx^2 + kxy + hy^2\right)\left(ax^2 + bxy + ay^2\right)^n,$$
$$y' = y - (\alpha x + \beta y)\left(hx^2 + kxy + hy^2\right)\left(ax^2 + bxy + ay^2\right)^n,$$

where a, b, α, β, h, k are real constants and n is positive integer. We introduce an explicit expression of invariant algebraic curves and we prove that these systems are Liouville integrable. Moreover, we determine sufficient conditions for a polynomial differential system to possess an explicit algebraic or non-algebraic limit cycles. Concrete examples exhibiting the applicability of our result are introduced.

Keywords: Planar polynomial differential system; First integral; Limit cycle.

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Iterated Binomial Transforms of the Balancing and Lucas-Balancing Polynomials

Nazmiye YILMAZ[1]

[1]Department of Mathematics, Karamanoglu Mehmetbey University, Turkey,
E-mail: yilmaznzmy@gmail.com

Abstract

In this study, we apply r times the binomial transforms to the balancing and Lucas-balancing polynomials. Also, the Binet formulas, summations, generating functions of these transforms are found using recurrence relations. Finally, we obtain the Catalan and Cassini formulas for these transforms.

Acknowledgement:

References:

Kinetic Moments of Vlasov Dynamics: A Matched Pair Analysis

Oğul Esen[1], Serkan Sütlü[2]

[1]Department of Mathematics, Gebze Technical University, Turkey,
[2] Department of Mathematics, Işık University, Turkey,
E-mails: oesen@gtu.edu.tr, serkan.sutlu@isikun.edu.tr

Abstract

This talk is based on [1]. We first present a gentle introduction to the Hamiltonian (Lie-Poisson) analysis of dynamical systems. Then we recast the dynamics of kinetic moments of Vlasov equation from the matched pair decomposition point of view. That is, we present the moment dynamics as a coupling of mutually interacting (Lie-Poisson) subdynamics. We observe that one of the constitutive subdynamics is the compressible isentropic fluid flow.

Acknowledgement: We are gratefully acknowledge the support by TÜBİTAK under the project "Matched pairs of Lagrangian and Hamiltonian Systems" with the Project number 117F426 for [1].

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Lacunary Statistical Convergence of Sequences in Neutrosophic Normed Spaces

Ömer Kişi[1], Erhan Güler[2]

[1,2]Deparment of Mathematics, Faculty of Science, Bartın University, Turkey
E-mail(s): okisi@bartin.edu.tr, eguler@bartin.edu.tr

Abstract

Statistical convergence of sequences has been studied in neutrosophic normed spaces by Kirişci and Şimşek [1]. In this present study, we investigate lacunary statistical convergence of sequences in neutrosophic normed spaces. We give the lacunary statistically Cauchy sequences in neutrosophic normed space and present the lacunary statistically completeness in connection with a neutrosophic normed space.

Keywords: Neutrosophic normed space; lacunary statistical convergence; lacunary statistically Cauchy sequences

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Laminated Timoshenko Beams With Interfacial Slip And Infinite Memories

O. Vera Villagran

Departamento de Matematica, Universidad del Bio-Bio, Concepciton, Chile
e-mail: overa@ubiobio.cl

Abstract

We study in this paper the well-posedness and stability of three structures with interfacial slip and two in_nite memories e_ective on the transverse displacement and the rotation angle. We consider a large class of kernels and prove that the system has a unique solution satisfying some regularity properties. Moreover, without restrictions on the values of the parameters, we show that the solution oes to zero at in_nity and give an information on its speed of convergence in terms of the growth of kernels at in_nity. A numerical analysis of the obtained theoretical results will be also given.

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Local Existence of Solutions for a p-Laplacian Type Equation with Delay Term and Logarithmic Nonlinearity

Erhan Pişkin[1], Hazal Yüksekkaya[2]

[1]Mathematics, Dicle University, Turkey,
[2]Mathematics, Dicle University, Turkey,
E-mail(s): episkin@dicle.edu.tr, hazally.kaya@gmail.com

Abstract

In this work, we deal with a p-Laplacian type equation with delay term and logarithmic nonlinearity. Under suitable conditions, we consider the local existence of solutions. Generally, time delay effects arise in many applications and practical problems such as physical, chemical, biological, thermal and economic phenomena.

Key Words: Delay, Local existence, Logarithmic nonlinearity.

Lyapunov Direct Method for Stability Analysis of Nonlinear Generalized Fractional Systems

Shiva Eshaghi
Department of Applied Mathematics, Faculty of Mathematical Sciences, Shahrekord University, P.O.Box 115, Shahrekord, Iran
E-mail: shiva_eshaghi69@yahoo.com

Abstract

In this paper, we study the stability of nonlinear generalized fractional system by using the Lyapunov direct method. Then, we provide an example to illustrate the effectiveness and availability of the result. Further, by employing numerical simulation, we show that the zero solution of the system converges to the origin when the time tends to infinity.

Mathematial Methods Safety Barrier Performance Assessment

Hamaidi Brahim[1], Taibi Hicham[2]

1Electromechanical Engineering Laboratory LGE, Faculty of Engineering Sciences BADJI Mokhtar University of Annaba - Algeria,
2 Electromechanical Engineering Laboratory LGE, Faculty of Engineering Sciences BADJI Mokhtar University of Annaba - Algeria,
Emails: ham5615@yahoo.fr ,taibi@univ-annaba.org

Abstract

Most well-designed systems have safety barriers against such circumstances to protect humans, the environment, and material assets. This makes it harder for any one initiating event to propagate through all the barriers culminating in a hazardous event or accident. Some barriers are set up to prevent accidents from occurring (prevention barriers). Others are in place to reduce the consequences of an event once it has already occurred (mitigation barriers). The purpose of this paper is evaluating the performance of the existing safety barriers and according to risk tolerable decides if more additional barriers should be implemented.

Key Words: Barrier, Failure, Lopa, Tolerable risk, Safety instrumented system

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Mathematical description and approximation for the water wave equation

Sh. Hajrulla[1], L. Bezati[2], Merita Bajrami[2], F. Hoxha[3]

Epoka University, Albania[1]
University of Vlora, Albania[2,]
University of Tetova, North Macedonia[2,]
University of Tirana, Albania[3]

E-mail(s): shajrulla@epoka.edu.al, leonard.bezati@univlora.edu.al, merita.azemi@unite.edu.mk, fatmir.hoxha@fshn.edu.al

Abstract

We deal with approximation made to justify the linearization of the equations. Because of the oscillatory motions that they generate, surface gravity waves can bereasonably well described by a linear analysis. This is mathematically justified by restricting the attention to small wave amplitudes and weak accompanying motions. In shallow water, the damping of water waves is highly influenced by the bottom friction.

Describing water wave breaking we linearize the problem through the linear parameter. It is interesting to mention that the mathematical model can be derived by alternative proofs. We linearize the wave breaking equation and come to conclusions through the wave absorption experiment on the coast. For instance, it can be derived by imposing the dynamic equilibrium of a string that is vibrating in a two-dimensional plane. Mathematical description and approximation leads us to get conclusions.

Key words: linearization, water waves equation, wave breaking, mathematical description**,** approximation

Mathematical Modelling of Tuberculosis Infection Dynamics with Effects of Case Detection and Drug Resistance

Gbolahan Bolarin[1], Yusuf Zubair[2] and Abdulhakeem Yusuf[3]

[1] Mathematics Department, Federal University of Technology, Minna, Nigeria,

E-mail(s): g.bolarin@futminna.edu.ng zubairoyereyi@gmail.com a.yusuf@futminna.edu.ng

Abstract

A deterministic mathematical model of tuberculosis incorporating case detection and drug resistance with constant recruitment rate was developed. The population was subdivided into six compartments according to their disease status. The basic reproduction number of the model was obtained using the next generation matrix. The existence of disease free and endemics equilibrium points were shown and the conditions for their stability was also esterblished. The results show that the disease free equilibrium points are locally asymptotically stable if $R_0 <1$ and globally stable if $R_0 \leq 1$. Also the results further show that the endemic equilibrium points are locally asymptotically stable if $R_0 >1$ and globally stable if $R_0 \geq 1$ .We obtain the approximate solution of the model using Homotopy Perturbation Methods. The graphical summaries of the solution were carried out and the result show that increase in case detection and sustained treatment can help to reduce transmission of tuberculosis disease.

Key words: Tuberculosis, Reproduction Number, Homotopy Perturbation Method, Next Generation Matrix

Measure of Noncompactness and Partial Functional Differential Equations with State-Dependent Delay

Mouffak Benchohra[1,2], Imene Medjadj[2]

1Mathematics, Sidi Bel-Abb\`es University, Algeria,
2King AbdulazizUniversity, Saudi Arabia,
E-mail(s): benchohra@univ-sba.dz, imene.medjadj@hotmail.fr

Abstract

Our aim in this work is to study the existence of solutions of first and second order functional differential equations with state-dependent delay. We use the Monch's fixed point theorem for the existence of solutions and the concept of measures of noncompactness.

Keywords:Functional differential equation, mild solution, infinite delay, state-dependent delay, fixed point, semigroup theory, cosine function of operator, measure of noncompactness.

Measure Pseudo Almost Periodic Solutions For Differential Equations With Reflection

Mohsen Miraoui

LR11ES53, University of Sfax. IPEIK, University of Kairouan. Tunisia.
E-mail adresse: miraoui.mohsen@yahoo.fr

Abstract

We give some new results for the existence and uniqueness of doubly measure pseudo almost periodic solutions for some di_erential equations with reection. We will use the Banach _xed-point theorem and some properties of pseudo almost periodic functions with measure and we will discuss both linear and nonlinear cases. Finally I finish with some applications to illustrate our results.

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Miscellaneous Properties of the Gamma Distribution Polynomials

Ugur Duran[1], Mehmet Acikgoz[2]

[1]Iskenderun Technical University, Turkey,
[2]University of Gaziantep, Turkey,
E-mail(s): mtdrnugur@gmail.com, acikgoz@gantep.edu.tr

Abstract

The main aim of this paper is to investigate multifarious properties and relations for the gamma distribution. The approach to reach this purpose will be introducing a special polynomial including gamma distribution. Several formulas covering addition formula, derivative property, integral representation and explicit formula are derived by means of the series manipulation method. Furthermore, two correlations including Bernoulli and Euler polynomials for gamma distribution polynomials are provided by utilizing of their generating functions.

Key Words: Special polynomials; gamma distribution; Cauchy product; generating function; Bernoulli polynomials; Euler polynomials.

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Modified Projective Synchronization Of Fractional-Order Chaotic Systems Using Adaptive Control

Zerimeche Hadjer[1], Houmor Tarek[2], Berkane Abdelhak[3]
[1]Laboratory of Mathematics and their interaction, University Center of Mila, Algeria,
[2,3]Mathematics, Mentouri University Constantine, Algeria,
E-mail(s): h.zerimeche@centre-univ-mila.dz, tarek_houmor@umc.edu.dz, berkane@usa.com

Abstract

This work focus on the adaptive modified projective synchronization (AMPS) method to synchronize different fractional-order chaotic systems (FOCS) with unknown parameters. The point of (AMPS) technique is to ensure synchronization between different (FOCS) by using the Lyapunov stability theory and some techniques of fractional calculus. The important feature of (AMPS) method is the other types of synchronization can be found, for instance, complete synchronization, anti-synchronization, and projective synchronization; also the synchronization between almost all (FOCS) with known or unknown parameters can achieve.

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Multiplicity Results for Stationnary Elliptic Kirchhoff Type Problems with Critical Growth

Meghnafi Mustapha[1] and El hendi Hichem[1]

[1] University of Bechar Department of Mathematics Bechar 08000, Algeria
E-mail(s): megnafi3000@yahoo.fr, E-mail:elhendihihem@yahoo.fr

Abstract

In this work, we show the existence of multiple positive solutions for an elliptic nonlocal problems of Kirchhoff type involving critical Hardy- Sobolev exponent which isdefined on a bounded regular domain in bolev exponent. We use Ekeland variational principle and Mountain Pass theorem to prove two distinct solution for the problem under consideration.

New estimate on the constant of strongly Lipschitz p-nuclear operators

Khedidja Bey[1], Amar Belacel[2]

Laboratoire de Mathématiques Pures et Appliqués, University of Laghouat, Laghouat, Algeria,
E-mail(s): kh.bey@lagh-univ.dz, a.belacel@lagh-univ.dz

Abstract

Chen and Zheng in [1] introduced a new class of Lipschitz operator ideal called "Lipschitz p-integral operators and Lipschitz p-nuclear operators" and proved among other results the non-linear version of the factorization theorem, where the domain of such operators is a metric space that need not be a normed space in the sens of creating a theory analogous to the ideal Banach operator. The aim of this work is to contribute to the theory of the theory of non-linear of p-nuclear by giving a new estimate on the constant of the strongly Lipcshitz p-nuclear operators which is also introduced and studied by Chen and Zheng in [1] only from pointed metric space into Banach spase.

Key Words: Factorization theorem, Lipschitz operators, Pointed metric space.

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Nonlinear Anal., 75 (2012), 5270-5282.

New Exact Solutions For Conformable Fractional Equations Via IBSEFM

Ulviye Demirbilek[1], Khanlar R. Mamedov [2]

[1, 2] Mathematics, MersinUniversity, Turkey,
E-mail(s): udemirbilek@mersin.edu.tr, hanlar@mersin.edu.tr

Abstract

The main intent of this paper is to find wave solutions for the many conformable fractional equation. In the present work, we use the technique of İmproved Bernoulli Sub-Equation Function Method (IBSEFM) to set new exact solutions to different types of conformable fractional equations These solutions are of significant importance in coastal and ocean engineering where the fractional equations modeled for some special physical phenomenon. As a result of this method suggested here is simple, direct, reliable and effective that can be extended to study and solve many of the conformable fractional equation in different branches of science.

Keywords: Conformable fractional derivative, Improved Bernoulli Sub-Equation Function Method, Conformable derivate.

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New Results On The Asymptotic Stability, Boundedness And Square Integrability of Third Order Neutral Differential Equations

Djamila Beldjerd
Oran's High School of Electrical Engineering and Energetics, Oran, Algeria.
dj.beldjerd@gmail.com

Abstract

Neutral differential equations have many applications. In the qualitative analysis of such systems, the stability and asymptotic behavior of solutions play an important role. In this talk by construting a Lyapunov functional, we obtain some sufficient conditions which guarantee the stability, boundedness and square integrability of solutions for some nonlinear neutral delaydifferential equations of third order.

New shock-wave and periodic-wave solutions for some physical models: Vakhnenko-Parkes, GEWB and GRLW equations

Marwan Alquran

Department of Mathematics and Statistics,
Jordan University of Science and Technology, Irbid, Jordan
E-mail: myali@just.edu.jo

Abstract

In this current work, the modified Unified method is utilized to extract new shock-wave and periodic-wave solutions for important physical models. We studied three models, the Vakhnenko-Parkes (VP) equation, the generalized equal width-Burgers (GEWB) equation and the generalized regularized-long-wave (GRLW) equation. Shock-wave and periodic wave solutions are obtained for these models. All obtained solutions are verified and categorized regarding its physical structures.

Numerical Discretization of Stochastic Oscillators with Generalized Numerical Integrators

Ali Sırma[1], Reşat Köşker[2], Muzaffer Akat[3]

1Industrial Engineering, Haliç University, Turkey,
2 Mathematical Engineering , Yıldız Technical University, Turkey,
3 International Finance, Özyeğin University, Turkey,
E-mail(s): alisirma@halic.edu.tr, kosker@yildiz.edu.tr, muzaffer.akat@ozyegin.edu.tr

Abstract

In this study, we propose a numerical scheme for stochastic oscillators with additive noise obtained by the method of variation of constants formula using generalized numerical integrators. For both of the displacement and the velocity components, we show that the scheme has an order of 3/2 in one step convergence and a first order overall convergence. Theoretical statements are supported by numerical experiments.

