

ABSTRACT BOOK

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Editors

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1. FOREWORD

On behalf of the Organizing Committee, we are very pleased to welcome you to the 4th International Conference of Mathematical Sciences (ICMS 2020) to be held between 17-21 June 2020 via Remote Video Conference supported by Maltepe University in Istanbul.

We hope that, ICMS 2020 will be one of the most beneficial scientific events, bringing together mathematicians from all over the world, and demonstrating the vital role that mathematics play in any field of science.

Welcome to our remote conference via Blackboard Maltepe University.
Stay at home or at your office in your University to be safe!

Hüseyin Çakallı
Chairman of the Organizing Committee

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1. “**Topology**” organized by Ljubisa D. R. Kocinac,
2. “**Analysis and Functional Analysis**” organized by İbrahim Çanak and Sefa Anıl Sezer,
3. “**Sequences, Series, Summability**” organized by Hacer Şengül Kandemir,
4. “**Fixed Point Theory**” organized by Duran Türkoğlu and Hakan Şahin,
5. “**Numerical Functional Analysis**” organized by Allaberen Ashyralyev and Charyyar Ashyralyev,
6. “**Computer Science and Technology**” organized by Raif Önvural and Sahin Uyaver,
7. “**Mathematical Methods in Science and Engineering**” organized by Özay Gürtuğ and Filiz Çağatay Uçgun,
8. “**Applied Statistics**” organized by Müjgan Tez and Kadri Ulaş Akay,

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6. ABSTRACTS

The abstracts are ordered by session number, and then ordered by the name of the first author of the presentation in each session.

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

Selected high quality full length papers presented at the sessions of the conference can be published in the following journals "Boletim da Sociedade Paranaense de Matemática", "Proceedings of International Mathematical Sciences (PIMS)", "Maltepe Journal of Mathematics" (MJM), "e-Journal of Analysis and Applied Mathematics (e-JAAM)", "Filomat", and "Tamap Journal of Mathematics and Statistics" upon a request of author/ or coauthor after reviewing process.

Extended 4 pages abstracts of high quality papers related to the research areas mainly, Topology, Analysis and Functional Analysis, Sequences, Series, Summability, Fixed Point Theory, Numerical Functional Analysis, Computer Science and Technology, Mathematical Methods in Physics, Applied Statistics, will be considered to be send to AIP Conference Proceedings and will be evaluated for AIP Conference Proceedings of ICMS 2020. The publication of a 4 page extended abstract will NOT restrict the author(s) from publishing a full-length article on the same topic and with either the same title or with a different title in another journal, provided that this new work is sufficiently enhanced, and cites published extended abstract.

6.0 Plenary Speakers

The abstracts of the plenary lectures are given in the following pages.

Fourth International Conference of Mathematical Sciences (ICMS 2020)
17 June - 21 June 2020, Maltepe University, Istanbul, Turkey

Invariant mean and Matrix transformation

Ekrem Savas

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The goal of this paper is to study characterization of strongly λ -invariant regular matrices, uniqueness of generalized limits and inclusion relations of such sequences have been discussed

Keywords: sequence space, σ -convergence, absolutely λ -invariant and strongly λ -invariant summability.
2010 Mathematics Subject Classification: 40B05, 40C05.

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Some new star selection properties

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Following ideas from the papers [1] and [2] we define and study several star selection covering properties that can be viewed as relative properties with respect to a family of subsets of a topological space. We will be concentrated on set star-Menger spaces and their weaker relatives.

Definition. A space X is said to have the *set-star-Menger property* **set-SM** (resp., *set strongly star-Menger property* **set-SSM**) if for each nonempty set $A \subset X$ and each sequence $(\mathcal{U}_n : n \in \mathbb{N})$ of sets open in X such that for each n , $\bar{A} \subset \cup \mathcal{U}_n$, there is a sequence $(\mathcal{V}_n : n \in \mathbb{N})$ (resp., a sequence $(F_n : n \in \mathbb{N})$) such that for each $n \in \mathbb{N}$, \mathcal{V}_n is a finite subset of \mathcal{U}_n (resp., each F_n is a finite subset of X) and $A \subset \bigcup_{n \in \mathbb{N}} \text{St}(\cup \mathcal{V}_n, \mathcal{U}_n)$ (resp., $A \subset \bigcup_{n \in \mathbb{N}} \text{St}(F_n, \mathcal{U}_n)$).

We have

$$\begin{array}{ccc} \text{Menger} & \rightarrow & \text{set-SSM} \rightarrow \text{set-SM} \\ & & \downarrow \quad \downarrow \\ & & \text{SSM} \quad \text{SM} \end{array}$$

We also define and study star-Hurewicz-type and star-Rothberger-type properties in topological spaces. Some examples supporting the theoretical part will be provided.

Keywords: Menger space, star-Menger space, set-star-Menger space.

2010 Mathematics Subject Classification: 54D20.

References

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Spectral disjointness

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Spectral disjointness confers a certain “independence” upon linear operators. If G is a ring with identity I then an idempotent $Q = Q^2 \in G$ gives the ring G a block structure

$$G \cong \begin{pmatrix} A & M \\ N & B \end{pmatrix}$$

where for example $A = QGQ$; then

$$T = \begin{pmatrix} a & m \\ n & b \end{pmatrix} \in G$$

commutes with Q iff it is a “block diagonal”:

$$TQ = QT \iff T = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}.$$

Specialising to complex Banach algebras, for block diagonals there is two way implication

$$\sigma_A(a) \cap \sigma_B(b) = \emptyset \iff Q \in \text{Holo}(T) :$$

$Q = f(T)$ with $f : U \rightarrow G$ holomorphic on an open neighbourhood of $\sigma_G(T)$. Weaker spectral disjointness gives a little less:

$$\sigma_A^{\text{left}}(a) \cap \sigma_B^{\text{right}}(b) = \emptyset = \sigma_A^{\text{right}}(a) \cap \sigma_B^{\text{left}}(b) \implies Q \in \text{comm}^2(T) :$$

the block structure idempotent Q “double commutes” with $T \in G$. Specializing to $G = B(X)$, the bounded operators on a Banach space, closed complemented subspaces $Y \subseteq X$ give us again the block structure, and operators $T \in G$ for which Y is “invariant” become “block triangles”:

$$T(Y) \subseteq Y \iff T = \begin{pmatrix} a & m \\ 0 & b \end{pmatrix}.$$

When $Y \subseteq X$ is not complemented then the block structure is missing and we must resort to the restriction and the quotient:

$$a = T_Y \in A = B(Y) ; b = T_{/Y} \in B(X/Y) .$$

Now spectral disjointness

$$\sigma_A(a) \cap \sigma_B(b) = \emptyset$$

ensures that the subspace $Y \subseteq X$ is both *hyperinvariant* and *reducing*, in particular complemented.

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Thin-shell formalism in general relativity

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In this work, I shall give a general overview on the formalism of the constructing time-like thin-shells in general relativity. The junction conditions and their applications will be highlighted. For some physical systems, the dynamic stability will be also investigated.

Keywords: Thin-Shell, General Relativity, Junction Conditions.
2010 Mathematics Subject Classification: Mathematical Physics.

6.1 Topology

Session Organizer: Ljubiša D.R. Kočinac

The talks in Topology Session cover several areas of Topology and Differential Geometry: selection principles theory, topology and graph theory, various aspects of neutrosophic topological spaces (separation axioms, connectedness, compactness, G-continuity), group-groupoids, category theory and topology, uniform spaces and uniform mappings, Fedosov manifolds. These lines of investigation open some new directions for scientific work and may be very useful for young researches. We expect that the authors will publish their works in good mathematical journals.