Keywords: Stochastic oscillators, The method of variation of constants formula, Stochastic integrators

Numerical simulations of a coupled two cell activator-inhibitor reaction-diffusion system by a scheme which preserves positivity of the solution

Redouane Douaifia[1], Salem Abdelmalek[1,2]

[1] Laboratory of Mathematics, Informatics and Systems (LAMIS), Larbi Tebessi University - Tebessa, Algeria,
[2] Department of Mathematics and Computer Science, Larbi Tebessi University - Tebessa, Algeria,
E-mail(s): redouane.douaifia@univ-tebessa.dz, salem.abdelmalek@univ-tebessa.dz

Abstract

A coupled two-cell Brusselator system subject to Neumann boundary conditions is considered. Firstly, we obtain the global existence of classical solution for the system. Then, for the aim to show the dynamics of model we develop positivity preserving splitting technique to find the numerical solution for the proposed model. The scheme leads to the convergence of solution to a true steady-state or fixed point under the given condition.

Keywords: Activator-inhibitor model; reaction-diffusion system; numerical method.

Odd dominating sets and parity of their cardinality

Ahmet Batal[1]

[1]Mathematics, Izmir Institute of Technology, Turkey,

E-mail: ahmetbatal@iyte.edu.tr

Abstract

Let G be a simple graph. Closed adjacency neighborhood of a vertex u of G is the set consists of the vertices adjacent to u and u itself. A set S of G is called odd dominating if the closed adjacency neighborhood of every vertex intersects with S odd number of times. We show that parity of the cardinality of an odd dominating set is equal to the parity of the rank of the closed adjacency matrix of G, where closed adjacency matrix of G is obtained by replacing diagonal entries of the adjacency matrix of G by 1.

Key words: domination number, odd dominating set, all-ones problem

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On Certain Integral Transforms and Extended Voigt Functions

Mohammad Kamarujjama[1]

[1] Department of Applied Mathematics, Z.H College of Engineering & Technology
Aligarh Muslim University, Aligarh-202002, India
E-mail: mdkamarujjama@rediffmail.com

Abstract

The Voigt functions K(x,y) and L(x,y) which play an important role in astrophysical spectroscopy and theory of neutron reactions are investigated and generalized from the view point of integral transforms. Unified representations and explicit expressions of these functions are given in terms of familiar special functions of mathematical physics. A set of partly bilateral and partly unilateral representations of generalized Voigt functions is also considered.

Keywords: Voigt functions, Generalized Bessel function, Hypergeometric functions, Meijer G-H functions.

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On Fixed Point Theorems of Some Multivalued Mappings

Seher Sultan Yeşilkaya
Department of Mathematics, Kahramanmaraş Sütçü Imam University, Turkey,
E-mail: sultanseher@gmail.com

Abstract

The Banach Contraction Principle [1] plays a fundamental role in metric fixed point theory. Further some results show that this principle has many application in many areas of mathematics. This result has been extended in many directions for single and multivalued cases on a metric space Y. In 1969, using Pompeiu-Hausdorff metric, Nadler [2] introduced the notion of mutivalued contraction mapping and proved a mutivalued version of the well known Banach contraction principle. Since then the metric fixed point theory of single-valued mappings has been extended to multivalued mappings, see for examples [3-6]. Lately, Jleli and Samet [7] introduced a new type of contractions called θ -contraction. In this study, we aim to present new fixed point theorems for multivalued mapping on complete metric spaces with δ-distance following by Jleli and Samet. We introduce the notion of generalized multivalued θ_δ-contractive in the context of complete metric spaces. Finally we give an illustrative example, which shows the importance of δ-distance on the contraction condition.

Keyword(s): fixed point, multivalued mapping, metric space.

Acknowledgement: The author would like to thank the anonymous reviewers for their valuable comments.

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On Fourth Fundamental Form of the Translation Hypersurface

Erhan Güler[1], Ömer Kişi[2]

[1,2]Department of Mathematics, Faculty of Sciences, Bartın University, Turkey,
E-mail(s): eguler@bartin.edu.tr, okisi@bartin.edu.tr

Abstract

We examine the fourth fundamental form of the translation hypersurface in the four dimensional Euclidean space. We also discuss I, II, III and IV fundamental forms of a translation hypersurface.

Keywords: 4-space, fourth translation hypersurface, fundamental form.

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On Fractional Integro-differential Equations with State-Dependent Delay and Non-Instantaneous Impulses

Nadia Benkhettou[1], Khalida Aissani[2]

[1] Department of Mathematics, Sidi Bel-Abbès University, Algeria,
[2] Department of Mathematics, Bechar University, Algeria,
E-mail(s): benkhettou_k@yahoo.fr, aissani_k@yahoo.fr

Abstract

In this paper, we prove the existence of mild solution of the fractional integro-differential equations with state-dependent delay with not instantaneous impulses. The existence results are obtained under the conditions in respect of Kuratowski's measure of noncompactness.

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On Gaussian (s,t)-modified Pell Sequence and Its Matrix Representation

Nusret Karaaslan[1], Tülay Yağmur[2]

[1]Dağdibi Secondary School, Rize, Turkey,
[2]Department of Mathematics, Aksaray University, Aksaray, Turkey,
E-mail(s): nusret5301@gmail.com, tulayyagmur@aksaray.edu.tr

Abstract

Fibonacci, Lucas, Pell, Pell-Lucas and modified Pell sequences were generalized by many authors. For example, in [1,2], Civciv and Türkmen introduced (s,t)-Fibonacci and (s,t)-Lucas sequences. Then, Güleç and Taşkara [3] presented (s,t)-Pell and (s,t)-Pell-Lucas sequences and matrix representations of these sequences. Additionally, the (s,t)-modified Pell sequence and (s,t)-modified Pell matrix sequence are defined in [4,5]. Moreover, Gaussian modified Pell sequence were defined in [5,6]. In this study we first define the Gaussian (s,t)-modified Pell sequence. Then, by using this sequence, we define the matrix sequence whose elements are Gaussian (s,t)-modified Pell numbers. Furthermore, we give various identities of these sequences.

Keyword(s): (s,t)-modified Pell sequence, (s,t)-modified Pell matrix sequence, Gaussian (s,t)-modified Pell sequence, Gaussian (s,t)-modified Pell matrix sequence.

Acknowledgement: This study is based on the sixth chapter of the corresponding author's Msc. Thesis.

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On Generic Submanifolds of Lorentzian β-Kenmotsu Manifold

Ramazan SARI[1], İnan ÜNAL[2]

1Gümüşhacıköy Hasan Duman Vocational Schools, Amasya University, Turkey,
2,Department of Computer Engineering, Munzur University, Turkey,
E-mail(s): ramazan.sari@amasya.edu.tr, inanunal@munzur.edu.tr

Abstract

In this paper, we are studied generic submanifolds of Lorentzian β-Kenmotsu manifold as a generalized semi-invariant submanifold. Firstly, we define generic submanifolds of Lorentzian β-Kenmotsu manifold. We investigate integrabilities of horizontal and vertical distributions of generic submanifold of Lorentzian β-Kenmotsu manifold. We obtain a necessary and sufficient condition for a generic submanifold of Lorentzian β-Kenmotsu manifold to be totally geodesic. We also consider parallel of horizontal and vertical distributions of generic submanifolds of Lorentzian β-Kenmotsu manifold.

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On Kenmotsu Manifold Admitting Yamabe Soliton

Halil İbrahim Yoldaş

Mathematics, Mersin University, Turkey,
E-mail: hibrahimyoldas@gmail.com

Abstract

In this work, we deal with a Kenmotsu manifold admitting a yamabe soliton and a quasi-yamabe soliton. We obtain some necessary conditions for a Kenmotsu manifold to be constant scalar curvature and give an example which support our results. Also, we give some important characterizations for such a manifold.

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On Lie Groupoids, Lie Algebroids and Equations of Motion under Mutual Actions

Ogul Esen[1], Hanife Kubra Kaya[1,2], Serkan Sutlu[2]

[1]Mathematics, Gebze Technical University, Turkey,
[2]Mathematics, Isık University, Turkey,
E-mail(s): oesen@gtu.edu.tr, hanifekubra.kaya@gmail.com, serkan.sutlu@ısıkun.edu.tr

Abstract

In this work, we present matching of two mutually interacting Lagrangian systems on Lie algebroid frameworks. Firstly, we mention Lie groupoids and Lie algebroids formally. Due to the mutual actions of two Lie groupoids and two Lie algebroids onto each other, we refer the matched Lie groupoids and Lie algebroids structures. Then, we obtain Euler-Lagrange equations on the matched Lie algebroids which involve individual behaviours and mutual action terms. During this work, we provide many examples.

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On Matched Pair Hamiltonian Analysis of the Compartmental Models

Begüm Ateşli[1], Oğul Esen[1], Serkan Sütlü[2]

[1]Mathematics, Gebze Tehnical University, Turkey,
[2]Mathematics, Işık University, Turkey,
E-mail(s): b.atesli@gtu.edu.tr, oesen@gtu.edu.tr, serkan.sutlu@isikun.edu.tr

Abstract

Epidemiological compartmental models predict the spread of an infectious disease that a specific population encounter. The population is divided into compartments representing different stages of the epidemic and the change of these compartments in time is given by nonlinear differential equations. In previous studies, the Hamiltonian analysis of these models is included. In this work, we briefly explain SIR, SEIR, 2-SIR and 2-SEIR models, and their Hamiltonian analysis. We recollect the matched pair Lie-Poisson systems and observe that SIR and SEIR models can be written as matched pair Lie-Poisson systems. We generalize the matched pair Lie-Poisson systems using the twisted cocycle extension. We attain that matched pair Lie-Poisson systems obtained by the twisted cocycle extension is convenient for 2-SIR and 2-SEIR models.

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On Modified Pell Polynomials

Nusret Karaaslan

Dağdibi Secondary School, Rize, Turkey,
E-mail: nusret5301@gmail.com

Abstract

Various sequences of polynomials by the names of Fibonacci and Lucas polynomials occur in the literature over a century. The Fibonacci and Lucas polynomials have many properties which have been studied in [1-2]. In Ref. [3], Horadam and Mahon introduced Pell and Pell-Lucas polynomials. Additionally, as a special case of Horadam polynomials [4], the modified Pell polynomials are defined recursively by, $q0(x)=1$, $q1(x)=x$; $qn(x)=2xqn-1(x)+qn-2(x)$. In this study, we first give the proof of the generating function and Binet formula of the modified Pell polynomials. Then, we obtain summation formulas and various identities for this sequence. Also Karaaslan studied modified Pell polynomials and their some properties in [5].

Keyword(s): Modified Pell sequence, modified Pell polynomial sequence, Binet formula, generating function.

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On Nonempty Intersection Properties in Metric Spaces

Ajit Kumar Gupta[1], Saikat Mukherjee[2]

[1,2]National Institute of Technology Meghalaya, Shillong, India
E-mail(s): emailstoajit@gmail.com, saikat.mukherjee@nitm.ac.in

Abstract

The classical Cantor's intersection theorem states that in a complete metric space X, the intersection of every decreasing sequence {Kn} of nonempty closed bounded subsets of X with the diameter diam(Kn) tending to 0 has exactly one point. In this article, we deal with decreasing sequences {Kn} of nonempty closed bounded subsets of a metric space X, for which the Hausdorff distance H(Kn, Kn+1) tends to 0, and for which the excess of Kn over X\Kn tends to 0. We achieve nonempty intersection properties of metric spaces. The obtained results also provide an improvement upon Cantor's intersection theorem.

Keywords: Hausdorff metric, Nested sequence, Cantor's intersection theorem.

On Non-null Rational Bézier Curves on 2-dimensional de Sitter Space S_1^2

Ayşe YILMAZ CEYLAN[1], Tunahan TURHAN[2] and Gözde ÖZKAN TÜKEL[3]
[1]Mathematics, Akdeniz University, Turkey,
[2] Electronic Technology, Isparta University of Applied Sciences, Turkey
[3]Finance, Banking and Insurance, Isparta University of Applied Sciences, Turkey,
E-mail(s): ayilmazceylan@akdeniz.edu.tr, tunahanturhan@isparta.edu.tr, gozdetukel@isparta.edu.tr

Abstract

We constitute an orthonormal frame field of an arbitrary speed non-null quadratic rational Bézier curve at the end points on 2-dimensional de Sitter space S_1^2 known as one of the hyperquadrics in Minkowski 3-space. We get the formulas of geodesic curvature for a non-null quadratic rational Bézier curve that allows a curve to be characterized on the surface.

Key words: Darboux frame field, non-null Rational Bézier curve, 2-dimensional de sitter space.

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On Oscillation of Nonlinear Impulsive Differential Equations System with Piecewise Constant Mixed Arguments

Mehtap Lafçı Büyükkahraman

Department of Mathematics, Faculty of Arts and Sciences, Usak University, Turkey

E-mail: mehtap.lafci@usak.edu.tr

Abstract

A nonlinear impulsive differential equations system with piecewise constant mixed arguments is considered. Also, the existence and uniqueness of the solutions are proved. Moreover, sufficient conditions for the oscillation of the solutions are obtained. Finally, two examples are given.

Keywords: Impulsive differential equation, piecewise constant argument, oscillation

On Semi- Invariant Submanifolds of para Kenmotsu manifold with a Semi Symmetric Metric Connection

Ramazan SARI

Gümüşhacıköy Hasan Duman Vocational Schools, Amasya University, Turkey,
E-mail(s): ramazan.sari@amasya.edu.tr

Abstract

In this paper we study semi-invariant submanifolds of an para Kenmotsu manifold endowed with a semi-symmetric metric connection. We define semi invariant submanifolds of para Kenmotsu manifold with semi symmetric metric connection. We give an example. Necessary and sufficient conditions are given on a submanifold of para Kenmotsu manifold with semi symmetric metric connection to be semi-invariant submanifold. We investigate integrabilities of horizontal and vertical distributions of semi-invariant submanifolds endowed with a semi-symmetric metric connection. We also consider parallel horizontal distributions of semi-invariant submanifolds.

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On Some Inequalities for a General Class of Analytic and Bi-univalent Functions

Arzu Akgül

Mathematics, Faculty of Arts and Science, Kocaeli University, Kocaeli, Turkey.
e-mail: akgul@kocaeli.edu.tr

Abstract

In this work, a new subclass of analytic and bi-univalent functions is constructed in the open unit disc. Estimates for initial coe¢ cients of Taylor- Maclaurin series of bi-univalent functions belonging these class are obtained. Also some related classes are recognized and connections to previus results are made.

Keywords: Analytic functions, Univalent functions, Biunivalent functions, Taylor-Maclaurin series expansion, Coefficient bounds and coefficient estimates, Taylor-Maclaurin coefficients

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On the Approximation of Partial Differential Equations using the Three-Step Wavelet Galerkin Method

Neslihan Ozdemir[1], Aydin Secer[2]

[1] Istanbul, Turkey,
[2]Yildiz Technical University, Department of Mathematical Engineering, Esenler, Istanbul, Turkey,
E-mail(s): ozdemirn511@gmail.com, asecer@yildiz.edu.tr

Abstract

In this study, we investigated the numerical solution of some well-known nonlinear partial differential equations by the three-step wavelet Galerkin method. Legendre wavelets are used in the presented method. The method is one of the useful and powerful numerical method which can be easily applied to linear and nonlinear problems. At the end of the study, the comparison between numerical and exact solution proves the efficiency and accuracy of the presented method.

Keywords: Legendre Wavelets, Galerkin method, three-step Taylor method

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On the convergence of Carathéodory numerical scheme for a class of nonlinear Mckean-Vlasov stochastic differential equations

Mohamed Amine Mezerdi
University of Toulon, Laboratoire IMATH
Po.Box 20132, 83957 La Garde Cedex 05, France
(E-mail: mmezerdi93@gmail.com)

Abstract

We study the strong convergence of the Carathéodory numerical scheme for a class of nonlinear McKean-Vlasov stochastic differential equations (MVSDEs). In the .first part of the paper, we prove the convergence of the approximate solutions to the unique solution of the MVSDE with Lipschitz coefficients. In the second part, we drop the Lipschitz condition, and we show that the result remains valid, under continuous coefficients provided that pathwise uniqueness holds.

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On the Gaps of Neumann Eigenvalues for Hill' s Equation with Symmetric Double Well Potential

Elif Başkaya[1]

[1]Mathematics, Karadeniz Technical University, Turkey,
E-mail: elifbekar@ktu.edu.tr

Abstract

A symmetric double well potential on [0,a] is defined as symmetric with respect to midpoint a/2 and quarter point a/4 and nonincreasing on [0,a/4]. In this study, some gaps between eigenvalues are minimized and maximized for Hill' s equation with Neumann boundary conditions when the potential is symmetric double well.