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A Look On Separation Axioms In Neutrosophic Topological Spaces

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This study is dedicated to make an attempt to define different types of separation axioms in neutrosophic topological spaces. The relationships among them are shown with a diagram and counterexamples. We also introduce some new terms such as neutrosophic quasi- coincidence, neutrosophic q-neighborhood, neutrosophic cluster point and give a new definition for neutrosophic function.

Keywords: Neutrosophic Separation Axioms, Neutrosophic Quasi-coincidence, Neutrosophic q-neighborhood, Neutrosophic Cluster Point, Neutrosophic Closure, Neutrosophic Function.

2010 Mathematics Subject Classification: 54J05, 54D10.

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Fourth International Conference of Mathematical Sciences (ICMS 2020)
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A Study On Connectedness In Neutrosophic Topological Spaces

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In this study, we introduce the concept of neutrosophic connectedness and give some of its characterizations. Additionally, we present neutrosophic product space and show that this type of connectedness is not preserved under neutrosophic product spaces. We also introduce here the notions of neutrosophic super-connected spaces, neutrosophic strongly connected spaces and study their properties. In this study, we introduce the concept of neutrosophic soft pre-open (neutrosophic soft pre-closed) sets and pre-separation axioms in neutrosophic soft topological spaces. In particular, the relationship between these separation axioms are investigated. Also, we give a new definition for neutrosophic soft topological subspace and define neutrosophic soft pre irresolute soft and neutrosophic pre irresolute open soft functions.

Keywords: Neutrosophic Connectedness, Neutrosophic Super-connectedness, Neutrosophic Strongly Connectedness, Neutrosophic Interior point

2010 Mathematics Subject Classification: 54J05..

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An Investigation On Compactness In Neutrosophic Topological Spaces

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In this paper, we introduce the concept of neutrosophic compactness and explore its properties. Also, neutrosophic locally compactness, neutrosophic sequentially compactness and neutrosophic countable compactness are initiated and investigated at neutrosophic point through its properties and characterization. We give some examples of presented concepts to validate their existence.

Keywords: Neutrosophic compactness, Neutrosophic Locally Compactness, Neutrosophic Countably Compactness, Neutrosophic Sequentially Compactness Neutrosophic q -neighborhood, Neutrosophic Function

2010 Mathematics Subject Classification: 54J05.

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A Quest Of G -Continuity In Neutrosophic Topological Spaces

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Sequentially continuity has always been a reputable character in not only Topology but also some other subbranches of Mathematics. Connor and Grosse-Erdmann remodeled its definition for real functions by replacing \lim with an arbitrary linear functional G defined on a linear subspace of the vector space of all real sequences. Then, this definition was extended to a topological group X by replacing G , a linear functional, with an arbitrary additive function defined on a subgroup of the group of all X -valued sequences. Also, Some new theorems in generalized setting were given and some other theorems that had not been obtained for real functions so far were presented. In this study, we introduce neutrosophic G -continuity and investigate its properties in neutrosophic topological spaces.

Keywords: Neutrosophic Quasi-coincidence, Neutrosophic q -neighborhood, Neutrosophic Sequential Closure, Neutrosophic G -sequential continuity.

2010 Mathematics Subject Classification: 54A05, 54C10, 54D30, 54D10.

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Topological Domination in Graph Theory

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Dominating sets play important role in application of graph theory. Almost studies in this field studied properties of minimum dominating set(γ -set). The other type of studies produce topology space from set of vertices or set of edges of a graph G . In this paper domination topology (τ_d) has been created from the set of minimal dominating sets of graph G . The family of all minimal dominating sets(MDS) represent open set in τ_d , (\wedge_d) d-intersection and (\vee_d) d-union have been defined.

Definition 1. Let G be a graph with (V,E) set of vertices and edges respectively and let $A, B \subseteq V(G)$. Define d-intersection ($A \wedge_d B$) and d-union ($A \vee_d B$) by the following:

$$A \wedge_d B = \begin{cases} D | D \text{ smallset MDS of } G & \text{such that } A \cap B \subseteq D \text{ if } A \cap B \neq \phi \\ \Phi_d & \text{otherwise} \end{cases}$$

$$A \vee_d B = \begin{cases} D | D \text{ smallset MDS of } G & \text{such that } A \cap D \neq \phi \text{ or } B \cap D \neq \phi \\ \Phi_d & \text{otherwise} \end{cases}$$

where Φ_d means there is no MDS.

Keywords: d-intersection, topological domination , d-union.
 2010 Mathematics Subject Classification: 05C69, 54-XX.

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On Countably Uniformly Paracompact Spaces

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In this work we introduce and study countably uniformly paracompact spaces. In particular, the problem is solved: what are uniform spaces that for any finitely additive countable open covering ω have a uniformly continuous ω -mapping to some metrizable space?

Definition 1. A uniform space (X, U) is called a countably uniformly paracompact if for each finitely additive countable open cover λ of the space (X, U) there exists a sequence $\{\alpha_n\} \subset U$ that the following condition is realized:

For each point $x \in X$ there exists a number $n \in \mathbb{N}$ and an element $L \in \lambda$ such that $\alpha_n(x) \subset L$. (*)

Theorem 1. A uniform space (X, U) is countably uniformly paracompact if and only if for every finitely additive countable open covering ω of (X, U) there exists a uniformly continuous ω -mapping f of the uniform space (X, U) onto some metrizable uniform space (Y, V) .

Keywords: finitely additive covering, countable uniform paracompactness, ω -mapping.

2010 Mathematics Subject Classification: 54E15, 54D20.

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Uniformly Locally Compact and Close to them Spaces

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In this work we study uniformly locally compact, uniformly locally Lindelöf and uniformly locally countably compact spaces. In particular, by using uniform structures the paracompactness of any locally Lindelöf topological group and the countable paracompactness of any locally countable compact group are obtained.

Theorem 1. Any locally Lindelöf topological group (G, \cdot, τ) is paracompact.

Theorem 2. Any locally countably compact topological group (G, \cdot, τ) is uniformly locally countably paracompact.

Corollary 1. Any locally compact topological group (G, \cdot, τ) is strongly paracompact [1].

Keywords: uniformly locally compactness, uniformly locally Lindelöf space, uniformly locally countable compactness.

2010 Mathematics Subject Classification: 54E15.

References

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Totally Bounded Remainders of Uniform Spaces and Samuel Compactification of Uniformly Continuous Mappings

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In this work we study totally bounded remainders of uniform spaces and Samuel compactification of uniformly continuous mappings.

A uniform space (X, U) is called co-totally bounded, if for any $\alpha \in U$ there exists a finite family $\{F_1, F_2, \dots, F_n\}$ of free Cauchy filters such that the subfamily $\alpha_0 = \{A : A \in \alpha \cap F_i, i = 1, 2, \dots, n\}$ is a co-covering of (X, U) .

Theorem 1. The remainder $(\tilde{X} \setminus X, \tilde{U}_{\tilde{X} \setminus X})$ of a space (X, U) is totally bounded if and only if the space (X, U) is co-totally bounded.

Theorem 2. The remainder $(\tilde{X} \setminus X, \tilde{U}_{\tilde{X} \setminus X})$ of a space (X, U) is compact if and only if the space (X, U) is co-totally bounded and co-closed.

A uniform space (X, U) is called co- f -closed if X is contained as an open subset in the uniform space $(\hat{s}X, \hat{s}U)$.

Theorem 3. The remainder $\hat{s}f|_{\hat{s}X \setminus X} : (\hat{s}X \setminus X, \hat{s}U_{\hat{s}X \setminus X}) \rightarrow (Y, V)$ of the uniformly continuous mapping $f : (X, U) \rightarrow (Y, V)$ is uniformly perfect if and only if X is co- f -closed in (X, U) .