Keywords: Hill's equation, symmetric double well potential, Neumann eigenvalues

On The Geometry of Para-Kenmotsu Space Forms

İnan ÜNAL[1], Ramazan SARI[2]

[1]Computer Engineering, Munzur University, Turkey,
[2] Gümüşhacıköy Hasan Duman Vocational Schools, Amasya University, Turkey
E-mail(s): inanunal@munzur.edu.tr, ramazan.sari@amasya.edu.tr

Abstract

In this paper, our aim is to study on para-Kenmotsu space forms under certain curvature relations. We classify such manifolds by using the generalized quasi-conformal curvature tensor.

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On the geometry of the tangent bundle with vertical rescaled generalized Cheeger-Gromoll metric

El hendi Hichem

University of Bechar

Department of Mathematics

Bechar 08000, Algeria

E-mail(s): elhendihichem@yahoo.fr

Abstract

Let (M,g) be a n-dimensional smooth Riemannian manifold. In the present paper, we introduce a new class of natural metrics denoted by G^{f} and called the vertical rescaled generalized Cheeger-Gromoll metric on the tangent bundle TM. We calculate its Levi-Civita connection and Riemannian curvature tensor. We study the geometry of (TM,G^{f}) ..

Acknowledgement:

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On the multiplicity of non radial solutions for singular elliptic equations

Noria Bekkouche[1], Naima Daoudi-Merzagu[2]

[1]Department of Mathematics, University of Saida, Algeria,
[2]Department of Mathematics, University of Tlemcen, Algeria,
E-mail(s): noria.bekkouche@yahoo.fr, nmerzagui@yahoo.fr

Abstract

The main goal of this work is to analyze the existence and the multiplicity of non radial solutions for a Dirichlet problem associated to an elliptic singular partial differential equation. Our approach is based on a variational method.

Keywrods: Singular quasilinear equations; minimization with constraints; periodic solution.

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On the open B-spline curves

Muhsin İncesu[1], Sara Yılmaz Evren[2]

[1] Muş Alparslan Üniversitesi, Eğitim Fakültesi, Matematik Eğitimi ABD, Muş, Türkiye,
[2] Y. Lisans Öğrencisi, Muş Alparslan Üniversitesi, Fen Edebiyat Fakültesi, Matematik Bölümü, Muş, Türkiye,
E-mail(s): m.incesu@alparslan.edu.tr, sara_yilmaz_90@hotmail.com

Abstract

In this paper the open B- spline curves was introduced. Then, the conditions of consisting Bertrand curve pairs of two given open non uniform rational B-spline curves were discussed.

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On the Optimal Control of An Isotropic Beam

Seda Göktepe Körpeoğlu

Mathematical Engineering, Yildiz Technical University, Turkey,
E-mail: sgoktepe@yildiz.edu.tr

Abstract

An isotropic structure modelled as a beam which is described using the body-force correction and Timoshenko's shear correction factor is considered. The beam model to be controlled is expressed using partial differential equations and boundary conditions including the control function. The aim of the proposed design is to suppress the vibrations. The performance index which seeks to be minimized indicates that the goal is to minimize the magnitude of performance measure without consuming control effort in large quantities. It is shown how to derive the optimal control function using Pontryagin's principle that turns the control problem into solving optimality system of partial differential equations with terminal values. Wellposedness of the optimal solution on the control set is presented and controllability of the problem is analyzed. In order to show the applicability and effectiveness of the control acting on the boundary conditions, numerical simulations are given in terms of computer codes produced in MATLAB© in the forms of graphical and tables.

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On the Reliability of Some Regular Graphs

Gülnaz Boruzanlı Ekinci[1], John Baptist Gauci[2]

[1]Department of Mathematics, Ege University, Turkey,
[2] Department of Mathematics, University of Malta, Malta
E-mails: gulnaz.boruzanli@ege.edu.tr, john-baptist.gauci@um.edu.mt

Abstract

Measuring fault-tolerance is vital in networks, thus reliability studies attract a great deal of consideration in graph theory. The connectivity of a graph G is the cardinality of a minimum vertex-cut. If every minimum vertex-cut isolates a vertex, then the graph is said to be super-connected. If a graph is super-connected, then it is of interest to ask what is the size of a smallest vertex-cut which does not isolate a vertex; a parameter known as the super-connectivity of a graph. In this talk, we present the super-connectivity of some infinite regular graph classes which are already known to be super-connected.

Optimal Control of Higher Order Differential Inequality

Sevilay Demir Sağlam[1], Elimhan N. Mahmudov[2]

[1]Mathematics, Istanbul University, Turkey,
[2] Mathematics, Istanbul Technical University, Turkey,
[2] Institute of Control Systems, Azerbaijan National Academy of Sciences, Azerbaijan
E-mail(s): sevilay.demir@istanbul.edu.tr, elimhan22@yahoo.com

Abstract

It is well known that, optimal control problems with ordinary differential inclusions and related results cover one of the intensively developing areas of optimal processes in mathematical theory. This paper discusses optimal control problems for differential inclusions described by the nonlinear differential inequality with higher order. To this end sufficient optimality conditions for such problems are based on the method of discretization of the continuous problem and equivalence theorems. Optimality conditions for the Mayer problem are proved in the form of Euler - Lagrange inclusions and transversality conditions. In addition, a numerical illustration is provided to demonstrate the theoretical result.

Key words: Differential inequality, Euler-Lagrange inclusion, higher-order, transversality.

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Optimal fault-tolerant resolving set of 4-th power of paths

Laxman Saha

[1]Department of Mathematics, Balurghat College, Balurghat 733101, India
E-mail(s): laxman.iitkgp@gmail.com

Abstract

For a simple finite connected graph $G=(V(G),E(G))$, we represent the distance between any two arbitrary vertices say u,v by $d(u,v)$. The distance $d(u,v)$ is considered as the length of the shortest path from the vertex u to the vertex v. Now an arbitrary vertex say u is said to resolve a set of vertices $\{v,w,...,z\}$ if $d(u,v)\neq d(u,w)\neq ...\neq d(u,z)$. The set of vertices $R\subseteq G$ is said to be the resolving set of G if every pair of vertices of G are resolved by some vertices in R i.e if $R=\{r_1,r_2,r_3,...,r_k\}$ then

$$\left(d(v,r_1),d(v,r_2),d(v,r_3),...,d(v,r_k)\right)\neq\left(d(w,r_1),d(w,r_2),d(w,r_3),...,d(w,r_k)\right)$$

for every pair of distinct vertices $v,w\in G$. The metric basis for a graph G is the resolving set of G containing the minimum number of vertices. Although the applications of metric bases arise in many various platforms such as Robot Navigation, Network Optimization, Sensor networks, but still they have some reservations due to the fact that if some detectors (elements of metric basis) are faulty, then it is not possible to identify the nodes uniquely. In order to improve the accuracy of the detection or the robustness of the system Hernando et al. in 2008 introduced concept of fault-tolerant metric dimension. This concept is defined as follows: A resolving set F of graphs G is fault- tolerant if $F\setminus\{v\}$ is also a resolving set, for every vertex $v\in F$. The fault-tolerant metric dimension of G is the minimum cardinality of a fault-tolerant resolving set. A fault-tolerant resolving set of with minimum cardinality is called a fault-tolerant metric basis. The problem of determining the fault-tolerant metric dimension is NP hard problem and results are known only for some classes of graphs. In this paper, we study the fault-tolerant metric dimension of 4th power of path P_n and determine the exact value of fault-tolerant metric dimension of P_n^4 for all n.

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P-adic Apostol-Bernoulli Measures

Altan Erdoğan[1]

[1]Mathematics, Gebze Technical University, Turkey
E-mail(s): alerdogan@gtu.edu.tr

Abstract

The p-adic Apostol-Bernoulli measures parametrized by the complement of an open ball in the algebraic closure of p-adic fields is introduced. It is proved that these measures are the higher order versions of the p-adic measure which interpolates the p-adic polylogarithms. The decomposition of Bernoulli measures as a linear combination of Apostol-Bernoulli measures is also given.

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Phase Plane Analysis of a Selected Form of Burgers Huxley Equation

Esen Hanaç

Department of Mathematics, University of Adiyaman, Adıyaman/Turkey
Email: ehanac@adiyaman.edu.tr

Abstract

I analyse the main results concerning the existence and structure of travelling waves (TWs) which may occur in the following reaction diffusion equation when reaction term is rational function

$$u_t + uu_x = u_{xx} + u(1-u)(u-m), \qquad -\infty < x < \infty \quad t > 0 \qquad (1)$$

where $x \neq 0$, represents distance, t represents time and $m > 2$ is a constant. The aim is to demonstrate any solution of the equation (1) has travelling wave solutions for a specific wave speed (ws) which is named as c^{**}, that speed occurs when heteroclinic trajectory is obtained in phase space which joins two different equilibrium points, by using eigenvalues and eigenvectors of jacobian matrix of the dynamical system of the reaction diffusion equation (1).

Keywords: Reaction diffusion equation, Travelling waves, stable node, unstable node.

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Positive periodic solutions of second-order delay dynamic equations

Kamel Ali Khelil[1], Abdelouaheb Ardjouni[2]

[1]Laboratory of Analysis and Control of Differential Equations, Guelma University, Algeria
[2]Department of Mathematics and Informatics, Souk Ahras University, Souk Ahras, Algeria,
E-mail(s): k.alikhelil@yahoo.fr, abd_ardjouni@yahoo.fr

Abstract

Let **T** be a periodic time scale such that $0 \in \mathbf{T}$. We use fixed point theorem to obtain a sufficient conditions for the existence of positive periodic solutions for second order dynamic equations.

Keywords: Fixed point, delay dynamic equations, periodic solutions.

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Prelle-Singer Procedure for the Mathematical Model of HIV Transmission

Gülden Gün Polat

Mathematics and Computer Sciences, İstanbul Kültür University, İstabul-Turkey,
E-mail: g.polat@iku.edu.tr

Abstract

The main goal of this research is to analyze null forms and integrating factors of a famous mathematical model which is known as the HIV transmission model. To understand the dynamics of HIV transmission, mathematical models enable to us an essential idea. HIV transmission which is described as the mathematical model can be determined by a nonlinear system of three first-order ordinary differential equations. Lie group analysis is successfully applied in different problems of physics, mathematics for about a hundred years, but in biology or epidemiology is not very common because the ordinary differential equations studied in these fields are generally of first-order in contrast with those in physics which are usually of second-order. But it is clear that any system of n-first-order equations could be transformed into an equivalent system where at least one of the equations is of second order. Based on this idea, in this research, we focus on the corresponding second-order differential equation of the nonlinear system of three first-order ordinary differential equations of the model of HIV transmission. By using the relationship between analytical methods such that Lie symmetry, λ-symmetry, and Prelle-Singer methods, the null forms and the integrating factors of HIV transmission are presented. Furthermore, the outcomes of the Prelle-Singer procedure are evaluated for a corresponding second-order differential equation of HIV transmission.

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Product integration method for a linear weakly singular Volterra integral equation

Ahlem Nemer , Hanane Kaboul , Zouhir Mokhtari

Applied Mathematics Laboratory , University of Biskra, Biskra 07000, Algeria

E-mail(s): ahlem.nemer@univ-biskra.dz, hanane.kaboul@univ-biskra.dz, z.mokhtari@univ-biskra.dz

Abstract

The main objective of our work is to determine an approximate solution of a weakly singular Volterra integral equation by adopting a product integration method which enables us to identify a best solution (see[4,3,5]). We firstly begin by transforming the considered equation to a system of integral equations (see[1,2]). Moreover, we demonstrate the approximate solution gotten by this method approaches the exact solution. To illustrate the effectiveness of out method, we present a numerical application.

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Product integration method for a weakly singular Volterra integral equation

Ahlem Nemer , Hanane Kaboul , Zouhir Mokhtari

Applied Mathematics Laboratory , University of Biskra, Biskra 07000, Algeria

E-mail(s): nemer.ahlem2016@gmail.com , hanane.kaboul@univ-biskra.dz , z.mokhtari@univ-biskra.dz

Abstract

The main objective of our work is to determine an approximate solution of a weakly singular Volterra integral equation by adopting a product integration method which enables us to identify a best solution (see[4,3,5]). We firstly begin by transforming the considered equation to a system of integral equations (see[1,2]). Moreover, we demonstrate the approximate solution gotten by this method approaches the exact solution. To illustrate the effectiveness of out method, we present a numerical application.

References:

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Pseudo almost automorphic functions and its application to a new recurrent neural networks model with several delays

Mohammed Salah M'hamdi[1], Chaouki Aouiti[2]
[1]Research unit LaMOS, Department of Technology, Faculty of Technology,
University of Bejaia, 06000 Bejaia, Algeria,
[2]Research Units of Mathematics and Applications UR13ES47, Department of Mathematics,
Faculty of Sciences of Bizerta,
University of Carthage, 7021 Zarzouna, Bizerta, Tunisia,
E-mail(s): mohammedsalah.mhamdi@yahoo.com, chaouki.aouiti@fsb.mu.tn

Abstract

In this paper, we consider a class of delayed recurrent neural networks (DRNNs) belonging to the category of delayed differential equations (DDEs), which is more general than the recent recurrent neural networks with varying delays or unbounded (proportional). Under some delay-independent and delay-dependent sufficient conditions, the existence, uniqueness and attractivity of pseudo almost automorphic solution for a new recurrent neural networks (RNNs) with time-varying coefficients and several delays is obtained. To do so, the theory of exponential dichotomy with the classical Banach's fixed-point principle, inequality techniques and constructing suitable Lyapunov functional are used. As you will see, our results improve and generalize many previous known results in DRNNs. Finally, an example together with its numeric simulations show the feasibility and effectiveness of our main results.

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Quantum Batteries Driven via Feedback Algorithms

Sergey Borisenok[1,2]

[1] Department of Electrical and Electronics Engineering, Faculty of Engineering, Abdullah Gül University, Kayseri, Turkey,
[2] Feza Gürsey Center for Physics and Mathematics, Boğaziçi University, Turkey,
E-mail(s): sergey.borisenok@agu.edu.tr, borisenok@gmail.com

Abstract

Feedback algorithms can be efficiently applied to control the basic characteristics of quantum batteries (QBs): their ergotropy, their charging power, their storage capacity and others. We discuss pros and cons of the proposed algorithms for different types of quantum batteries: Dicke QB, spin QB, harmonic oscillator QB. For different physical realizations we compare alternative algorithms, including the standard speed gradient and target attractor feedback and our original target repeller feedback. With their application we study the control efficiency for the basic working stages of quantum batteries: charging, long time storage and the energy transfer to a consumption center or engine.

Quaternion-based Kinematics Using Dual Transformations

Gülsüm Yüca[1]

[1]Mathematics, Aksaray University, Turkey,
E-mail: gulsumbicer@gmail.com

Abstract

In this study, we investigate quaternion-based kinematics with the help of dual transformations. In particular, we examine rotational motions in Euclidean and Lorentzian spaces by using orthogonal matrices generated with quaternions. Additionally, we obtain one-parameter motions in both spaces via quaternions and dual transformations. Furthermore, we provide applications and draw their figures for visualization.

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R^3_1 Semi-Riemannian Manifoldların Birasyonel Kobordizm İnvaryantları Üzerine

Muhsin İncesu[1], Sara Işık[2]

[1] Muş Alparslan Üniversitesi, Eğitim Fakültesi, Matematik Eğitimi ABD, Muş, Türkiye,
[2] Y. Lisans Öğrencisi, Muş Alparslan Üniversitesi, Fen Edebiyat Fakültesi, Matematik Bölümü, Muş, Türkiye,
E-mail(s): m.incesu@alparslan.edu.tr, sara_yilmaz_90@hotmail.com

Özet

Duggal ve Bejancu 1996 da yayınladıkları kitapta bir semi-Riemannian manifoldda lightlike (null) alt uzayın varlığını gösterdiler ve alt manifoldların geometrisi için ihtiyaç duyulan önemli bir boşluğu doldurdular. Semi-Riemannian manifoldlar için unireglelik, kodaira boyutu gibi birasyonel invaryantların yanında maximum lineer bağımsız lightlike vektörlerin sayıları olan k(U) değerlerinin de bir birasyonel invaryant olduğu vurgıulanarak R^3_1 Semi-Riemannian Uzayda 2-Cob Üreteç kobordizmlere örnekler verilmiş, bunların kkodaira boyutları ve k(U) invaryantları ifade edilmiştir.

Anahtar Kelimeler: Kobordizm, Birasyonel invaryant, Semi-Riemannian manifold, Kodaira boyutu, Ruled yapı..

Acknowledgement:

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Radiation and Heat Transfer Effects on MHD Boundary Layer Flow over a Flat- Plate

S. Gherieb[1], M.R.Sari[2] And M. Kezzar[1]

[1]Technical Sciences Department, University of Skikda, El Hadaiek Road, B. O. 26, 21000 Skikda, Algeria
[2]Mechanical Engineering Department, University of Badji Mokhtar, Road, B. O. 12, 23000 Annaba, Algeria

Abstract

The main purpose of this study is to investigate the effects of thermal radiation and transverse magnetic field with the presence of an adverse pressure gradient on the two-dimensional laminar incompressible boundary layer flow over a flat plate. Using the appropriated similarity transformations, the partial differential equations governing the studied problems are transformed to the nonlinear ordinary differential equations. Thereafter, equations obtained are solved numerically and analytically using the fourth order Runge Kutta method based shooting technique and the Generalized Adomian Decomposition method respectively. Thermal behaviour and heat transfer characteristics for different values of effective Prandtl number P_{reff} and radiation parameter R are considered. Results obtained reveal that the thermal distribution increases as the radiation parameter R increases. Comparison between analytical and numerical data for fluid velocity and thermal profiles shows an excellent agreement, thus justifying the validity and effectiveness of the adopted Generalized-ADM technique.

Keywords: MHD boundary layer flow,Heat transfer,Thermal radiation.

Ranking the dimensions and attributes of SERVQUAL model for hotel satisfactory customers in Albania : A fuzzy AHP method

Phd. Daniela Halidini Qendraj[1], Phd. Evgjeni Xhafaj[2]

1Department of Mathematics, Faculty of Information Technology, Aleksander Moisiu University Durres, Albania,
2Department of Mathematics, Faculty of Mathematics and Physics Engineering, Polytechnic University of Tirana, Albania.
E-mails: daniela_qendraj@hotmail.com, genaxhafa@yahoo.com

Abstract

The quality of service (SERVQUAL) is mainly used as a multi-dimensional research instrument for customer satisfaction, and has a direct impact on hotels and their business development in Albania. Keeping tourist satisfied is more important for hotel industry to survive in the competitive market. Customer Satisfaction includes five dimensions named criteria as are: Tangibles, Reliability, Responsiveness, Empathy and Assurance. Each of them has their attributes in total 22 items, named as sub-criteria. The aim of this paper is to find the most important criteria, and their sub-criteria. The questionnaire has been developed to 200 tourists from 10 hotels of Tirana in Albania during the year 2018. The Fuzzy AHP (FAHP) method is applied by using a fuzzy conversion of the Saaty scale into Triangular Fuzzy Numbers (TFN) numbers. FAHP is an extension of AHP and shows how the decision maker thinks about using the information to estimate uncertainty in producing decisions under some subjective criteria and their sub-criteria. Due to the data, study results showed that the most important criteria was Responsiveness, the second Empathy, then Reliability, Assurance and the last one was Tangibles. Also the sub-criteria have been ranked related to criteria with FAHP method. These study results help Albania to be more sensitized to tourism in future.

Keywords: Customer Satisfaction, Fuzzy AHP, Fuzzy Weights, TFN numbers.

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Regularity and Normality via $e^*\theta$-open Sets

Burcu Sünbül AYHAN

Rectorate, Turkish-German University, Turkey
E-mail: brcyhn@gmail.com

Abstract

The regular space and normal space concepts, which has an important role in the classification of topological spaces, was introduced and studied respectively by L. Vietoris and H. Tietze in 1921. In this study, $e^*\theta$-regular space and $e^*\theta$-normal space, which are generalizations of regular space and normal spaces, are defined by means of $e^*\theta$-open sets introduced by A.M. Farhan and X.S. Yang. The main purpose of this study is to obtain some characterizations of the newly defined spaces and to investigate some basic properties.

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Regularity and Normality via $e^*\theta$-open Sets

Burcu Sünbül AYHAN

Rectorate, Turkish-German University, 34820, Beykoz-İstanbul, Turkey
E-mail: burcu.ayhan@tau.edu.tr

Abstract

Regular and normal space concepts, which has an important role in the classification of topological spaces, was introduced and studied respectively by Vietoris [4] and Tietze [3].

In this study, e*θ-regular space, which is a generalization of regular space, has been studied by defining via e*θ-open sets introduced by Farhan and Yang [2]. In addition, e*θ-normal space, which is a generalization of normal space, was defined by Ayhan and Özkoç [1]. Some characterizations and main results of e*θ-normal space have been studied in this work.

The main purpose of this study is to obtain some characterizations of e*θ-regular and e*θ-normal spaces and to investigate some of their fundamental properties.

Keyword(s): e*θ-open sets, e*θ-regularity, e* θ-normality.

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Relaxed Elastic Lie Quadratics

Gözde ÖZKAN TÜKEL[1], Ahmet YÜCESAN[2]

[1]Finance, Banking and Insurance, Isparta University of Applied Sciences, Turkey,
[2]Mathematics, Süleyman Demirel University, Turkey,
E-mail(s): gozdetukel@isparta.edu.tr ahmetyucesan@sdu.edu.tr

Abstract

We introduce the problem of the relaxed elastic Lie quadratic in the Lie algebra of a Lie group endowed with bi-invariant Riemannian metric. Then we characterize relaxed elastic Lie quadratics by the Euler-Lagrange equations with two boundary conditions in Lie algebra $\mathfrak{g}$.

Key words: Relaxed elastic Lie quadratics, Lie groups, Lie algebra.

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Reliability bounds of dependent linear consecutive k-out-of-n:G systems

Megraoui Fatima Zohra[1], Soheir Belaloui[2]

[1] Higher School of Finance and Accounting of constantine,
Département de Mathématiques Université frères Mentouri
Constantine,

[2] Département de Mathématiques Université frères Mentouri
route d'Ain El Bey,25017 Constantine,
E-mail(s): meghraouifatima@yahoo.fr, s -belaloui@yahoo.fr

Abstract

Most of researches in the reliability theory dealt to study the independence between components in a system. But, in many real systems, dependence between the components is one of the intractable realistic assumptions that need to be carefully considered.

Then, the main purpose of this paper is to provide sharp upper and lower bounds for the reliability of linear consecutive k-out-of-n:G systems consisting of dependent components with identical or arbitrary distribution functions. Some comparisons are done and many examples are treated to prove the performance of the proposed method.

Acknowledgement:

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Riemannian Submersions with Quarter-Symmetric Metric Connection

Hakan Demir[1], Ramazan Sarı[2]

[1] Institute of science, Amasya University Turkey
[2] Gümüşhacıköy Hasan Duman Vocational Scools, Amasya University, Turkey
Email(s): hakandemir@hitit.edu.tr, ramazan.sari@amasya.edu.tr

Abstract

In this paper we study Riemannian submersions from a Riemannian manifold with a quarter-symmetric metric connection onto a Riemannian manifold. We investigate O'Neill's tensor fields for quarter-symmetric metric connection, check the Schouten connection and derive the covariant derivative of O'Neill's tensor fields. We show that this tensors are not skew symmetric. We obtain derivatives of those tensor fields and compare curvatures of the total manifold, the base manifold and the fibres by computing curvatures.

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Rough Statistical Convergence of Double Sequences of Fuzzy Numbers

Ömer Kişi[1], Erhan Güler[2]

[1,2]Deparment of Mathematics, Faculty of Science, Bartın University, Turkey
E-mail(s): okisi@bartin.edu.tr, eguler@bartin.edu.tr

Abstract

In this study, we introduce the notion of rough statistical convergence of double sequences in the fuzzy setting, which generalizes rough convergence of sequences of fuzzy numbers. We define the set of rough statistical limit points of a double sequence of fuzzy numbers and prove some results associated with these notions.

Keywords: fuzzy number; rough convergence; double seqeunce

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Sasaki-Kenmotsu manifold

Gherici BELDJILALI[1], Habib BOUZIR[2]

[1,2]Laboratory of Quantum Physics and Mathematical Modeling (LPQ3M),
University of Mascara, Algeria ,
E-mail(s): gherici.beldjilali@univ-mascara.dz
habib.bouzir@univ-mascara.dz

Abstract

In [2], K. Yano introduced the notion of *f*-structure on a $(2n+s)$-dimensional manifold as a tensor field f of type (1,1) and rank $2n$ satisfying $f^3 + f = 0$. Almost complex ($s = 0$) and almost contact ($s = 1$) structures are well-known examples of *f*-structures. In this context, D.E. Blair [1] defined *K*-structures (and particular cases of *S*-structures and *C*-structures). Then, *K*-structures are the analogue of Kählerian structures in the almost complex geometry and *S*-structures (resp., *C*-structures) of Sasakian structures (resp., cosymplectic structures) in the almost contact geometry.

In this talk, we will present a class of structures in an even dimensional diffierentiable Riemannian manifold ($s=2$) which we call almost bi-contact metric structures to indicate the presence of two associated vector fields. Next, we investigate a particular type belonging to this class which we call Sasaki-Kenmotsu structure which is not in S-structures neither in C-structures nor in K-structures. This kind of structures combines the Sasakian structure and the Kenmotsu structure simultaneously. Then, some basic properties of this structure is discussed, also we construct an interesting class of examples to prove the existence of this type in $(2n + 2)$-dimensional Euclidean space .

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Semisymmetric ($N(K)$, Ξ) Manifolds

Mukut Mani Tripathi[*] , **Punam Gupta**[#]

[*] Department of Mathematics, Banaras Hindu University
Varanasi-221005, U.P., INDIA
[#]Department of Mathematics & Statistics, Dr. Harisingh Gour University,
Sagar-470003, M.P., INDIA

Abstract

($N(k)$, ξ)-semi-Riemannian manifolds are defined. Examples and properties of ($N(k)$, ξ)-semi-Riemannian manifolds are given. Some basic relations involving T_a-curvature tensor in ($N(k)$, ξ)-semi-Riemannian manifolds are proved. It is proved that if M is an n-dimensional ξ-T_a-flat ($N(k)$, ξ)-semi-Riemannian manifold, then it is η-Einstein under an algebraic condition. It is also proved that a semi-Riemannian manifold, which is T-recurrent or Tsymmetric, is always T-semisymmetric, where T is any tensor of type (1, 3). (T_a, T_b)-semisymmetric semi-Riemannian manifold is defined and studied. Several interesting results for T_a-semisymmetric, T_a-symmetric and T_a-recurrent ($N(k)$, ξ)-semi-Riemannian manifolds are obtained. The definition of (T_a, S_{Tb})-semisymmetric semi-Riemannian manifold is given. (T_a, S_{Tb})-semisymmetric ($N(k)$, ξ)-semi-Riemannian manifolds are classified. Some results for T_a-Riccisemisymmetric ($N(k)$, ξ)-semi-Riemannian manifolds are obtained.

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Slant Helices of (k,m)-type according to the ED-frame of first kind in Minkowski 4-space

Fatma BULUT[1], Mehmet BEKTAŞ[2]

[1]Mathematics, Bitlis Eren University, Turkey,
[2] Mathematics, Fırat University, Turkey,
E-mail(s): fbulut@beu.edu.tr, mbektas@firat.edu.tr

Abstract

In this paper, we obtain slant helices of k-type according to the extended Darboux frame (or shortly ED-frame) field of first kind (case 1) in 4-dimensional Minkowski space E_1^4. Also, we present some characterisations of slant helices and determine (k,m)-type slant helices for the ED-frame in Minkowski 4-space.

Key words: k-type slant helix, (k,m)-type slant helix, Minkowski 4-space.

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Slant Helices of (k,m)-type according to the ED-frame of second kind in Minkowski 4-space

Fatma BULUT[1]

[1]Mathematics, Bitlis Eren University, Turkey,
E-mail(s): fbulut@beu.edu.tr

Abstract

In this paper, we obtain slant helices of k-type according to the extended Darboux frame (or shortly ED-frame) field of second kind (case 2) in 4-dimensional Minkowski space E_1^4. Also, we present (k,m)-type slant helices for the ED-frame in Minkowski 4-space.

Key words: Slant helix, (k,m)-type slant helices, Minkowski 4-space.

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Solution of Linear Volterra Integral Equations of Second Kind Using Shehu Transform

Hayriye Bozburun[1], Haldun Alpaslan Peker[2]

[1]Graduate School of Natural and Applied Sciences, Selcuk University, Turkey,
[2]Department of Mathematics, Faculty of Science, Selcuk University, Turkey,
E-mails: hay4292@gmail.com (ORCID: 0000-0001-9468-9539),
pekera@gmail.com (ORCID: 0000-0002-1654-6425)

Abstract

Volterra integral equations are a special type of integral equations. They are divided into two groups referred to as first and second kind. It was shown that Volterra integral equations can be derived from initial value problems. Therefore, the solution of Volterra integral equation is much easier than the original initial value problem. Volterra integral equations arise in many scientific applications such as spread of epidemics, population dynamics, neutron diffusion problems, heat transfer problems, radiation transfer problems and electric circuit problems [1,2]. In this study, we discussed the solution of linear Volterra integral equations of second kind using Shehu transform [3].

Keywords: Shehu Transform, Integral Equation, Linear Volterra Integral Equation

Acknowledgement: This study is a part of the M.Sc. Thesis of the first author.

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Solution of Linear Volterra Integro-Differential Equations of Second Kind Using Shehu Transform

Hayriye Bozburun[1], Haldun Alpaslan Peker[2]

[1]Graduate School of Natural and Applied Sciences, Selcuk University, Turkey,
[2]Department of Mathematics, Faculty of Science, Selcuk University, Turkey,
E-mails: hay4292@gmail.com (ORCID: 0000-0001-9468-9539),
pekera@gmail.com (ORCID: 0000-0002-1654-6425)

Abstract

Integro-differential equation is an equation where both differential and integral operators appeared together in the same equation. These equations have found extensive applications in applied sciences since it was established by Volterra [1]. Integro-differential equations arise in many mathematical modelling of real life problems such as glass forming process, diffusion process, neutron diffusion problems, heat transfer problems, nanohydrodynamics, epidemiology, circuit analysis [2,3]. A special class of these equations are the Volterra type which have been used to model heat and mass diffusion processes, biological species coexisting together with increasing and decreasing rate of growth, electromagnetic theory and ocean circulations, among others [3]. In this study, we discussed the solution of linear Volterra integro-differential equations of second kind using Shehu transform [4].

Keywords: Shehu Transform, Integro-Differential Equation, Linear Volterra Integro-Differential Equation

Acknowledgement: This study is a part of the M.Sc. Thesis of the first author.

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Some Characterizations of Super Quasi-Einstein Manifold Admitting Ricci Soliton

Halil İbrahim Yoldaş

Mathematics, Mersin University, Turkey,
E-mail: hibrahimyoldas@gmail.com

Abstract

In this work, some special vector fields on a super quasi-Einstein manifold admitting a Ricci soliton are examined. Some necessary conditions for such a manifold to be quasi-Einstein manifold are obtained. Also, some important characterizations for such a manifold are given.

Some Counterexamples of Real Analysis

Alpgiray Tekin[1]

1Mathematics, Ahi Evran University, Turkey,

E-mail(s): salt.huk@hotmail.com

Abstract

Counterexamples have great educational value, because they serve to illustrate the limits of mathematical facts. Every mathematics course should include counterexamples that convince students that some misconceptions are false, the converse of a theorem does not hold, and each hypothesis of a theorem is essential. In this presentation, we give some counterexamples of real analysis appeared in [1,2,3].

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Some Existence and Stability Results of Generalized Sturm-Liouville and Langevin Equations with Hadamard Fractional Derivatives

Saadi Abdelkader
Faculty of Exact Sciences, Tahri mohamed University, Bechar, Algeria,
E-mail: mathsaadi@yahoo.fr

Abstract

In this paper, we study existence, uniqueness and Ulam-Hyers stability of solutions for integro-differential equations involving two fractional orders. By using Banach's fixed point theorem, we obtain some sufficient conditions for the existence and uniqueness of solution for the mentioned problem. Furthermore, we derive the Ulam-Hyers stability and the generalized Ulam-Hyers stability of solution. At the end, an illustrative example is discussed.