Keywords: remainder, co-covering, totally bounded, B -compactness, Samuel compactification.

2010 Mathematics Subject Classification: 54E15.

References

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Ternary Semigroups of Topological Transformations of Open Sets of Finite-Dimensional Euclidean Spaces

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We give a characterization of open sets of finite-dimensional Euclidean spaces by ternary semigroups of homeomorphic transformations.

A ternary semigroup is a nonempty set T together with a ternary operation $[abc]$ satisfying the associative law $[[abc]de] = [a[bcd]e] = [ab[cde]]$ for every $a, b, c, d, e \in T$. Let R be a finite-dimensional Euclidean space with the standard topology. Let Ω_1 and Ω_2 be two open sets of R . Let $K_i(\Omega_i)$ denote the set of all homeomorphic maps a from Ω_i to Ω_j for which there is an n -sized element $E_a \subset \Omega_j$ and a closed set $F_a \subset \Omega_j$ such that $a\Omega_i \subset F_a \subset \text{Int}E_a$, where $i, j = 1, 2$ ($i \neq j$). The set $K(\Omega_1, \Omega_2) = K_1(\Omega_1) \times K_2(\Omega_2)$ is a ternary semigroup with respect to the ternary operation

$$[(a_1, b_1)(a_2, b_2)(a_3, b_3)] = (a_1b_2a_3, b_1a_2b_3).$$

Theorem 1. Let R and R' be finite-dimensional Euclidean spaces. Let Ω_1 and Ω_2 be open sets of R and let Ω'_1 and Ω'_2 be open sets of R' . The ternary semigroups $K(\Omega_1, \Omega_2)$ and $K(\Omega'_1, \Omega'_2)$ are isomorphic if and only if the spaces Ω_i and Ω'_i are homeomorphic ($i = 1, 2$).

Keywords: Euclidean n -space, ternary semigroup.

2010 Mathematics Subject Classification: 20M20, 54C10.

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Local group groupoids and Local crossed modules

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Crossed modules defined by Whitehead in [4] as 2-dimensional groups are widely used in algebraic topology. Brown and Spencer in [1] defined the notion of \mathcal{G} -groupoid or *group-groupoid* which is a group object in the category of groupoids and proved that the category of group-groupoids is equivalent to the category of crossed modules.

By [3] a *local group* is a set L with a partial composition defined on a subset \mathcal{U} of $L \times L$, an identity $e \in L$ and inverse map defined on a subset \mathcal{V} of L provided with the associativity and inverse axioms. The local group-groupoid is defined in [2] to be a local group object in the category of local groups.

The aim of this paper is to define local crossed module of local groups and prove that local group-groupoids is categorically equivalent to local crossed modules.

Keywords: Crossed module, group-groupoid, local group.

2010 Mathematics Subject Classification: Primary 20L05; Secondary 22E05.

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An Interpretation On G -Continuity In Neutrosophic Soft Topological Spaces

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Scientists have always adopted the concept of sequential continuity as a indispensable character not only in Topology but also in some other branches of Mathematics. Connor and Grosse-Erdmann gave this concept for real functions a new identity by slotting an arbitrary linear functional G defined on a linear subspace of the vector space of all real sequences into \lim . Afterwards, this concept were adapted to a topological group X by replacing G , a linear functional, with an arbitrary additive function defined on a subgroup of the group of all X -valued sequences. In this investigation, we offer neutrosophic soft G -continuity and analyze its characteristics in neutrosophic soft topological spaces.

Keywords: Neutrosophic Soft Quasi-coincidence, Neutrosophic Soft Group, Neutrosophic Soft G -sequential continuity.

2010 Mathematics Subject Classification: 54A05, 54C10, 54D30, 54D10.

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Conformally Fedosov Manifolds and Geodesic Mappings

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We study the notion of a conformally Fedosov structure [1] with respect to geodesic mappings of manifolds with affine connection [2]. It is proved that in the case of geodesic mapping of manifolds with affine connection and when skew-symmetric part of the Ricci tensors is preserved then conformally Fedosov structure is also preserved.

Theorem 1. Let A_n be a manifold with affine connection and with conformally Fedosov structure J . If diffeomorphism $f: A_n \rightarrow \bar{A}_n$ is a geodesic mapping of A_n onto \bar{A}_n and preserves skew part of the Ricci tensor (i.e. $\bar{R}_{[ij]} = R_{[ij]}$), then \bar{A}_n is also manifold with affine connection and with conformally Fedosov structure \bar{J} for which $\bar{J} = \exp(-2\Psi)J$, where Ψ is function.

Keywords: conformally Fedosov structure, geodesic mapping, manifold with affine connection.

2010 Mathematics Subject Classification: 53B15, 53A40, 53D05.

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G -compactness and locally G -compactness for topological groups with operations

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For given a Hausdorff topological space X , the limits of convergent sequences in X define a function denoted by \lim from the set of all convergent sequences in X to X . This notion has been modified in [3] by Connor and Grosse-Erdmann for real functions by replacing \lim with an arbitrary linear functional G . Recently some authors have extended the concept to the topological group setting and introduced the concepts of G -continuity, G -compactness and G -connectedness. In this paper we prove some results on different types of G -compactness for topological group with operations which include topological groups, topological rings without identity, R-modules, Lie algebras, Jordan algebras, and many others.

Keywords: Sequences, G -sequentially continuity, G -sequentially compactness, topological group with operations.

2020 Mathematics Subject Classification: Primary 40J05, 22A05 ; Secondary 22Axx.

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Internal categories in the category of semi abelian algebras

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A semi-abelian category introduced in [2] is the Barr exact category with a zero object and binary co-products, in which the short five lemma holds. A theory \mathbb{T} in the sense of Lawvere [3] is a category with a certain object T such that all objects are some multiple copies of T . A model of a theory \mathbb{T} , which is also called a \mathbb{T} -algebra, is a product preserving functor from \mathbb{T} to the category of sets. A *topological \mathbb{T} -algebra* is the same type of functor from the category \mathbb{T} to the category of topological spaces. An algebraic theory \mathbb{T} whose category of the models is semi-abelian is called *semi-abelian theory* and a model of such a theory is called *semi-abelian algebra*.

In this work for a semi-abelian theory \mathbb{T} we define internal categories in the category of semi-abelian algebras and then relate them to the covering groupoids.

Keywords: Semi-abelian category, topological \mathbb{T} -algebra, covering groupoid, internal groupoid covering.
2010 Mathematics Subject Classification: Primary 20L05, 57M10; Secondary 22A05, 22A30.

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Around NSM spaces

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A space X is said to be *neighbourhood star-Menger* (NSM) if for every sequence $(\mathcal{U}_n : n \in \mathbb{N})$ of open covers of X , one can choose finite $F_n \subset X$, $n \in \mathbb{N}$, so that for every open $O_n \supset F_n$, $n \in \mathbb{N}$, we have $\bigcup_{n \in \mathbb{N}} \text{St}(O_n, \mathcal{U}_n) = X$.

This class of spaces was introduced (in a general form and under a different name) in [1] and studied in details in [2].

In this talk we define three weaker versions of this property (weakly NSM, almost NSM, faintly NSM) and present some results about these new classes of spaces.

Keywords: Star-Menger, NSM, wNSM, aMSM, fNSM.

2010 Mathematics Subject Classification: 54D20.

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6.2 Analysis and Functional Analysis

Session Organizers: İbrahim Çanak and Sefa Aml Sezer

The Analysis and Functional Analysis session of the 4th International Conference of Mathematical Sciences (ICMS 2020) aims to provide a platform for presenting and discussing the most recent developments in a wide variety of topics including invariant subspaces, neutral differential equations with delay, optimization, analytic functions, Jones spaces, time scale, boundary value problems, Abel statistical convergence, deferred Cesaro summability, two-normed spaces and weighted mean summability of integrals. This session of this conference is a perfect opportunity for young researchers to improve themselves and to find some new open problems in their specific area of study. We think that most of the presentations in this session deserve to be published in prestigious mathematical journals.

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Local well-posedness and time regularity for a fifth-order shallow water equations in analytic Gevrey spaces

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This work studies a Cauchy problems for fifth-order shallow water equations with nonlinear terms in [3]. With data in analytic Gevrey spaces on the line and the circle, we prove that the problem is well defined. We also treat the regularity in time which belongs to $G^{5\sigma}$ near zero for every x on the circle. The proof is based mainly on bilinear and trilinear estimates in the analytic Gevrey-Bourgain spaces, relies on the contraction mapping theorem to improve the results in [3]

Keywords: Fifth-order shallow water equations, Well-posedness, Analytic Gevrey spaces, Bourgain spaces, Bilinear estimates, Trilinear estimates, Time regularity
2010 Mathematics Subject Classification: 35E15, 35Q53, 35B65, 35C07

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Investigating Boundary Value Problems In Polydomains

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In order to find the solutions of boundary value problems in a domain \mathbb{C} , we start with deriving integral representations of the functions in the domains considered.

Unit disc is the first domain have to be considered. Afterwards the discussions have been extended to domains that are Cartesian products of unit discs. We develop a method to derive integral representations for functions in \mathbb{C}^n .

Keywords: Boundary value problem, unit disc, complex variables

2010 Mathematics Subject Classification: 32W50.

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A note on invariant subspaces on Banach lattices

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In this talk, we deal with the existence of invariant subspaces of some special operators acting on Banach lattices, e.g., semi-compact operators and operators dominated by Dunford-Pettis operators.

Keywords: semi-compact operator, Dunford-Pettis operator, vector lattice.

2010 Mathematics Subject Classification: 46B42, 46A40.

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The Jones spaces over \mathbb{R}_I^n

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The objective of this paper is the construction of the Banach spaces $SD^p[\mathbb{R}_I^n]$ for $1 \leq p \leq \infty$, each of which contains all of the standard $L^p[\mathbb{R}_I^n]$ spaces, as well as finitely additive measures, as compact dense embedding.

Definition: $SD^p[\mathbb{R}_I^n]$, $1 \leq p \leq \infty$. To construct $SD^p[\mathbb{R}_I^n]$ for all p and for $f \in L^p[\mathbb{R}_I^n]$, define:

$$\|f\|_{SD^p[\mathbb{R}_I^n]} = \begin{cases} \left(\sum_{|\beta| \leq m} \sum_{k=1}^{\infty} t_k \left| \int_{R_I^n} \mathcal{E}_k(x) D^\beta u(x) d\lambda_\infty(x) \right|^p \right)^{\frac{1}{p}}, & \text{for } 1 \leq p < \infty; \\ \sum_{|\beta| \leq m} \sup_{k \geq 1} \left| \int_{R_I^\infty} \mathcal{E}(x) D^\beta u(x) d\lambda_\infty(x) \right|, & \text{for } p = \infty \end{cases}$$

Theorem 1. For each q , $1 \leq q \leq \infty$ $L^q[\mathbb{R}_I^n] \subset SD^p[\mathbb{R}_I^n]$ as a dense continuous embeddings.

Theorem 2. For $SD^p[\mathbb{R}_I^n]$, $1 \leq p \leq \infty$, we have

1. $SD^p[\mathbb{R}_I^n]$ is uniformly convex.
2. If $\frac{1}{p} + \frac{1}{q} = 1$ then the dual space of $SD^p[\mathbb{R}_I^n]$ is $SD^q[\mathbb{R}_I^n]$.
3. If K is a weakly compact subset of $L^p[\mathbb{R}_I^n]$, it is a strongly compact subset of $SD^p[\mathbb{R}_I^n]$.
4. The space $SD^\infty[\mathbb{R}_I^n] \subset SD^p[\mathbb{R}_I^n]$.

Keywords: Uniformly convex, compact dense embedding, strong Jones spaces.

2010 Mathematics Subject Classification: 46B03, 46B20, 46B25.

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Some Stability, Boundedness and Square Integrability Conditions for Certain Third Order Neutral Differential Equations with Delay

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The literature on stability of neutral delay differential equations is relatively a new field with interesting applications in real world life problems.

In this talk asymptotic property of solutions of a class of nonlinear neutral delay differential equations are studied. Sufficient conditions are obtained for asymptotic stability, boundedness and square integrability of solutions for the following equations

$$\left[q(t) \left(x''(t) + \beta(t)\Omega(x''(t-r)) \right) \right]' + g(x(t), x'(t))x''(t) + f(x(t), x'(t))x'(t) + h(x(t-\sigma)) = 0, \quad (1)$$

and

$$\left[q(t) \left(x''(t) + \beta(t)\Omega(x''(t-r)) \right) \right]' + g(x(t), x'(t))x''(t) + f(x(t), x'(t))x'(t) + h(x(t-\sigma)) = e(t), \quad (2)$$

Keywords: asymptotic stability, boundedness, square integrability, neutral differential equation of third order.
 2010 Mathematics Subject Classification: 34K12, 34K20, 34K40.

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A Second Regularized Trace Formula For A Higher Order Differential Operator

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In this paper, we obtain a second regularized trace formula on $L_2([0, \pi]; H)$ for a higher order self-adjoint differential operator with unbounded operator-valued coefficient, where H is a separable Hilbert space.

Keywords: Trace class operator, spectrum, resolvent, regularized trace.
2010 Mathematics Subject Classification: 47A10, 34L20, 34L05.

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On Optimal Solutions to a Generalized Heron Problem

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The original Heron problem is the problem of finding a different point for the three points given in the plane such that the sum of its distances to the given points is minimal. This is an unconstrained convex optimization problem.

In this talk, we will consider the distance function version of the generalized Heron problem as follows:

$$\text{minimize } \sum_{i=1}^m d(x; C_i) \text{ subject to } x \in C$$

where C and $m \geq 2, i = 1, \dots, m, C_i,$ are given nonempty closed convex subsets of \mathbb{R}^n .

Keywords: Convex optimization, generalized Heron problem, optimal solutions, convex analysis.
 2010 Mathematics Subject Classification: 90C25, 90C90, 49N90.

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Variational method for a Class of delay differential equations

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This paper is devoted to the study of the existence of nonconstant $2r$ -periodic solutions of the following nonautonomous second-order delay differential equation

$$x''(t) = -f(t, x(t), x(t-r)), \quad (1)$$

where $r \in \mathbb{R}^{+*}$ is a given constant, and the following equation

$$-x''(t) + \lambda x(t-r) = h(t, x(t)) \quad (2)$$

is treated as a particular case of (1).

Our study consists in the application of a variational approach based on a direct minimization with constraints.

Keywords: delay differential equation, periodic solution, variational method.

H. Brezis, *Analyse Fonctionnelle, Théorie et Applications*, Masson, Paris, 1983. 2010 Mathematics Subject Classification: 34B15, 34C15, 34C25.

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Coefficient Estimates for Certain Subclasses of Analytic Functions Defined by New Operator

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In this paper, we investigate certain subclasses of analytic functions defined by generalized differential operators involving binomial series. Also, we obtain coefficient estimates involving of the nonhomogeneous Cauchy-Euler differential equation of order r .

Keywords: Analytic functions, coefficient bounds, subordination.

2010 Mathematics Subject Classification: 30C45, 30C80.

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Statistical extensions of Tauberian theorems for the weighted mean method of summability in two-normed spaces

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In this paper, we first define the concept of statistical summability (\overline{N}, p) in two-normed spaces and then present necessary and/or sufficient Tauberian conditions for statistical summability (\overline{N}, p) in two-normed spaces.