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Some Fixed Point Theorems in Partially Ordered Metric Spaces

Seher Sultan Yeşilkaya
Department of Mathematics, Kahramanmaraş Sütçü Imam University, Turkey,
E-mail: sultanseher@gmail.com

Abstract

Ran and Reurings [1] proved a fixed point theorem on a partially ordered metric space. Then several authors considered the problem of existence (and uniqueness) of a fixed point for contraction type operators on partially ordered sets, see for examples [2-4]. Recently, Jleli and Samet [5] introduced a new type of contraction which is called the θ -contraction and established some new fixed point theorems for such a contraction in the context of generalized metric spaces. Following by Ran and Reurings, Jleli and Samet [5], we introduce some fixed point theorems in fixed point theory. The purpose of this study is to present some fixed point results for self-generalized contractions in partially ordered metric spaces. These results extend the main results of many comparable results from the current literature.

Keyword(s): fixed point, single valued mapping, partially ordered metric space.
Acknowledgement: The author would like to thank the anonymous reviewers for their valuable comments.

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Some fixed point theorems via C-class functions in b-metric spaces

Taieb Hamaizia

Department of informatic and mathematics, OEB university, Algeria

E-mail(s): tayeb042000@yahoo.fr

Abstract

This paper is devoted to present some fixed points for self maps under C-class functions in b-metric spaces, Our results extended and generalized previous results in metric spaces and b-metric spaces.. Moreover, some examples are given to support the main results.

Some Properties of The Pre-orders Obtained by Some Topological Closure Operators

Funda Karaçal[1], Ümit Ertuğrul[2], M. Nesibe Kesicioğlu[3]

[1,2]Mathematics, Karadeniz Technical University, Turkey,
[2]Mathematics, Recep Tayyip Erdoğan University, Turkey,
E-mail(s): fkaracal@yahoo.com, uertugrul@ktu.edu.tr, nesibe.kesicioglu@erdogan.edu.tr

Abstract

In this paper, the pre-order is defined by means of the topological operator c",$\ast$. Some properties of the preorders are investigated under some restrictions on the set A. The relationship between the selection of the set A and the obtained pre-orders is revealed. Moreover, an equivalence relation is defined and some properties of the relation are researched. Also, we define a uninorm on the quetient set of L by the relation $\sim$.

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Some results about the λ- Aluthge transform

Sohir Zid[1], Safa Menkad[2]

[1]Department of Mathematics University of Batna 2, Algeria,

[2] Department of Mathematics, University of Batna 2, Algeria,

E-mail(s): sohirzid@mail.com, s.menkad@univ-batna2.dz

Abstract

Let $T \in B(H)$ be a bounded linear operator on a Hilbert space H, and let $T = U|T|$ be the polar decomposition of T. For any $\lambda \in [0, 1]$, the λ-Aluthge transform of T is defined by $\Delta_\lambda(T) = |T|^\lambda U|T|^{1-\lambda}$. In this paper, we show that several properties which are proved for the usual Aluthge transform (i.e. the case $\lambda = 1/2$) also hold for λ-Aluthge transforms with $\lambda \in [0, 1]$.

Keywords: Polar decomposition, λ- Aluthge transform, reduced minimum modulus.

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Some results of the class of D-normal operators

Elgues Anissa[1], Menkad Safa[2]

[1]Mathematics, Batna 2 University, Algeria,
[2]Engineering, Batna 2 University, Algeria,
E-mail(s): elguesanissa@yahoo.com , menkad_safa@yahoo.fr

Abstract

Let B (H) be the space of all bounded linear operators on a finite complex Hilbert space H, in this poster we present a new class of operators called D-normal operators as a generalization of normal operators, for a bounded linear operator T on a Hilbert space H using the Drazin TD inverse of T, After establishing the basic properties of such operators and discuss how this class of operators is distinct from several other operator classes.

Keywords : Drazin inverse · normal operator . N-normal operators · D-normal operators ·

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Some Results on the Lights Out Game Using the Activation Numbers of Vertices

Ahmet Batal[1]

[1]Mathematics, Izmir Institute of Technology, Turkey,
E-mail: ahmetbatal@iyte.edu.tr

Abstract

The Lights Out is a game which can be played on any simple graph. Initially, every vertex of the graph has a configuration state on or off. The aim of the game is to turn all vertices off by activating vertices, where each activation of a vertex u switches the states of u and every vertex adjacent to u. It turns out that there is always a solving pattern for the all-ones configuration, where initially each vertex is at the on state. A vertex may be activated in all, exactly half or none of the solving patterns of all-ones configurations, and according to its activation behavior we assign a number, which we call the activation number, to every vertex. Using this concept we prove several results. First, we show that every always solvable graph, where every configuration is solvable, admits a chain of always solvable subgraphs which differ from one another by only a vertex. Second, we characterize always solvable trees by showing that every always solvable tree is a special join graph of some of its always solvable subtrees. Third, we show that the nullity, the dimension of the space of null solutions, of a tree can be characterized by the cardinality of its minimal partition into always solvable subtrees.

Key words: Lights Out, all-ones problem, odd dominating set

Some Semi-Symmetry Conditions On Para-Kenmotsu Manifolds Admitting A Type Of Semi-Symmetric Metric Connection

İnan ÜNAL[1]

[1]Computer Engineering, Munzur University, Turkey,
E-mail: inanunal@munzur.edu.tr

Abstract

The aim of presented paper is to examine para-Kenmotsu manifolds admitting a type of semisymmetric metric connection. We classify this kind of manifolds via flatness and semi-symmetry conditions on the m-projective curvature tensor.

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Spectral Analysis of Non-selfadjoint Matrix Schrödinger Operator on the Half-line with General Boundary Conditions at Origin

Gökhan MUTLU[1]

[1]Department of Mathematics, Faculty of Science, Gazi University, Turkey,
E-mail: gmutlu@gazi.edu.tr

Abstract

We examine the spectral properties of the non-selfadjoint matrix Schrödinger equation on the half-line

$$-y'' + Q(x)y = k^2, \qquad 0 < x < \infty,$$

where k^2 is a spectral parameter and $n \times n$ matrix potential $Q(x)$ is symmetric but non-Hermitian, Lebesgue measurable on $(0, \infty)$ and satisfies the condition

$$\int_0^\infty (1+x)\|Q(x)\|dx < \infty,$$

where "$\|,\|$" denotes any of the equivalent matrix norms. We assume the most general boundary conditions at origin given by

$$Ay(0) + By'(0) = 0,$$

such that the constant $n \times n$ matrices A and B satisfy

$$AB^T - BA^T = 0,$$
$$Rank\,(A|B) = n,$$

where "A^T" denotes the transpose of A. We obtain the resolvent operator, the point spectrum, continuous spectrum and the set of spectral singularities of this non-selfadjoint matrix Schrödinger operator on the half-line.

Key Words: matrix Schrödinger equation, Jost matrix, resolvent, continuous spectrum, eigenvalues, spectral singularities.

Stability of double diffusive convection of a Couple Stress fluid filled with nanofluid

S.Kapoor
Department of Education in Science and Mathematics, Regional Institute of Education (NCERT), Bhubaneswar, Utkal University, BBSR
E-mail: saurabh09.ncert@gmail.com

Abstract

In a horizontal layer of nanofluid, stability of double-diffusive convection is investigated. Stability of nanofluid has various effects by the features of couple-stress fluid, suspended nanoparticles and investigated under the consideration of momentum and thermal slip boundary conditions. The nanoparticle concentration flux is supposed to vanish on the boundaries which minimizes the possibility of oscillatory convection and only stationary convection takes place. We have analysed the impact of the physical parameters, like the thermo-solutal Lewis number, thermo-nanofluid Lewis number, couple stress parameter, Soret parameter, Dufour parameter and solutal-Rayleigh Number and compared with the published work. Between the present paper and earlier published results a very good agreement is established. Kumar et al.in (2016) analyzed effects of horizontal magnetic field and rotation on thermal instability of a couple-stress fluid through a porous medium. Kumar et al.(2017) studied the effect of horizontal magnetic field and horizontal rotation on thermosolutal stability of a dusty couplestress fluid through a porous medium. Chand and et al. discussed thermal instability in a layer of couple stress nanofluid saturated porous medium. Singh(2018) analyzed double-diffusive convection of synovial (couple-stress) fluid in the presence of hall current through a porous medium. Rana et al.(2018) studied the stability analysis of double-diffusive convection in a couple stress nanofluid. Keeping in view of the contribuation of the above researcher an attempt has been taken here to discuss the stability of double diffusive convection of a couple stress fluid filled with nano fluid.The above study has large number of application in the distinguished filed.

Stability Of Essential Spectra Of Closed Operators Under T-Compact Equivalence And Applications

Nassima KHALDI[1], Bekkai MESSIRDI[2]

1Department of Mathematics, University of Sciences and Technology of Oran, Mohammed Boudiaf, USTO, Oran, Algeria.
Laboratory of Fundamental and Applicable Mathematics of Oran (LMFAO), University of Oran,
2Laboratory of Fundamental and Applicable Mathematics of Oran (LMFAO), University of Oran 1, Ahmed Benbella,
E-mail(s): kh_nassima@hotmail.fr, bmessirdi@yahoo.fr

Abstract

The main subject of this paper is to introduce and study the concept of T-compact equivalence of closed linear operators in Hilbert spaces. Many results are proved via this equivalence, especially the invariance of essential spectra of T-compact equivalent closed operators. The results obtained are used to describe some Fredholm essential spectra of transport operators.

Keywrods: weak and strong T-compact equivalence, closed operators, essential spectra, stability, transport operator

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Stability of integro-dynamic equations with multiple functional delays on time scales

Kamel Ali Khelil[1], Abdelouaheb Ardjouni[2]

[1]Laboratory of Analysis and Control of Differential Equations, Guelma University, Algeria
[2]Department of Mathematics and Informatics, Souk Ahras University, Souk Ahras, Algeria,
E-mail(s): k.alikhelil@yahoo.fr, abd_ardjouni@yahoo.fr

Abstract

In this work, we use the fixed point theorem to obtain asymptotic stability and stability results about the zero solution for integro-dynamic equation with delay on time scale.

Keywords: Fixed point, integro-dynamic equations, stability.

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Stabilization of the Schrödinger Equation with a delay term in boundary feedback and memory

Nawel Abdesselam

University of Laghouat, Algeria.
E-mail(s): nawelabedess@gmail.com

Abstract

In this work, we investigate the effect of time delays in boundary and memory feedback stabilization of the Schrödinger equation. We establish sufficient conditions on the delay term that guarantee the exponential stability of the solution. These results are obtained by using suitable energy functionals and some estimates.

Stabilization of the Schrödinger equations with memory and fractional boundary

Nawel Abdesselam
Mathematics, Laghouat University, Algeria,
E-mail(s): nawelabedess@gmail.com

Abstract

This work is concerned with stabilization of a Schrödinger equation by a linear boundary term combining fractional damping and memory on part of the boundary. We prove that the energy decays to zero exponentially if the kernel decays exponentially at infinity.

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Statistical study of the effect of temperature on the deterioration of a polluted mechanical contact (elastohydrodynamics)

Sabrina Mattallah[1,2] Mohamed Rafik Sari[3]

[1] Department of Mechanics. University of Skikda. Algeria
[2]Laboratory of Mechanical Engineering and Materials
[3]Department of Mechanics. University of Annaba. Algeria
E-Mail: sabmat4@gmail.com / s.matallah@univ-skikda.dz

Abstract

The increase in temperature in mechanical contact is one of the multiple causes of degradation of friction surfaces; the lubrication of elastohydrodynamic contacts is also threatened by pollution which is an inevitable problem. Several studies have tried to treat this problem. The study of lubrication brings together all the knowledge relating to the diagnosis and improvement of the efficiency of protective films, in order to increase the control of friction, the wear of mechanical interfaces, cool and prevent their damage. In our work we tried to make a statistical modeling of the temperature of a contact in lubricated C40 steel (elastohydrodynamic), subjected to internal and external operating factors, this modeling is carried out by tests planned with the Taguchi tables. The present experimental study includes the influence of parameters such as, the speed, the size of the grains of sand, the viscosity and the charge on the increase in temperature which in turn causes the degradation of the surfaces in contact.

Keywords: elastohydrodynamic contact, Lubrication, solid pollution, Wear, Experimental design..

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Structures of Timelike Canal Surfaces using Quasi Frame

Gul Ugur Kaymanli [1]

[1]Mathematics, Cankiri Karatekin University, Turkey,
E-mail: gulugurk@karatekin.edu.tr

Abstract

In geometry, a canal surface in three dimensional space is a surface formed as the envelope of a family of spheres whose centers lie on a space curve, its directrix. If the radius of the generating spheres are constant the canal surface is called pipe surface. In this study, we introduce three kinds of canal surfaces with respect to quasi frame $\{t,n_q,b_q\}$ in Minkowski 3-space. Giving characterizations of timelike canal surfaces by using quasi frame in Minkowski 3–space, some properties of these surfaces are examined by computing first and second fundamental forms. We, also give the some geometric properties of pipe surfaces with the help of Gaussian and mean curvatures of canal surfaces in Minkowski 3-space.

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Studies on Reliability of Circular Multi-State Consecutive-k-out-of-n System under a Shock Model

Besma Bennour[1], Soheir Belaloui[2]

[1]Department of informatics and Mathematics, Larbi Ben M'hidi University, Oum El Bouaghi, Algeria,
[2]Department of Mathematics, Frères Mentouri University, Constantine 1, Algeria,
E-mail(s): besma_bennour@yahoo.fr, s_belaloui@yahoo.fr

Abstract

Our main aim in this paper is to study the reliability of circular multi-state consecutive-k-out-of-n:G system subjected to shocks, with dependent components. First, we describe the system by using the extreme shock model. Second, we obtain the reliability formula of the system in question. Then, the survival function of the time spent by the system in a perfect functioning state such the random time of the shock follows phase-type distribution. Finaly, we give some numerical examples.

Keywords: Circular multi-state "consecutive-k-out-of-n" system; Shock model; Reliability function.

A Study of General Sumudu Transform for Solving of General Quasi-Linear Differential Equations in Domain with m-Variables

Mohammed S. Mechee, Abbas J. Naeemah

Department of Mathematics, Faculty of Education , University of Kufa , Najaf, Iraq
E-mail: mohammeds.abed@uokufa.edu.iq

Abstract

In this paper, we have studied the extension of Sumudu transform to deal with functions which have more than three-variables. Furthermore, the main properties of the general m-dimensional Sumudu transform have been studied. In addition, we have compared the properties of the general m-dimensional Laplace and Sumudu transforms with their main characteristics. Several examples of di_erential equations have been solved using Laplace and Sumudu transforms. Finally, the general solution which that contains m-variables for general n th-order PDEs has been constructed using two transforms.

Keyword: Sumudu Transform; Laplace Transform; Fractional Differential Equations (FrDEs);

Binomial series; Models

Study Of Null-Controllability Using The Sentinel Method As A Tool

Rezzoug Imad[1], Oussaief Taki-Eddine[2]

1,2 Department of Mathematics and Informatics. Faculté SESNV. Larbi Ben M'hidi University, Oum El Bouaghi. Laboratory of dynamical systems and control. Algeria.

E-mail(s): rezzoug.imad@univ-oeb.dz, taki_maths@live.fr

Abstract

We study a problem of null-controllability for the parabolic heat equation with linear constraints on the control. The main tool used to solve the problem of existence and convergence is an observability inequality of Carleman type, which is 'adapted' to the constraints. We then apply the obtained results to the sentinels theory of Lions.