Keywords: Tauberian conditions, statistical convergence, statistical summability (\overline{N}, p) , two-normed spaces, statistically slow oscillation.

2010 Mathematics Subject Classification: 40E05, 40G05.

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A revisited Tauberian theorem for which slow decrease with respect to a weight function is a Tauberian condition for the weighted mean summability of integrals over \mathbf{R}_+

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Let $p(x)$ be a nondecreasing real valued continuous function on $\mathbf{R}_+ := [0, \infty)$ such that $p(0) = 0$ and $p(x) \rightarrow \infty$ as $x \rightarrow \infty$. Given a real valued function $f \in L^1_{loc}(\mathbf{R}_+)$, we define $s(x) := \int_0^x f(u)du$ and its weighted mean as

$$\sigma_p(s(x)) := \frac{1}{p(x)} \int_0^x s(u)dp(u), \quad x > 0$$

provided that $p(x) > 0$.

It is clear that to verify that if the limit $\lim_{x \rightarrow \infty} s(x) = l$ exists, then $\lim_{x \rightarrow \infty} \sigma_p(s(x)) = l$ also exists. However, the reverse implication is not true in general. The converse implication might hold under some appropriate conditions. In this paper, we have given an alternative proof of the Tauberian theorem which states that the existence of $\lim_{x \rightarrow \infty} s(x) = l$ follows from that of $\lim_{x \rightarrow \infty} \sigma_p(s(x)) = l$ under some Tauberian condition. Some particular choices of weight functions provide alternative proofs of some well-known Tauberian theorems given for several important summability methods.

Keywords: Tauberian conditions and theorems, weighted mean method of summability, slow decrease with respect to a weight function.

2010 Mathematics Subject Classification: 40E05, 40G05, 40A10.

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On Abel statistical delta quasi Cauchy sequences

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In this paper, we investigate the concept of Abel statistical delta ward compactness and Abel statistical delta ward continuity in metric spaces. A function f defined on a metric space X into X is called Abel statistically delta ward continuous if it preserves Abel statistical delta quasi Cauchy sequences, where a sequence (x_k) of points in X is called Abel statistically delta quasi Cauchy if $\lim_{x \rightarrow 1^-} (1-x) \sum_{k: |\Delta^2 x_k| \geq \varepsilon} x^k = 0$ for every $\varepsilon > 0$, where $\Delta^2 x_k = d(x_{k+2}, x_{k+1}) - d(x_{k+1}, x_k)$ for every $k \in \mathbf{N}$. Some other types of compactnesses are also studied and interesting results are obtained.

Keywords: Sequences, series, summability, compactness, continuity.

2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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Controllability and Stabilization results for dissipative wave equation

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In this work, we analyze a general multiplication method to obtain the stabilization of the wave equation by means of Neumann feedback. This also allows us to obtain the results of controllability of the wave equation with Robin boundary conditions under certain geometric assumptions.

Keywords: Stabilization, Controllability, Robin boundary conditions.

2010 Mathematics Subject Classification: 93D15, 35L05, 35J25.

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Fourth International Conference of Mathematical Sciences (ICMS 2020)
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On the $(\lambda, v)_h^\alpha$ -statistical convergence of the functions defined on the time scale product

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In this talk, we have introduced the concepts $(\lambda, v)_h^\alpha$ -density of a subset of the product time scale \mathbb{T}^2 and $(\lambda, v)_h^\alpha$ -statistical convergence of order α ($0 < \alpha \leq 1$) of Δ -measurable function f defined on the product time scale with the help of modulus function h and $\lambda = (\lambda_n)$, $v = (v_n)$ sequences. Later, we have discussed the connection between classical convergence, λ -statistical convergence and $(\lambda, v)_h^\alpha$ -statistical convergence. In addition, we have seen that f is strongly $(\lambda, v)_h^\alpha$ -summable on \mathbb{T} then f is $(\lambda, v)_h^\alpha$ -statistical convergent of order α .

Keywords: Time scale, statistical convergence, modulus function, lamda sequence, order alfa.
2010 Mathematics Subject Classification: 40A05, 47H10, 46A45.

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Fourth International Conference of Mathematical Sciences (ICMS 2020)
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A Necessary Condition for a Terminal Point Problem Governed by a Discrete Inclusion System

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In this talk we will give a necessary condition for K -optimality of the following Mayer type optimization problem

$$\begin{aligned} & \min x_T \\ & x_{t+1} \in F_t(x_t), \quad t = 0, \dots, T-1 \\ & x_0 \in M \end{aligned}$$

where $T \in \mathbb{N}$, the $F_t : X_t \rightarrow X_{t+1}, t = 0, \dots, T-1$, are Lipschitzian set-valued mappings in neighborhoods of the points $x_t, t = 0, \dots, T-1$ respectively, the $X_t, t = 0, \dots, T$, are finite-dimensional Euclidean spaces, and $M \subset X_0$. We also assume that the space X_T is partially ordered by a proper cone K .

Keywords: Discrete inclusions, set-valued mappings, necessary conditions, vector optimization.
2010 Mathematics Subject Classification: 90C46, 58C06, 49J53.

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The Second Regularized Trace of Even Order Differential Operators with Operator Coefficient

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In this paper, we investigate the spectrum of the self adjoint operator L defined by

$$L := (-1)^r \frac{d^{2r}}{dx^{2r}} + A + Q(x),$$

where A is a self adjoint operator and $Q(x)$ is a nuclear operator in a separable Hilbert space. We also derive asymptotic formulas for the sum of eigenvalues of the operator L .

Keywords: Nuclear operator, Regularized trace, Compact operator.

2010 Mathematics Subject Classification: 47A10, 34L20

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Conditions for the Pringsheim convergence of double sequences that are deferred Cesàro summable

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The concept of deferred Cesàro means was defined by Agnew [1] for single sequences. This concept was extended for double sequences in [2]. For a given real or complex valued double sequence (u_{mn}) , its deferred Cesàro means are given by

$$D_{mn}(u) = \frac{1}{(\beta_m - \alpha_m)(q_n - p_n)} \sum_{j=\alpha_m+1}^{\beta_m} \sum_{k=p_n+1}^{q_n} u_{jk} \quad (1)$$

where (p_n) , (q_n) , (α_m) and (β_m) are the sequences of non-negative integers satisfying $p_n < q_n$, $\alpha_m < \beta_m$ and $\lim_n q_n = \infty$, $\lim_m \beta_m = \infty$. We say that (u_{mn}) is deferred Cesàro summable (briefly $(DC, 1, 1)$ summable) to l if (1) tends to l as $m, n \rightarrow \infty$. Note that, if $p_n = 0$, $q_n = n$ and $\alpha_m = 0$, $\beta_m = m$, then corresponding $(DC, 1, 1)$ method is the well known Cesàro summability $(C, 1, 1)$.

In this study we give inverse conditions to obtain Pringsheim convergence of deferred Cesàro summable double sequences. We also give some inclusion relations with examples.

Keywords: Deferred Cesàro means, double sequences, convergence in Pringsheim's sense, inverse conditions, inclusion relations.

2010 Mathematics Subject Classification: 40B05, 40C05 , 40A05.

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Optimization of Bolza Problem for Third-Order Polyhedral Delay-Differential Inclusions with State Constraints

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The present paper studies a Bolza problem of optimal control theory with third-order polyhedral delay-differential inclusions and state constraints. We aim to establish well verifiable sufficient conditions of optimality for the polyhedral third-order delay-differential inclusions. Discrete-approximate inclusions are investigated using the method of discretization to ensure the transition to a continuous problem. The idea for obtaining sufficient conditions of the problem is based on passing the formal limit on the optimality conditions of the discrete-approximation problem. Thus, the sufficient conditions are formulated by using polyhedral Euler-Lagrange inclusions and the distinctive “transversality” conditions.

Keywords: Delay-Differential inclusion, Polyhedral, Transversality.

2010 Mathematics Subject Classification: 34A60, 49K15.

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Sharpened Forms for λ -Spirallike function of Complex Order on the Boundary

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We consider a different version of Schwarz Lemma for λ -spirallike function of complex order at the boundary of the unit disc D . We estimate the angular derivative of the function $\frac{zf'(z)}{f(z)}$ from below for λ -spirallike function $f(z)$ of complex order at the boundary of the unit disc D by taking into account of the zeros of the function $f(z) - z$ which are different from zero. We show the sharpness of this estimation and gives two examples.

Keywords: Schwarz Lemma, Holomorphic function, λ -spirallike function, Julia-Wolff Lemma.
 2010 Mathematics Subject Classification: 30C80, 32A10.

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Energy Decay in a Timoshenko-Type System for Thermoelasticity of Type III with Distributed Delay and Past History

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In this work, we consider a one-dimensional Timoshenko system of thermoelasticity of type III with past history and distributive delay. It is known that an arbitrarily small delay may be the source of instability. We establish the well-posedness and the stability of the system for the cases of equal and nonequal speeds of wave propagation respectively. Our results show that the damping effect is strong enough to uniformly stabilize the system even in the presence of time delay under suitable conditions and improve the related results.

Theorem 1. Assume $U_0 \in \mathcal{H}$ and (H1)–(H4) hold. Then, there exists a unique solution $U \in (R_+, \mathcal{H})$ of problem e2.1. Moreover, if $U_0 \in D(\mathcal{A})$ then

$$U \in C(R_+, D(\mathcal{A})) \cap C^1(R_+, \mathcal{H}).$$

Keywords: Timoshenko system, past history, energy decay.

2010 Mathematics Subject Classification: 35L70, 35L75, 93D20.

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6.3 Sequences, Series, Summability

Session Organizer: Hacer Şengül Kandemir

The session “Sequences, Series, Summability” is organized in ICMS 2020, Maltepe University, Istanbul, Turkey, 17th - 21th June, 2020. Sequence spaces and series are widely applied to various other branches of functional analysis, e.g., the theory of functions, summability theory, the theory of locally convex spaces, nuclear spaces, and matrix transformations. The theory of summability is used in many areas of analysis and applied mathematics. The engineer or physicist who works with Fourier series, Fourier transforms or analytic continuation will find the concepts of summability theory extremely useful for their research.

This session is organized to bring together scientists who have worked in the fields of sequences, series and summability. In this section, results will be given about how the sequence spaces and series are used in different spaces. However, activities will include the discussion of different methods of summabilities in computer sciences and engineering, where will be presented theoretical studies and experimental results. The session interest subjects include, but are not limited to: Sequence Spaces, Tauberian Theorems, Special Summability Methods, Riesz difference sequence spaces.

On asymptotic expansion of double Laplace-type integrals with a curve of minimal points

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In this paper we consider the problem of the asymptotic expansion of double Laplace-type integrals, in the case when the set λ of points where the phase achieves its absolute minimum is a simple curve. The case where the curve λ coincides with the boundary of the domain of integration was solved in our last paper published in slovac mathematica journal [1]. Similar problems for oscillatory integrals were already treated in several papers. A three dimensional case was studied by Kaminski. In this paper, we give a method to investigate the problem when the curve λ of minimal points of the phase f lies on the boundary, but don't coincide with it. In this paper we use a Laplace method to calculate explicitly the coefficients of the asymptotic series in terms of the original data of the problem. The study of such problems is motivated by their implication in many problems of applied mathematics, for example in exit problems of stochastic processes, see for example [2].

Keywords: Asymptotics of integrals, Laplace method, exit time problems.
2020 Mathematics Subject Classification: 41A60, 14H50, 34E20.

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Delta ward continuity in metric spaces

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In this study, we investigate the concept of delta quasi Cauchy sequences in metric spaces. A function f defined on a subset of a metric space X to X is called delta ward continuous if it preserves delta quasi Cauchy sequences, where a sequence (x_k) of points in X is called delta quasi Cauchy if $\lim_{k \rightarrow \infty} [d(x_{k+2}, x_{k+1}) - d(x_{k+1}, x_k)] = 0$. A new type compactness in terms of δ -quasi Cauchy sequences, namely δ -ward compactness is also introduced, and some theorems related to δ -ward continuity and δ -ward compactness are obtained. Some other types of continuities are also discussed, and interesting results are obtained.

Keywords: Sequences, series, summability, compactness, continuity.
2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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On absolute summability by generalized means

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In the present study, we introduce absolute generalized series space $|\bar{A}_{(r,t,u)}|_p^\theta$ based on the notion of generalized means defined by Mursaleen and Noman in [2], for $p \geq 1$ and a sequence $\theta = (\theta_n)$ of non-negative terms, where $\bar{A}(r, t, u)$ is the infinite matrix of generalized means. Furthermore, we examine some topological properties of the space $|\bar{A}_{(r,t,u)}|_p^\theta$ for $p \geq 1$ and we compute the Köthe-Toeplitz duals of this space.

Keywords: Generalized means, absolute summability methods, BK spaces, Köthe-Toeplitz duals.
2020 Mathematics Subject Classification: 46A45, 40C05, 40F05.

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Classical Tauberian theorems for Cesàro summability method of double integrals over \mathbb{R}_+^2

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For a real- or complex-valued valued continuous function f over $\mathbb{R}_+^2 := [0, \infty) \times [0, \infty)$, we denote its integral over $[0, u] \times [0, v]$ by $s(u, v)$ and its $(C, 1, 1)$ mean, the average of $s(u, v)$ over $[0, u] \times [0, v]$, by $\sigma(u, v)$. The other means $(C, 1, 0)$ and $(C, 0, 1)$ are defined analogously. We give one-sided Tauberian conditions of Landau type and two-sided Tauberian conditions of Hardy type for double integrals under which convergence of $s(u, v)$ follows from integrability of $s(u, v)$ in different senses.

Keywords: One-sided and two-sided Tauberian conditions, improper double integrals, Cesàro summability $(C, 1, 1)$, $(C, 1, 0)$ and $(C, 0, 1)$.

2020 Mathematics Subject Classification: 40B05, 40C10, 40E05.

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On strong $N_p^\beta(\rho)$ -convergence and $S^\beta(\rho)$ –convergence

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In this paper, we introduce the concept of strong ρ –convergence of order β (or $N_p^\beta(\rho)$ –convergence) of sequence of real numbers and give some inclusion relations between the set of all ρ –statistical convergence of order β and strong $N_p^\beta(\rho)$ -convergence.

Keywords: Statistical convergence, Cesàro summability.

2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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Wijsman deferred statistical convergence and Wijsman strong deferred Cesàro convergence of order α of sequences of sets

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The main purpose of this paper is to introduce the concepts of Wijsman deferred statistical convergence of order α and Wijsman strong deferred Cesàro convergence of order α for sequences of sets.

Keywords: Deferred density, deferred Cesàro mean, statistical convergence, Wijsman convergence.

2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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Δ^m – weighted statistical convergence

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In this study, we introduce and examine the concepts of Δ^m –weighted statistical convergence and Δ^m –weighted (\overline{N}, p_n) –summability. Also some relations between Δ^m –weighted statistical convergence and Δ^m –weighted (\overline{N}, p_n) –summability are given.