Suction/Injection Effects on Unsteady Magneto - Hydrodynamics (MHD) Oscillatory Flow of a Couple Stress Fluid in an Asymetric Tapered Channel with Heat and Mass Transfer

Joseph Kpop Moses
Department of Mathematical Sciences, Kaduna State University, Kaduna, Nigeria.
E-mail: kpop.moses@kasu.edu.ng

Abstract

Suction/injection effects on Unsteady Magneto – hydrodynamics (MHD) oscillatory flow of a couple stress fluid in an asymmetric tapered channel with heat and mass transfer have been investigated. The channel is filled with porous medium. The flow is incompressible and the temperatures prescribed at the channel walls are non – uniform. A uniform magnetic field is applied transverse to the channel. Non-dimensional parameters are used to make the governing equations non-dimensioned to dimensionless form. Closed form solution method is used to solve the dimensionless equations that govern the flow and the solutions for velocity, temperature and concentration are obtained. The impact of flow parameters on the velocity profile, the temperature distribution, the concentration distribution, the skin friction, the Nusselt number and the Sherwood number are analyzed and graphically demonstrated in detail. From many obtained results it is concluded that the Hartman number suppresses the turbulence of the flow, the suction injection parameter speeds up the speed, thermal radiation increases the temperature distribution and the chemical reaction parameter improves the concentration distribution.

Teaching Mathematics through coding and programming. Programming with students during math lessons

Robert Kosova[1], Rinela Kapçiu[2], Fiona Teli[2], Oltiona Sula[2], Fatjona Bushi[2], Krisel Tole[2]

[1]Mathematics. University "A. Moisiu". Durrës, Albania,
[2]Computer Science. University "A. Moisiu". Durrës, Albania,
E-mail: robertko2000@gmail.com

Abstract

Mathematics has always been a traditional science. And, that will be always the case in the future. Algebra, Euclidean Geometry, Trigonometry, and all the classic definitions and theorems of mathematics will be always in our books, notebooks. Blackboard and chalk will be permanent elements of teaching, where math professors will write and prove math theorems, draw graphs, and solve problems. However, with the development of Information Technology, we are witnessing that many mathematical issues, problems, and calculations, are solved with the help of familiar programs like Java, C ++, Python, etc. The first examples of computer programming to explore mathematics are found in the 1960s, (Feurzeig, 1969), although the most prominent pedagogical approach was proposed by Seymour Papert. He was the first to note that young people learn best when they are engaged in the construction of digital and/or physical artifacts that are personally meaningful to them and that can be shared with others (Papert, 1980). The use of software and applications will help students to understand and solve math problems, this applies especially to students who will become high school math teachers. Starting from EXCEL, students can try to do simple tasks such as multiplication of matrices, solving algebraic equations, and others. Students can also write code and programs in Java, C ++, Python, etc., to handle and solve problems of Discrete Mathematics, Number Theory courses, etc. They can generate Pythagorean triples, verify prime and perfect numbers, generate Ferma and Mersenne numbers, etc. The coding and programming, in addition to being a fascinating process in itself, will become even more fascinating when it comes to finding solutions and results, that will strengthen the knowledge of math concepts, aiding students and professors in working together for a better and more effective classroom.

Keywords. Mathematics, coding, teaching, programming, classroom.

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The Bounds for the Length Between Dirichlet and the Semi-Periodic Eigenvalues of Hill's Equation with Symmetric Single Well Potential

Elif Başkaya[1]

[1]Mathematics, Karadeniz Technical University, Turkey,
E-mail: elifbekar@ktu.edu.tr

Abstract

In this paper, the length between Dirichlet and the semi-periodic eigenvalues is estimated for Hill's equation with continuous and periodic potential. The potential is also symmetric to the midpoint and nonincreasing on the first half of the related interval. This function is known as symmetric single well potential in quantum mechanics.

Keywords: Hill's equation, Dirichlet eigenvalues, semi-periodic eigenvalues, symmetric single well potential

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The Effect of Adjacency Relations to the Digital Homotopic Distance

Ayse Borat

Mathematics, Bursa Technical University, Turkey,
E-mail: ayse.borat@btu.edu.tr

Abstract

Homotopic distance between continuous maps $f,g:X\to Y$ as defined by Macias-Virgos and Mosquera-Lois in [1] is the least integer k if there are open subsets $U_0,U_1,\ldots,U_k$ covering X such that $f|_{Ui}\simeq g|_{Ui}$ for each i=0,1,…,k. In this talk, we will introduce a digital analog of homotopic distance and introduce some basic properties such as how the digital homotopic distance is affected if we change the adjacency relations on domain and codomain.

Keywords: Homotopic distance, digital topology, digital homotopic distance.

The evaluation of online teaching performance in high education using Google Classroom platform : A Fuzzy AHP method

Phd. Daniela Halidini Qendraj[1], Phd. Evgjeni Xhafaj[2]

[1]Department of Mathematics, Faculty of Information Technology, Aleksander Moisiu University Durres, Albania,
[2]Department of Mathematics, Faculty of Mathematics and Physics Engineering, Polytechnic University of Tirana, Albania.
E-mails: daniela_qendraj@hotmail.com, genaxhafa@yahoo.com

Abstract

The emergence of the Pandemic Covid-19 caused to the education system the transition from classroom learning to online learning almost all over the globe. One of the main difficulties was the using and learning of a platform by lecturer and students. Google classroom was one of the platforms that were adapted very quickly. Through the unified theory of acceptance and use of technology 2 (UTAUT2) we have evaluated five criteria out of eight in total, relating to performance and use of this technology for students of mathematics courses in total 194 from "Alexander Moisiu" University Durres. The main criteria are considered Performance Expectancy (PE), Social influence (SI), Habit (HT), Behavioral Intention (BI), and Use Behavior (UB). Each of these criteria has their sub-criteria: PE1, PE2, PE3, PE4, SI1, SI2, SI3, HT1, HT2, HT3, HT4, BI1, BI2, BI3, UB1, UB2. The method used to evaluate the most important criteria and their sub-criteria is Fuzzy AHP with trapezoidal fuzzy numbers. The students answered the questionnaire after completing the course study and passing the exam. According to the study results, the most important criterion was Performance Expectancy followed by Behavioral Intention, Social Influence, then Habit, and the last Use Behavior. Regarding the sub-criteria the most important were PE4, BI2, SI3, HT2 and UB1. These results help students and lecturers to orient themselves towards online learning and make improvements to this teaching method.

Keywords: Google Classroom, Fuzzy AHP, trapezoidal fuzzy numbers, online learning.

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The Lattice of Fuzzy Topologies Generated by Fuzzy Relations

Soheyb Milles[1]

[1]Laboratory of Pure and Applied Mathematics, Department of Mathematics, University of Msila, Algeria

E-mail(s): soheyb.milles@univ-msila.dz

Abstract

In a recent paper, Mishra and Srivastava have introduced and studied fuzzy topology generated by fuzzy relation and some basic properties were proved. In this paper, we provide the lattice structure to a family of fuzzy topologies generated by fuzzy relations. Moreover, some its fundamental properties and characteristics are given.

The Nonparametric Estimation of the Robust Regression by the Local Linear Method

Bakhtaoui Ataouia

Laboratory of Statistics and Stocastic Processes,University of Djillali Liabes,
BP 89,Sidi Bel Abbes 2200, Algeria,
E-mail: ataouia.30.01.1993@gmail.com

Abstract

In this work, we study the nonparametric estimation of the local linear regression model when the regressors are a functional random variables. We construct an estimator by combining both local linear ideas and an M-estimation techniques. The main results of this work are the establishment of the almost complete convergence as well as the asymptotic normality for the constructed estimator. These asymptotic results are stated with rate and are proved under a general condition.

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The notion of continuous additive units of product systems of Hilbert modules

Biljana Vujošević

Mathematics, University of Belgrade, Serbia
E-mail: bvujosevic@matf.bg.ac.rs

Abstract

We consider continuous additive units and roots of a central unital unit in a spatial product system of two-sided Hilbert modules. We prove that the set of all continuous additive units of a central unital unit has a two-sided Hilbert module structure. Also, we show that the set of all roots is a Hilbert two-sided submodule therein.

Keywords: additive unit, Hilbert module, product system of Hilbert modules

The Number of m-potent Elements in Subset of Catalan Monoid

Emrah Korkmaz[1]

[1]Mathematics, Çukurova University, Turkey,
E-mail: emrahkorkmaz90@mail.com

Abstract

Let C_n be catalan monoid, that is, the semigroup of all order-preserving and order-decreasing transformations on $X_n = \{1,2,\dots,n\}$, under its natural order. The index and the period of an element b of a finite semigroup S are the least positive integers m and r, respectively satisfying $b^{m+r} = b^m$. An element $a \in S$ with the property that $a^{m+1} = a^m$ is called an m-potent. Let $\mathrm{fix}(\alpha) = \{x \in X_n : x\alpha = x\}$ for any transformation α. For any $Y \subseteq X_n$, the cardinality of $C_{n.Y} = \{\alpha \in C_n : \mathrm{fix}(\alpha) = Y\}$ were computed in [1]. In this note, for any subset Y of X_n, we calculate the the number of m-potent elements in $C_{n.Y} = \{\alpha \in C_n : \mathrm{fix}(\alpha) = Y\}$.

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The Relationship Between Mathematical Problem-Solving and Planning Ability

Birgul Damla Baber Elbistan[1]

[1]Social Science, The University of Göttingen, Germany,
E-mail: birgueldamla.baber@stud.uni-goettingen.de

Abstract

Mathematical problem-solving skills depend on many variables and cognitive skills are one of the most important of them. The purpose of this study is to determine the mathematical problem-solving skills in terms of cognitive aspects. This aims to reveal the relationship between the planning ability and mathematical problem-solving skills at the secondary school level. Empirical quantitative research was done for this purpose. For the measurement of problem-solving skills, a curriculum-based mathematics achievement test, and for assessing the planning ability, a computerized Tower of London test was used. It was applied to a total of 416 students from the fifth, sixth, and seventh grades. As a result of the statistical analysis, a positive significant relationship was found between planning skills and problem-solving skills but there were not any significant differences in terms of gender.

Keywords: Mathematics, Mathematics Achievement, Executive Function, Tower of London Test

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The Solution of Linear First Order Stiff Differential Equations by Applying Haar Wavelet Collocation Method

Mehmet Tarık Atay[1], Abdülkadir Yılmaz[2], Musa Kasım Ağca[2], Onur Metin Mertaslan[1]

[1] Mechanical Engineering, Abdullah Gul University, Turkey,
[2] Mechanical Engineering, Middle East Technical University, Turkey
E-mail(s): mehmettarik.atay@agu.edu.tr, abdulkadir.yilmaz@metu.edu.tr, agca.musa@metu.edu.tr, onurmetin.mertaslan@agu.edu.tr

Abstract

Generally, there are many sorts of problems experienced by various disciplines that can be expressed by differential equations. These issues can be interpreted analytically in more straightforward cases; notwithstanding, computational methods are needed for more complex cases. In such manner, the wavelet-based approaches have been utilizing to compute these sorts of equations more dramatically. The Haar Wavelet is one of the relevant procedures that have a place with the wavelet family which is used to solve stiff ordinary differential equations (ODEs). In this paper, The Haar Wavelet method is applied to stiff differential equations to show the accuracy and ability of this method by comparing it to the analytical solutions. In conclusion, the Haar wavelet method gives satisfactory outcomes to stiff differential problems compared to exact solutions.

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The Usefulness of Mathematical Sciences in Geotechnical Calculation

Boukhatem Ghania[1], Rehab Bekkouche Souhila[2], Mendjel Djenette[3]

[1]Department of Civil Engineering, Badji Mokhtar Annaba University, Laboratory LMGHU, Algeria,
[2,3]Skikda University, Laboratory LMGHU , Algéria
E-mail(s): gboukhatem3@yahoo.fr, solrehab@yahoo.fr, rech_mendjel@yahoo.fr

Abstract

Geometric calculation is a very strong tool in the kinematic approach in geotechnics failure calculation, a method based on the triangular design of virtual failure mechanisms inspired by the shapes observed on reduced models. In this work, we propose a collapse mechanism for the ground under a geotechnical structure and geometrically determining its lengths and surfaces and its equation of equilibrium using trigonometric simplifications. By developing such approach we arrive at a mathematical equation, which depends on a finite number of parameters, we determine its minimum by the Mathcad 2001 software, this minimum represents the limit load of vertically loaded piles, by developing a model in three dimensions. Geometrical computation have a great convenience for geotechnical computation at the collapse which aims to define a field of potentially bearable loads for a structure, and which uses a criterion of rupture based on geometric mathematical computations and not a law of behavior, wich give difficulty of developing such sufficiently realistic law for soils.

Keywords: geometry, pile, failure design, limit load, equations, minimum.

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Three-dimensional CR subanifolds of the nearly Kähler sphere $S^6(1)$ that admit foliation by $S^2(1)$

Miroslava Antić

Faculty of Mathematics, Belgrade University, Serbia,
E-mail(s): mira@matf.bg.ac.rs

Abstract

A submanifold M of an almost Hermitian manifold (N, J) is a CR submanifold if admits a C^∞-differentiable almost complex distribution D $(JD \subseteq D)$, such that its orthogonal complement $D^\perp \subset TM$ is totally real, i.e. $JD^\perp \subseteq TM^\perp$ and they represent the most natural generalization of the notions of almost complex and totally real submanifolds. Here, we are interested in three-dimensional CR submanifolds of the nearly Kähler, six-dimensional sphere $S^6(1)$. In particular, we note that $S^6(1)$ is one of the four six-dimensional, homogeneous nearly Kähler manifolds. One of the first known families of the three dimensional minimal CR submanifolds in $S^6(1)$ was introduced in [2] and [1].

We recall that a submanifold M of a Riemannian manifold (N, g) is said to be ruled, if it admits a foliation with leaves that are totally geodesically immersed into N. We investigate three dimensional CR submanifold of $S^6(1)$ ruled by $S^2(1)$ and give their explicit classification. In particular, we show that the examples given in [1] are of this type.

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Timelike Harmonic Evolute Surfaces of Quasi Binormal Surfaces

Talat Korpinar[1], Gul Ugur Kaymanli[2]

[1]Mathematics, Mus Alparslan University, Turkey,
[2]Mathematics, Cankiri Karatekin University, Turkey,
E-mail(s): talatkorpinar@gmail.com, gulugurk@karatekin.edu.tr

Abstract

In this study, we work on timelike harmonic surfaces of quasi binormal surfaces with q-frame in three dimensional Minkowski space. Using q-frame, we first construct special type of ruled surface called quasi binormal ruled surface, we then study timelike harmonic evolute surfaces of them. The condition for timelike harmonic evolute surface to be Bonnet surface is given for each cases. Later, some geometric properties are examined and an application of results is given.

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Truncated normed vector lattices

Osman Hamza, Ömer Gök

Mathematics, Yıldız Technical University, Turkey,
E-mail(s): hamzaosman61@gmail.com

Abstract

In this presentation, we give the truncated normed vector lattices and their properties. Also, we deal with structure of truncated normed vector lattice and the relation with Banach lattices.

Two solutions for an elliptic nonlocal problem with critical nonlinearity

Meghnafi Mustapha

Department of Mathematics, University of Bechar, Bechar , Algeria.
Email:megnafi3000@yahoo.fr

Abstract

In this work, we investigate the existence and the multiplicity of positive solutions for stationnary elliptic nonlocal problems of Kirchhoff type with Dirichlet conditions on a regular bounded domain in R3 and critical Sobolev exponent. The main results of this paper are obtained using variational methods .

Key words: Nonlocal operator, Palais-Smale condition, Sobolev exponent

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Unbounded Order Convergence and Compactness

Şaziye Ece Özdemir[1]

[1]Mathematics, Pamukkale University, Turkey,
E-mail: saziyeo@pau.edu.tr

Abstract

Unbounded order convergence (or uo-convergence, for short) was first defined for sequences on \sigma-Dedekind complete Riesz spaces by H. Nakano (1948) under the name "individual convergence". The name "unbounded order convergence" was first proposed by R. DeMarr (1964). It is the generalization of almost everywhere convergence. Recently, many researchers have studied on uo-convergence defined on Riesz spaces. Therefore, it is highly important term for Riesz spaces. Moreover,compact operators are of central significance in the theory of operators on Banach lattices. In this talk, we will examine uo-compact operators and their properties. Additionally, the relations of them with other types of compact operators will be studied.

Keywords: Riesz Spaces, Unbounded Order Convergence, Unbounded Order Compact Operators

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Using Factor Analysis and Cluster Analysis as tools for studying the service quality. An evidence from the field of hospitality in Albania

Phd. Evgjeni Xhafaj[1], Phd. Daniela Halidini Qendraj[2]

[1]Department of Mathematics, Faculty of Mathematics and Physics Engineering, Polytechnic University of Tirana, Albania,
[2]Department of Mathematics, Faculty of Information Technology, Aleksander Moisiu University Durres, Albania.
E-mails: genaxhafa@yahoo.com, daniela_qendraj@hotmail.com

Abstract

In an environment of strong competition and continuous development, the hotel sector must improve the quality of service in order to increase customer satisfaction to cope the competition and long-term position in the market. The main purpose of this study is to evaluate the dimensions of service quality and the relationship between the latter, and customer satisfaction in the field of hospitality. The data belong to the year 2018 and the questionnaire was developed by 200 tourists from 10 hotels in Tirana. Is used the service quality model (SERVQUAL) which includes the dimensions reliability, empathy, responsiveness, assurance, and tangibility. The Factor Analysis (FA) technique has been applied to determine the variables that are most important in defining customer satisfaction and has been integrated the Cluster Analysis method to realize a division of the data in groups based on the customer satisfaction level. According to the FA results it was found out that from all of the dimensions taken into consideration, tangibility has the largest loadings with customer satisfaction. The results of this study serve in improving service quality enhancement programs in hotel's sector.

Keywords: Factor Analysis, Cluster analysis, dimension, SERVQUAL.

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Various/Fixed point results of Picard sequence in complete G -metric space

Vishal Gupta[1], Rajani Saini[2]

[1]Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana 133207, India.
[2]Research Scholar, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana 133207, India.
E-mail(s): vishalgupta@gmail.com, rajanisainiraj@gmail.com

Abstract

Our aim in the present paper is to prove some new fixed point results associated to Picard sequence in G -metric spaces. We are presenting the results of Khojasteh et.all [2] for single valued and multivalued mappings in G -metric spaces. We have also given an example in support of our result.

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Various Fixed point results of Picard sequence in complete G -metric space

Vishal Gupta[1], Rajani Saini[2]

[1]Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana 133207, India.
[2]Research Scholar, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana 133207, India.
E-mail(s): vishalgupta@gmail.com, rajanisainiraj@gmail.com

Abstract

Our aim in the present paper is to prove some new fixed point results associated to Picard sequence in G -metric spaces. We are presenting the results of Khojasteh et.all [2] for single valued and multivalued mappings in G -metric spaces. We have also given an example in support of our result..

Acknowledgement: All the authors of this manuscript are very thankful to the organizing committee of this conference for conductiong this type of valuable conference.

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Weak Solutions for Nonlinear Fractional Differential Equations with Integral boundary conditions in Banach Spaces

Mouffak Benchohra[1], Fatima Zohra Mostefai[2]

[1]Sidi eBel-Abbés University, Algeria,

[2]Saida University, Algeria,
E-mail(s): benchohra@univ-sba.dz, fatymath@mail.com

Abstract

The aim of our work is to investigate a class of boundary value problems for fractional differential equations involving nonlinear integral conditions. The main tool used in our considerations is the technique associated with measure of weak noncompactness.

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A model based on fuzzy inference system to analyze the trends of financial market

Sanjeev Kumar
Mathematics, Dr. Bhimrao Ambedkar University
IBS, Khandari Campus, Agra 282002 India
sanjeevibs@yahoo.co.in

Abstract

Stock investment has become an important investment activity and the internet makes it easier to exchange stock information and to make stock transactions. Trading system in stock market is full of uncertainty therefore nobody can make accurate decision for investing their money and therefore investors often lose money due to unclear investment objective. Predicting the stock market is very difficult since it depends on several unknown factors. Technical analysis is sometimes used in financial markets to assist traders to make buying and selling decision. This work will examine a trading model that combines fuzzy logic and technical analysis to find patterns and trends in financial market. To accomplish this goal, the daily data of a financial institute from July 2012 to June 2013 is used. Here take four input factors and use fuzzy logic to find the output. For fuzzifying these input data, trapezoidal membership function is used, and center of gravity method is used for defuzzification of fuzzy output. Finally, observed that this fuzzy logic model gives best result to put on hold with degree of precision 37.587%.

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A Study On The Trigonometric Approximation in Morrey Spaces Using Matrix Methods

Ahmet Hamdi Avsar[1], Yunus Emre Yildirir[2]

[1,2]Mathematics, Balikesir University, Turkey,
E-mail(s): ahmet.avsar@balikesir.edu.tr, yildirir@balikesir.edu.tr

Abstract

In this study, we investigate the error of trigonometric approximation using different two matrix methods and prove some trigonometric approximation theorems with degree of $n^{-\beta}$ in Morrey spaces. Also, to obtain our main results, we prove the boundedness of the conjugate function in this space. Our main results are:

Theorem 1. Let $0 \leq \alpha \leq 2, 1 < p < \infty$ and $f \in L^{p,\alpha}(\mathrm{T})$. Then the estimate

$$\|\tilde{f}\|_{L^{p,\alpha}(\mathrm{T})} \preccurlyeq \|f\|_{L^{p,\alpha}(\mathrm{T})}$$

is valid.

Theorem 2. Let $f \in Lip_{\alpha,p}(\beta), 0 < \beta < 1$ *and* $A = (a_{n,k})$ be a lower triangular matrix with $|S_n^{(A)} - 1| = O(n^{-\beta})$. If one of the following conditions

(i) $(a_{n,k}) \in AMDUMS$,

(ii) $(a_{n,k}) \in AMIUMS$ *and* $(n+1)(a_{n,n}) = O(1)$,

holds, then

$$\|f - T_n(f)\|_{L^{p,\alpha}(\mathrm{T})} = O(n^{-\beta}).$$

In the case of $a_{n,n-k} = \frac{p_{n,n-k}}{P_k}$, this theorem gives the approximation by the Nörlund means in this space.

Theorem 3. Let $f \in Lip_{\alpha,p}(\beta), 0 < \beta < 1$ *and* $A = (a_{n,k})$ be a lower triangular matrix with nonnegative entries and row sums 1. If one of the conditions

(i) $(a_{n,k}) \in AMIMS$,

(ii) $(a_{n,k}) \in AMDMS$ *and* $(n+1)a_{n,0} = O(1)$,

is valid, then

$$\|f - \tau_n(f)\|_{L^{p,\alpha}(\mathrm{T})} = O(n^{-\beta}).$$

In the case of $a_{n,k} = \frac{p_{n,k}}{P_k}$, this theorem gives the approximation by the Riesz means in this space.

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Ambarzumyan's theorem with eigenparameter in the boundary conditions on closed sets

İbrahim Adalar

Zara Veysel Dursun Colleges of Applied Sciences,
Sivas Cumhuriyet University, Zara/Sivas, Turkey,
E-mail: iadalar@cumhuriyet.edu.tr

Abstract

Ambarzumyan investigated the Schrödinger operator with Neumann boundary conditions, and proved that if its spectrum consists of zero and infinitely many other square integers, then the potential is zero. Ambarzumyan's result is exceptional. In general, two spectra is needed to determine the potential. The goal of this study to prove an Ambarzumyan-type theorem with eigenparameter in the boundary conditions on closed sets.

If T is a closed subset of $\mathbb{R}$ it called as a time scale. The jump operators σ, ρ and graininess operator on T are defined as follow:

$$\sigma : T \to T,\ \ \sigma(t) = \inf\{s \in T, s > t\},\ \textit{if}\ \ t \neq \sup T,$$
$$\rho : T \to T,\ \ \rho(t) = \sup\{s \in T, s < t\},\ \textit{if}\ \ t \neq \inf T,$$
$$\sigma(\sup T) = \sup T,\ \ \rho(\inf T) = \inf T.$$
$$\mu : T \to [0, \infty),\ \ \mu(t) = \sigma(t) - t.$$

We consider the eigenvalue problem L:

$$-y^{\Delta\Delta} + q(t)y^{\sigma} = \lambda y^{\sigma}, \quad t \in T^{k^2}$$

subject to the boundary conditions

$$y^{\Delta}(a) = 0$$
$$y^{\Delta}(\rho(b)) + f(\lambda)y(\rho(b)) = 0$$

where T is the time scale, $a = \inf T$, $b = \sup T$, $q(t)$ is a real-valued continuous function on T and λ is the spectral parameter. Additionally, we assume that $a \neq \rho(b)$, $f(\lambda) = a_1\lambda + a_2$, $a_i \in \mathbb{R}$.

Our result is as follows:

Theorem: Let λ_1 be the first eigenvalue of L and $1 - f(\lambda_1)\mu(\rho(b)) \neq 0$.

If $\lambda_1 = \dfrac{1}{\rho(b) - a}\left(f(\lambda_1) + \int_a^{\rho(b)} q(t)\Delta t \right)$ then $q(t) \equiv \lambda_1$.

Keywords: Ambarzumyan Theorem, Time Scale, Inverse Problem.

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Laplace Transform Collocation Method for Fractional order Pseudo- Hyperbolic Differential Equation

Mahmut Modanlı [1],

[1]Mathematics, Harran University, Turkey,
E-mail(s): mmodanli.harran@edu.tr

Abstract

In this paper, Laplace transform collocation method is applied to Pseudo-hyperbolic partial differential equation. First, definition of this method is given for approximation solution. Second, the exact solution is obtained for this equation. Error analysis is calculated by comparing the exact and approximate solution for this problem. This method was found to be convenient and effective on a sample problem.

Acknowledgement:

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Local linear estimation of the conditional quantile for functional and α-mixing data

Leulmi Safia[1] , Leulmi Sara[2], Belaloui Soheir[3], Leulmi Assma[4]

[1,3] Departement de Mathématiques, Université frères Mentouri, Constantine 1, Algeria,
[2]Laboratoire LAMASD, departement de Mathématiques, Université frères Mentouri, Constantine 1, Algeria,
[4]Departement of mathematics Ferhat Abass Setif-1, Algeria,
E-mail(s): safia_leulmi@hotmail.fr, math17sara@yahoo.fr, s_belaloui@yahoo.fr , as_smaleulmi@yahoo.fr

Abstract

Functional data is an important subject in modern nonparametric statistics. During the last years, many works have been devoted to theoretical results or applied studies on models involving functional data such as the conditional mode and condotional quantiles. Messaci et all. 2015 have introduced a local linear estimation of the conditional quantile which is more general and flexible method than the kernel one. They established their pointwise and uniform almost-complete convergence. In this work, we studied their pointwise and uniform almost-complete in the α-mixing case. This is significant because because it is used to improve the efficiency of the estimation and to solve some problems such as data-driven bandwidth choise (see Benhenni et al., 2007), or bootstrapping (see Ferraty et al., 2008). Noting that, unlike in the multivariate case, the uniform consistency is not a standard extension of the pointwise one. So, suitable additional tools and topological conditions are needed. Finally, a simulation study is carried out to show the good behaviour of the conditional quantile estimator in the α-mixing case.

Keywords: Functional data · the α-mixing data · Rate of almost-complete convergence.

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New Fixed Point Theorems on Vector Metric Spaces with w-distance

Hakan Sahin

Mathematics, Amasya University, Turkey,
E-mail: hakan.sahin@amasya.edu.tr,

Abstract

The fixed point theory has important place in many disciplines, since it has vital tools for solving some problems in these areas. Therefore, Banach contraction principle [1] which is fundamental result in fixed point theory has attracted interest of authors. In this sense, Cevik et al. [2] introduced a notion of vector metric space and proved Banach's result in these spaces. On the other hand, recently, the concept of w-distance on metric spaces is defined by Kada et al. [3]. Many authors have generalized and improved results existing in the literature by using this concept. In this paper, we aim to obtain some fixed point theorems on vector metric spaces with w-distance.
Keywords: Fixed point, w-distance, vector metric spaces.

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Numerical investigation of fractional sine-Gordon equation

Mahmoud Behroozifar [1]

[1] Faculty of Basic sciences, Department of Mathematics, Babol Noshirvani University of Technology, Babol, Mazandaran, Iran,
E-mail(s): m_behroozifar@nit.ac.ir, behroozifar2@gmail.com.

Abstract

A method for the numerical solution of fractional sine-Gordon (SG) equation is investigated. Considered fractional sine-Gordon (SG) equation is

$$\frac{\partial^{\nu} u(x,t)}{\partial t^{\nu}} = \frac{\partial^{2} u(x,t)}{\partial t^{2}} - \sin(u(x,t)) + f(x,t) \quad x \in \Omega, \quad t \in [0,T]$$

with initial condition

$$u(x,0) = \omega_1(x),$$

$$\frac{\partial u(x,0)}{\partial t} = \omega_2(x), \quad x \in \Omega,$$

and boundary conditions

$$u(0,t) = h_1(t), \quad u(1,t) = h_2(t), \quad t > 0 .$$

where $u(x,t)$ represents the solute concentration, $f(x,t)$ is the source term, $h_1(t)$, $h_2(t)$ are boundary solute concentrations, $\omega_1(x)$, $\omega_2(x)$ are initial solute concentration, v is the order of time derivative ($1 < v < 2$) and $\frac{\partial^{\nu} u(x,t)}{\partial t^{\nu}}$ is the Caputo fractional derivative.

We first derive a homogeneous one using interpolation from the main equation. In second step: two-dimensional approximation of functions by shifted Jacobi polynomials is used to reduce the problem into a system of nonlinear algebraic equations. The archived system is solved by Newton's iterative method. Our method is stated in general case on rectangular $[a,b]\times[0,T]$ which is based upon Jacobi polynomial by parameters (α,β). Several test problems are employed and results of numerical experiments are presented and also compared with analytical solutions. Also, we verify the numerical stability of the method, by applying a disturbance in the problem. The obtained results confirm the acceptable accuracy and stability of the presented method.

Paranormed sequence space defined by q-Cesàro matrix

Taja Yaying[1,*]

[1]Department of Mathematics, Dera Natung Government College, Itanagar-791113, India
E-mail: tajayaying20@gmail.com

Abstract

In this study, we introduce paranormed sequence space $\mathcal{X}^q(p)$ defined by the domain of q-analog $C(q)$ of Cesàro matrix of order 1 in Maddox's space $\ell(p)$, where $p = (p_r)$ is a bounded sequence of strictly positive real numbers. We investigate certain topological properties, determine Schauder basis and compute $\alpha-, \beta-, \gamma-$duals of the space $\mathcal{X}^q(p)$. Finally, we characterize certain matrix mappings from the space $\mathcal{X}^q(p)$ to $\mu \in \{\ell_\infty, c, c_0\}$.

Acknowledgement: This research is supported by Science and Engineering Research Board (SERB), New Delhi, India, under the grant EEQ/2019/000082.

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Ranking the dimensions and attributes of SERVQUAL model for hotel satisfactory customers in Albania : A fuzzy AHP method.

Phd. Daniela Halidini Qendraj[1], Phd. Evgjeni Xhafaj[2]

[1]Department of Mathematics, Faculty of Information Technology, Aleksander Moisiu University Durres, Albania,
[2]Department of Mathematics, Faculty of Mathematics and Physics Engineering, Polytechnic University of Tirana, Albania.
E-mails: daniela_qendraj@hotmail.com, genaxhafa@yahoo.com

Abstract

The quality of service (SERVQUAL) is mainly used as a multi-dimensional research instrument for customer satisfaction, and has a direct impact on hotels and their business development in Albania. Keeping tourist satisfied is more important for hotel industry to survive in the competitive market. Customer Satisfaction includes five dimensions named criteria as are: Tangibles, Reliability, Responsiveness, Empathy and Assurance. Each of them has their attributes in total 22 items, named as sub-criteria. The aim of this paper is to find the most important criteria, and their sub-criteria. The questionnaire has been developed to 200 tourists from 10 hotels of Tirana in Albania during the year 2018. The Fuzzy AHP (FAHP) method is applied by using a fuzzy conversion of the Saaty scale into Triangular Fuzzy Numbers (TFN) numbers. FAHP is an extension of AHP and shows how the decision maker thinks about using the information to estimate uncertainty in producing decisions under some subjective criteria and their sub-criteria. Due to the data, study results showed that the most important criteria was Responsiveness, the second Empathy, then Reliability, Assurance and the last one was Tangibles. Also the sub-criteria have been ranked related to criteria with FAHP method. These study results help Albania to be more sensitized to tourism in future.

Keywords: Customer Satisfaction, Fuzzy AHP, Fuzzy Weights, TFN numbers.