Keywords: Weighted statistical convergence, difference sequence, Cesàro summability, density.
2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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Δ^α -deferred statistical convergence of fractional order

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In this study, we introduce the concepts of Δ^α -deferred statistical convergence with the fractional order of α and Δ^α -strongly convergence with the fractional order of α . Also some relations between Δ^α -deferred statistical convergence with the fractional order of α and Δ^α -strongly convergence with the fractional order of α are given.

Keywords: Statistical convergence, deferred statistical convergence, difference sequence.
2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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On ρ - statistical convergence

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In this study, we introduce the concepts of strong $(S, [\rho])$ summability and study some connections between ρ -statistical convergence was defined by Çakallı[2] and strong $(S, [\rho])$ summability.

Keywords: Statistical convergence, Cesàro summability, strongly p -Cesàro summability.
2020 Mathematics Subject Classification: 40A05, 40C05, 46A45.

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Double Almost Lacunary Summable Sequences of Weight \hat{g} in 2-Normed Spaces

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The concept of almost P-convergent double sequences spaces was presented in 1998 by Moricz and Rhoades , and also in 2005, the almost lacunary strong P-convergent double sequence spaces was introduced by Savas and Patterson, using Orlicz functions. Following these two concepts, we present almost double lacunary sequences spaces of weight \hat{g} via Orlicz Functions in 2-Normed Spaces. Additionally, inclusion theorems and extension of existing results in the literature have been established.

Keywords: Weight function \hat{g} , almost convergence, double sequences.

2020 Mathematics Subject Classification: 40A05, 40A35.

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Double Almost Lacunary Statistical Convergence of Weight \hat{g} in 2-Normed Spaces

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The goal of this paper is to present almost double lacunary statistical convergence of weight \hat{g} in 2-Normed Spaces. Furthermore, we examine some inclusion theorems and variations.

Keywords: Weight function \hat{g} , lacunary statistical convergence, double sequences.
2020 Mathematics Subject Classification: 40A05, 40A35.

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Strongly ideal lacunary quasi-Cauchyness in 2-normed space

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In this paper, we introduce and investigate ideal strong lacunary ward continuity in 2-normed spaces. A function f on a subset A of a 2-normed space X into X is ideal strongly lacunary ward continuous if it preserves ideal strong lacunary quasi-Cauchy sequences of points in A . We also studied some other kinds of continuities.

Keywords: Sequences, series, summability, compactness, continuity.

2020 Mathematics Subject Classification: 40A35, 40G15, 40A05, 46A50.

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Compact operators on Riesz difference sequence space of fractional order

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In this presentation, we study the domain of generalized Riesz difference matrix $R^q\Delta^{(\alpha)}$ of fractional order α in the classical sequence spaces c_0 and c and introduced the sequence spaces $r_0^q(\Delta^{(\alpha)})$ and $r_c^q(\Delta^{(\alpha)})$. We obtain the α -, β - and γ -duals of these spaces and using Hausdorff measure of non-compactness, we characterize certain classes of compact operators on the space $r_0^q(\Delta^{(\alpha)})$.

Keywords: Sequence space, Riesz difference matrix, Hausdorff measure of non-compactness.

2020 Mathematics Subject Classification: 46A45, 46B45, 47B07.

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6.4 Fixed Point Theory

Session Organizers: Duran Turkoglu and Hakan Sahin

Fixed point theory has an important place in other branches as well as mathematics because of its applicability. Indeed, fixed point theory can be used to find solutions of nonlinear integral equations and solutions of first order differential equations. On the other hand, it might be used to determine the conditions for the existence of Nash equilibrium in strategic games too. Therefore, this topic has attracted attention of many scientist. The Fixed Point Theory session of the 4nd International Conference of Mathematical Sciences (ICMS 2020) provides a platform to researchers interested in this area to discuss and present of their ideas.

The topics of presentations in this session include nonlinear fractional differential equations, periodic point, generalized metric spaces, integral type, D-compatible but are not limited to. Besides, 3 extended abstracts will be published in AIP Conference Proceedings.

Blow-up rates for higher-order semilinear parabolic equations with nonlinear memory term

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In this talk, we investigate the higher-order semilinear parabolic equations with nonlocal in time nonlinearity

$$\begin{cases} u_t + (-\Delta)^m u = \int_0^t (t-s)^{-\gamma} |u|^p ds & x \in \mathbb{R}^n, t > 0, \\ u(x, 0) = u_0(x) & x \in \mathbb{R}^n, \end{cases} \quad (1)$$

where $u_0 \in L^1(\mathbb{R}^n) \cap L^\infty(\mathbb{R}^n)$, $n \geq 1$, $m \geq 1$, $0 < \gamma < 1$, $p > 1$.

This equation has been considered by Sun and Shi [1]. They proved the local and global existence of solution as well as the blow-up result. Our goal is to establish the blow-up rates of solutions for (1). We also present the local existence of mild solution via the fixed point theorem. We use a scaling argument to reduce the problems of blow-up rate to Fujita-type theorems (it is similar to blow-up analysis in elliptic problems to reduce the problems of a priori bounds to Liouville-type theorems).

Keywords: Blow-up rate, higher-order, Riemann-Liouville fractional integrals and derivatives.

2010 Mathematics Subject Classification: 35B44, 26A33, 35K25.

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On an anti-periodic boundary value problem of fractional differential equations

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The topic of fractional differential equations has been of great interest for many researchers in view of its theoretical development and widespread applications in various fields of science and engineering such as physics, biophysics, chemistry, statistics, economics, blood flow, phenomena, control theory, porous media, electromagnetic and other fields. Boundary value problems with anti-periodic boundary conditions constitute an important class of problems and arise in the mathematical modeling of various phenomena such as heat conduction, wave propagation, gravitation, chemical engineering, underground water flow, thermoelasticity, and plasma physics. They include two-point, three-point, multipoint and nonlocal boundary value problems. Our main concern is to investigate the existence of solutions of an anti-periodic boundary value problem of fractional differential equation of Caputo type relying on the method associated with the technique of measures of noncompactness and the fixed point theorem of Mönch type.

Keywords: Caputo fractional derivative, measure of noncompactness, Banach space.
2010 Mathematics Subject Classification: 34A08, 26A33, 34B15.

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Some Ćirić type fixed and periodic point results with Q -function on quasi metric spaces

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Banach contraction principle is considered as initial point of fixed point theory. Owing to applicability of this result to many branches of mathematics, it has been generalized and extended in various ways by many authors. In this sense, Ćirić obtained a new result by taking into account both nonuniqueness of fixed point and discontinuity of the self mapping. Thus, the Banach's result is generalized different way from the results existing in the literature. On the other hand, it was defined a new concept so called quasi metric spaces by removing the symmetry condition on metric spaces. This topic has attracted interest of many authors, since the results proved on ordinary metric spaces are not clear on this spaces. In this paper, we investigate some Ćirić type nonunique fixed and periodic point results on quasi metric spaces by considering Q -function given by Al Homidian et al.

Keywords: fixed point, periodic point, quasi metric, Q -function.

2010 Mathematics Subject Classification: 54H25, 47H10.

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Periodic point results for Boyd-Wong contraction mappings on partial metric spaces

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The applications of fixed point theory comprise different disciplines 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 develop 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. After that, the concepts of nonunique fixed and periodic point were introduced by Ćirić and thus Banach contraction principle is extended in a different way from the literature. Then, this result has been extended and generalized by many authors. On the other hand, Matthews[3] introduced the concept of partial metric spaces and proved the Banach contraction principle on partial metric spaces. In this paper, we proved a periodic point result on partial metric spaces. Thus, we generalize famous results existing in the literature such as Boyd-Wong fixed point theorem and Banach's result.

Keywords: Periodic point, partial metric space, Boyd-Wong contraction.