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Ranks of Nilpotent Subsemigroup of the Catalan Monoid

Emrah Korkmaz[1]

[1]Mathematics, Çukurova University, Turkey,
E-mail: emrahkorkmaz90@mail.com

Abstract

Let C_n be the semigroup of all order-preserving and decreasing transformations of a finite chain, say $X_n = \{1,2,\dots,n\}$. The monoid C_n is also known as the Catalan monoid. Let $N(C_n)$ be the subsemigroup of all nilpotent elements of C_n. In this study, we determine the minimum generating set of $N(C_n)$, and so we calculate the rank of $N(C_n)$.

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Rate of Convergence of Some Positive Linear Operators

Faruk Özger

Department of Engineering Sciences, İzmir Katip Çelebi University, İzmir, Turkey
E-mail: farukozger@mail.com

Abstract

In this study, we give estimates for the rates of convergence for some Bernstein type operators. We also prove some Voronovskaja-type theorems. Moreover, we obtain some numerical results to support theoretical results.

Keywords: Approximation properties, Bernstein operators, Voronovskaja-type theorem

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Relaxed Elastic Lie Reductions

Gözde ÖZKAN TÜKEL[1], Ahmet YÜCESAN[2]

[1]Finance, Banking and Insurance, Isparta University of Applied Sciences, Turkey,
[2]Mathematics, Süleyman Demirel University, Turkey,
E-mail(s): gozdetukel@isparta.edu.tr ahmetyucesan@sdu.edu.tr

Abstract

We introduce the problem of the relaxed elastic Lie reduction in the Lie algebra of a Lie group endowed with bi-invariant Riemannian metric. Then we characterize relaxed elastic Lie reductions by the Euler-Lagrange equations with two boundary conditions in Lie algebra $\mathbf{g}$.

Key words: Relaxed elastic Lie reductions, Lie groups, Lie algebra.

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Ricci Soliton of Walker manifolds

Noura Sidhoumi

Mathematics, Ecole Nationale Polytechnique d'Oran-Maurice Audin, Algeria,
E-mail: sidhoumi_noura@yahoo.fr

Abstract

The existence of non-trivial (i.e., not Einstein) Ricci solitons on non-conformally flat four-dimensional Lorentzian Walker manifolds is proved. Moreover, we show that only steady Ricci solitons may be gradient ones.

1. Introduction

Lorentzian Ricci solitons have been intensively studied, showing many essential differences with respect to the Riemannian case. In fact, although there exist three-dimensional Riemannian homogeneous Ricci solitons, there are no left-invariant Riemannian Ricci solitons on three-dimensional Lie groups. Moreover, the Lorentzian case is much richer, allowing the existence of expanding, steady and shrinking left-invariant Ricci solitons. These results make it interesting to further investigate Ricci soliton on Lorentzian manifolds.

2. Main Results

The aim of this talk is to prove the existence of non-trivial (i.e., not Einstein) Ricci solitons on non-conformally flat four-dimensional Lorentzian Walker manifolds, in addition we show that only steady Ricci solitons may be gradient ones.

3. Conclusion

Four-dimeniosnal Walker manifolds are Ricci solitons.

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Γ-semigroups are concrete

Fabiana Muharremi[1], Anjeza Krakulli[2]

"Aleksander Moisiu" University of Durres, Albania
Faculty of Information Technology
Mathematics Department
E-mail(s): fabianacullhaj@gmail.com & anjeza.krakulli@gmail.com

Abstract

Given a monoid M with group of units Γ, we can define an obvious Γ-semigroup (M, Γ) where for each $\gamma \in \Gamma$ and $s, t \in M$, the γ-multiplication of s with t is just the product $s\gamma t \in M$. We call (M, Γ) the Γ-semigroup of units of M. The aim of this paper is to prove that any Γ-semigroup embeds in the Γ-semigroup of units of a certain monoid M whose group of units has the underlying set Γ. This fact shows the concrete nature of Γ-semigroups and their intimate relationship with monoids.

Keywords: monoid, Γ –semigroup, semigroup, group of units.

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References:

R^3_1 Semi-Riemannian Manifoldların Birasyonel Kobordizm İnvaryantları Üzerine

Muhsin İncesu[1], Sara Işık[2]

[1] Muş Alparslan Üniversitesi, Eğitim Fakültesi, Matematik Eğitimi ABD, Muş, Türkiye,
[2] Y. Lisans Öğrencisi, Muş Alparslan Üniversitesi, Fen Edebiyat Fakültesi, Matematik Bölümü, Muş, Türkiye,
E-mail(s): m.incesu@alparslan.edu.tr, sara_yilmaz_90@hotmail.com

Özet

Duggal ve Bejancu 1996 da yayınladıkları kitapta bir semi-Riemannian manifoldda lightlike (null) alt uzayın varlığını gösterdiler ve alt manifoldların geometrisi için ihtiyaç duyulan önemli bir boşluğu doldurdular. Semi-Riemannian manifoldlar için unireglelik, kodaira boyutu gibi birasyonel invaryantların yanında maximum lineer bağımsız lightlike vektörlerin sayıları olan k(U) değerlerinin de bir birasyonel invaryant olduğu vurgıulanarak R^3_1 Semi-Riemannian Uzayda 2-Cob Üreteç kobordizmlere örnekler verilmiş, bunların kkodaira boyutları ve k(U) invaryantları ifade edilmiştir.

Anahtar Kelimeler: Kobordizm, Birasyonel invaryant, Semi-Riemannian manifold, Kodaira boyutu, Ruled yapı..

Acknowledgement:

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Simpson Type Inequalities

Zeynep ŞANLI[1]

E-mail: zeynep.sanli@ktu.edu.tr.

Abstract

Inequalities are extremely useful in mathematics, especially when we deal with quantities that we do not know exactly what they equate too. Often, one can solve a mathematical problem, by estimating an answer, rather than writing down exactly what it is. This is one way inequalities are very useful and very attractive.

The another one that attracts many researchers in the last and present centuries is the fractional calculus. The effect of this fractional calculus in both pure and applied branches of science and engineering started to rise significantly during the last decades appearently.

The concept of convexity is not new one it occurs in some other form in Archimede's treatment of orbit length. Nowadays convex geometry is a mathematical subject in its own right.

In this study, considering these three different concepts, we obtained the some new inequalitis. While obtaining these inequalities, we based on the following inequality, well known in theliterature as Simpson's inequality.

Let $f:[a,b]\to\mathbb{R}$ *be four times continuously differentiable mapping on* (a,b) *and* $\|f^{(4)}\|_\infty = sup|f^{(4)}(x)| < \infty$. *Then,*

$$\left|\int_a^b f(x)dx - \frac{b-a}{3}\left[\frac{f(a)+f(b)}{2} + 2f\left(\frac{a+b}{2}\right)\right]\right| \le \frac{1}{2880}\|f^{(4)}\|_\infty (b-a)^4.$$

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Some Combinatorial Properties for the Congruence Subgroup $\Gamma_{0,N}(n)$

Zeynep ŞANLI[1]

E-mail: zeynep.sanli@ktu.edu.tr.

Abstract

The modular group $\Gamma = PSL(2,\mathbb{Z})$ is the group of all linear fractional transformations

$$T: z \to \frac{az+b}{cz+d}, \text{ where } a, b, c \text{ and } d \text{ are integers and } ad - bc = 1.$$

In terms of matrix representation, the elements of Γ correspond to the matrices

$$\pm\begin{pmatrix} a & b \\ c & d \end{pmatrix};\ a, b, c, d \in \mathbb{Z} \text{ and } ad - bc = 1.$$

The principal congruence subgroup of level n is

$$\Gamma(n) = \left\{\begin{pmatrix} a & b \\ c & d \end{pmatrix} \equiv \pm\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} mod\ n\right\},$$

and any subgroup of Γ containing $\Gamma(n)$ is called a congruence subgroup of level N. The most used congruence subgroup is

$$\Gamma_0(n) = \left\{\begin{pmatrix} a & b \\ c & d \end{pmatrix} \mid c \equiv 0\ mod\ n\right\}.$$

There are several difeerent subgruops of $\Gamma_0(n)$. The one of these subgroups that we use in this paper is below:

The subgroup $\Gamma_{0,N}(n)$ of $\Gamma_0(n)$ consists of matrices

$$\pm\begin{pmatrix} a & b \\ Nc & d \end{pmatrix}, \qquad a \equiv d\ mod\ n.$$

In this paper, we examine the index of the group $\Gamma_{0,N}(n)$ in $\Gamma_0(n)$ when $n|N$. To do this, firstly, we will give in general an account for the imprimitivity of transitive permutation groups. Then, some combinatorial properties are obtained and investigated suborbital graph of this group.

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Stability Analysis of the Fractional-Order $SEIR$ Model with the Different Infected Rates of Individuals as Exposed and Infected

Bahatdin Daşbaşı

Mathematics,Kayseri University, Turkey,
E-mail: bdasbasi@kayseri.edu.tr

Abstract

Mathematical models can reflect how the disease progresses to show the possible consequence of an outbreak of infectious diseases and to help inform public health responses [1]. In this way, modeling can help decide which interventions to avoid or to try, and so, it predicts future growth patterns [2]. Many epidemic models attract attention in the literature.

In here, the fractional-order $SEIR$ epidemic model is proposed. Model have four compartment consist of susceptible individuals $\big(S(t)\big)$, exposed individuals $\big(E(t)\big)$, infected individuals $\big(I(t)\big)$ and recovered individuals $\big(R(t)\big)$. Therefore, the dynamics are governed by a system of four fractional-order differential equations (FODEs) as follows

$$\begin{aligned} \frac{d^\alpha S}{dt^\alpha} &= \Lambda + \nu R - \frac{\beta}{N}(a_E E + a_I I)S - (b+\mu)S, & \frac{d^\alpha E}{dt^\alpha} &= \frac{\beta}{N}(a_E E + a_I I)S - (\eta + \gamma_E + b)E, \\ \frac{d^\alpha I}{dt^\alpha} &= \eta E - (\gamma_I + d + b)I, & \frac{d^\alpha R}{dt^\alpha} &= \mu S + \gamma_E E + \gamma_I I - (\nu + b)R, \end{aligned} \tag{1}$$

where $0 < \alpha \leq 1$ and the initial conditions are $S(t_0) = S_0 > 0$, $E(t_0) = E_0 > 0$, $I(t_0) = I_0 > 0$ and $R(t_0) = R_0 > 0$ for $t > t_0$. The basic reproduction number, usually denoted as $\mathcal{R}$ defines the average number of secondary infections caused by an individual in an entirely susceptible population. This parameter has been defined related to the proposed system, which has two points given as disease free equilibrium point and endemic equilibrium point when $\mathcal{R}_0 > 1$. The stability results of the equilibrium points regarding this threshold parameter were expressed and supported with numerical simulations.

Keywords: SEIR Epidemic Model; Fractional-order Differential System; Stability Analysis

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STABILITY OF ESSENTIAL SPECTRA OF CLOSED OPERATORS UNDER T-COMPACT EQUIVALENCE AND APPLICATIONS

Nassima KHALDI[1], Bekkai MESSIRDI[2]

[1]Department of Mathematics, University of Sciences and Technology of Oran, Mohammed Boudiaf, USTO, Oran, Algeria.
Laboratory of Fundamental and Applicable Mathematics of Oran (LMFAO), University of Oran,
[2]Laboratory of Fundamental and Applicable Mathematics of Oran (LMFAO), University of Oran 1, Ahmed Benbella,
E-mail(s): kh_nassima@hotmail.fr, bmessirdi@yahoo.fr

Abstract

The main subject of this paper is to introduce and study the concept of T-compact equivalence of closed linear operators in Hilbert spaces. Many results are proved via this equivalence, especially the invariance of essential spectra of T-compact equivalent closed operators. The results obtained are used to describe some Fredholm essential spectra of transport operators.

Acknowledgement: weak and strong T-compact equivalence, closed operators, essential spectra, stability, transport operator

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Stabilization of the Schrödinger Equation with a delay term in boundary feedback and memory.

Nawel Abdesselam.

University of Laghouat, Algeria.
E-mail(s): nawelabedess@gmail.com

Abstract

In this work, we investigate the effect of time delays in boundary and memory feedback stabilization of the Schrödinger equation. We establish sufficient conditions on the delay term that guarantee the exponential stability of the solution. These results are obtained by using suitable energy functionals and some estimates.

1. References

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Teaching Mathematics through coding and programming. Programming with students during math lessons.

Robert Kosova[1], Rinela Kapçiu[2], Fiona Teli[2], Oltiona Sula[2], Fatjona Bushi[2], Krisel Tole[2]

[1]Mathematics. University "A. Moisiu". Durrës, Albania,
[2]Computer Science. University "A. Moisiu". Durrës, Albania,
E-mail: robertko2000@gmail.com

Abstract

Mathematics has always been a traditional science. And, that will be always the case in the future. Algebra, Euclidean Geometry, Trigonometry, and all the classic definitions and theorems of mathematics will be always in our books, notebooks. Blackboard and chalk will be permanent elements of teaching, where math professors will write and prove math theorems, draw graphs, and solve problems. However, with the development of Information Technology, we are witnessing that many mathematical issues, problems, and calculations, are solved with the help of familiar programs like Java, C ++, Python, etc. The first examples of computer programming to explore mathematics are found in the 1960s, (Feurzeig, 1969), although the most prominent pedagogical approach was proposed by Seymour Papert. He was the first to note that young people learn best when they are engaged in the construction of digital and/or physical artifacts that are personally meaningful to them and that can be shared with others (Papert, 1980). The use of software and applications will help students to understand and solve math problems, this applies especially to students who will become high school math teachers. Starting from EXCEL, students can try to do simple tasks such as multiplication of matrices, solving algebraic equations, and others. Students can also write code and programs in Java, C ++, Python, etc., to handle and solve problems of Discrete Mathematics, Number Theory courses, etc. They can generate Pythagorean triples, verify prime and perfect numbers, generate Ferma and Mersenne numbers, etc. The coding and programming, in addition to being a fascinating process in itself, will become even more fascinating when it comes to finding solutions and results, that will strengthen the knowledge of math concepts, aiding students and professors in working together for a better and more effective classroom.

Keywords. Mathematics, coding, teaching, programming, classroom.

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Recent Developments on the Commutativity of Time-Varying Systems

Mehmet Emir Koksal

Department of Mathematics, Ondokuz Mayis University, 55139 Atakum, Samsun, Turkey
E-mail(s): mekoksal@omu.edu.tr

Abstract

In system design, it is a common approach to use the successive synthesis of subnetworks to assembly the whole system. The realization is done by cascading or series connection of these low-order subnetworks. In this respect, If the main functioning of the system is not changed by the order of connection of these subnet-works, which is known as the commutativity property, it is important in what order the connection is better made. Because, although the same system is realized according to main specifications, some of the realized ones have better performance characteristics such as robustness, sensitivity, realizability point of views. Hence, the sequence which gives the optimum performance characteristics should be chosen.

When the subsystems are time-invariant and so is the resulting system, the commutativity always hold under zero initial conditions. On the other hand, the commutativity rarely holds for the case of linear time-varying systems. To be able to use the benefits gained from the commutativity, one has to know the conditions that must be satisfied for commutativity of subsystems so that the realization is performed by cascade interconnection of subsystems. In this presentation, the systems and its associated subsystems are assumed to be defined by linear time-varying differential and difference equations for analog and digital cases, respectively.

There has been a great deal of literature about the commutativity and its benefits not only including sensitivity, stability, and robustness even including the cryptology. In this talk, recent developments on the commutativity of continuous (analogue) and discrete (digital) time-varying linear systems are considered and a panoramic review of this literature is presented. Explicit results are exhibited. The concepts of transitivity and decompositions are introduced. Some benefits of commutativity are discussed. Possible research work for the future study on the subject is presented.

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Numerical simulation for some chaotic attractors with fractional differential operators

Seda İĞRET ARAZ[1]

[1]Department of Mathematic Education, Faculty of Education, Siirt University, Siirt 56100, Turkey
E-mail: sedaaraz@siirt.edu.tr

Abstract

In this study, we deal with numerical solutions of some chaotic attractors with fractional differential operators which are Caputo, Caputo-Fabrizio and Atangana-Baleanu fractional derivative. To do this, we use the newly introduced numerical method based on the Newton polynomial to derive numerical solutions for all cases. Also we provide numerical simulations for different values of fractional orders

Keywords: Chaotic attractors, fractional derivatives, numerical scheme.

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