2010 Mathematics Subject Classification: 54H25, 47H10.

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Common Fixed Point Results For General Contractive Inequality of Integral Type on GMMS

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We prove common fixed point theorems for mappings satisfying a general contractive inequality of integral type for generalized metric spaces. Our results extend of the theorem of Branciari (2002) constitutionally and we provide some examples in support of our results.

Theorem 1. Let (X, D_λ) be a D -complete GMMS, $k \in (0, 1)$, and let $T : X \rightarrow X$ be a mapping such that for each $x, y \in X$,

$$\int_0^{D_\lambda(T(x), T(y))} \phi(t) dt \leq k \int_0^{D_\lambda(x, y)} \phi(t) dt$$

where $\phi : [0, \infty) \rightarrow [0, \infty)$ is a Lebesgue-integrable mapping which is summable (i.e., with finite integral) on each compact subset of $[0, \infty)$ nonnegative, and such that for each $\varepsilon > 0$, $\int_0^\varepsilon \phi(t) dt > 0$; then T has a unique fixed point $a \in X$ such that for each $x \in X$, $\lim_{n \rightarrow \infty} T^n(x) = a$.

Keywords: integral-type, generalized modular metric, D-compatible.

2010 Mathematics Subject Classification: 54H25, 47H10.

References

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6.5 Numerical Functional Analysis

Session Organizers: Allaberen Ashyralyev and Charyyar Ashyralyev

This section of abstract book is a collection of abstracts of 23 original papers by 41 authors. These papers are presented at the Special Session “Numerical Functional Analysis” which will be held in online as a part of the International Conference of Mathematical Sciences (ICMS 2020) 17 June - 20 June 2020 in Maltepe University, Istanbul, Turkey.

The main aim of this special session is to provide impetus, motivation and to bring together researchers and scientists working in the fields of Numerical Functional Analysis, Operator Theory and Applications by providing a forum for the academic exchange of ideas and recent research works.

They are include different problems of well-posedness of differential and difference problems, construction and investigation of analytic and numerical methods for ordinary and partial differential equations and dynamic equations, investigation of stochastic equations, study of identification problems, involuntary problems, manifolds, fractional calculus, and mathematical modelling.

The selected papers examine wide ranging and cutting edge developments in various areas of Numerical Functional Analysis, Operator Theory and their applications. The papers give a taste of current research.

We feel the variety of topics will be of interest to both grade students and researchers.

Further, we are very grateful to all scientists from Turkey, TKNC, Iraq, Algeria, Kazakhstan, Russia, Jordan, Turkmenistan and Nijeria for their interest in Special Session “Numerical Functional Analysis” as a part of ICMS 2020.

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Euler-Maruyama method for Initial Value Problem for the Stochastic Schrödinger Equation

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In this study, the initial value stochastic Schrödinger type problem in an abstract Hilbert space with the self-adjoint operator is investigated. Euler-Maruyama method for the numerical solution of this problem is presented. The main theorems on the stability of this difference scheme are established. In applications, theorems on the stability of the difference scheme for several initial value problems for stochastic Schrödinger equations are proved. Numerical results are given.

Keywords: stochastic Schrödinger equation, Euler-Maruyama method, stability.
2010 Mathematics Subject Classification: 35J25, 47E05, 65H10.

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- [1] D.G. Gordeziani, G.A. Avalishvili, Time-nonlocal problems for Schrödinger type equations: I. Problems in abstract spaces, *Differential Equations* 41 (5) (2005) 703-711.
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Source Identification Problems for Two Dimensional Neutron Transport Differential and Difference Equations

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In the present paper, we consider the with time-dependent source identification for the two dimensional neutron transport equation

$$\left\{ \begin{array}{l} \frac{\partial u(t,x,y)}{\partial t} = \frac{\partial u(t,x,y)}{\partial x} + \frac{\partial u(t,x,y)}{\partial y} + p(t)q(x,y) + f(t,x,y), \\ t \in (0, T), x, y \in (0, L), \\ u(0, x, y) = \varphi(x, y), \quad x, y \in [0, L], \\ u(t, 0, y) = 0, \quad u(t, x, 0) = 0, t \in [0, T], x, y \in [0, L], \\ u(t, l, y) = \alpha(t, y), \quad t \in [0, T], y \in [0, L], l \in (0, L]. \end{array} \right. \quad (1)$$

Here, $u(t, x, y)$ and $p(t)$ are unknown functions, $f(t, x, y)$, $q(x, y)$, $\varphi(x, y)$, and $\alpha(t, y)$ are given sufficiently smooth functions and all compatibility conditions are satisfied. In the rest of paper the theorem on the stability of differential problem (1), is established. For the approximate solution of problem (1), a first order of accuracy difference schemes is proposed. The theorem on stability of this difference scheme is established. Some results of numerical experiment are presented.

Keywords: Source identification problem, neutron transport, difference schemes.

2010 Mathematics Subject Classification: 46N40, 65J22, 47N40.

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A note on the elliptic-telegraph identification problem with non-local condition

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The theory of nonlocal boundary value problems for elliptic-telegraph equations and its applications have been investigated by many scientists in [1]-[4]. In the present paper, a source of identification problem for elliptic-telegraph equation with non-local condition is studied. Stability estimates for the differential equations of the source identification problem are established. Furthermore, Stability estimates for the difference schemes of the source identification problem are presented.

Keywords: Source identification problem, elliptic-telegraph, stability, differential equations, difference schemes.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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A high order of accuracy of difference schemes for the nonlocal boundary value Schrödinger problem

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It is known that various problems in physics lead to the Schrödinger equation. Methods of solutions of the problems for Schrödinger equation have been studied extensively by many researchers (see, e.g., [1, 2, 3], and the references given therein). In this study, nonlocal boundary value Schrödinger type problem in a Hilbert space with the self-adjoint positive definite operator is investigated. Single step stable third and fourth order of accuracy difference schemes for the numerical solution of this problem are presented. The main theorems on the stability of these difference schemes are 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.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

References

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A numerical algorithm for the involutory parabolic problem with Neumann condition

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Parabolic and elliptic type partial differential equations with involution in x have been investigated in papers [1]-[2]. In [3], the theory of the basis property of eigenfunctions of second order differential operators with involution was investigated, on this basis the Fourier method was justified for solving direct and inverse problems for one dimensional parabolic equations with involution in x . The existence and uniqueness of the solution of a mixed problem for a parabolic equation with an involution in x in the form of a Fourier series were established. In the present paper, the first and second order of accuracy difference schemes for the numerical solution of the initial boundary value problem for one dimensional parabolic type involutory partial differential equation with Neumann condition are presented. Numerical results are provided.

Keywords: Involutory parabolic equation, difference schemes, numerical experience.
 2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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A numerical algorithm for the involutory hyperbolic problem

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In the present paper, initial value problem for the involutory hyperbolic equation

$$\frac{d^2 u(t)}{dt^2} + aAu(t) + bAu(-t) = f(t), t \in (-\infty, \infty), u(0) = \varphi, u'(0) = \psi \quad (1)$$

in a Hilbert space H with the self-adjoint positive definite operator A is studied. Here, $a, b, d \in (-\infty, \infty)$, $f(t)$ is the continuous and bounded abstract function defined on $(-\infty, \infty)$ with values in H .

Using Fourier series, Laplace and Fourier transform methods, we can obtain the solution of several hyperbolic type involutory differential problem. Furthermore, the first and second order of accuracy difference schemes for the numerical solution of the initial boundary value problem for one dimensional hyperbolic type involutory partial differential equation are presented. Numerical results are provided.

Keywords: Hilbert space, involutory hyperbolic equation, difference schemes, accuracy.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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On r-modified Crank-Nicholson difference schemes for the source identification parabolic-elliptic problem

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Many local and nonlocal boundary value problems for parabolic-elliptic equations have been investigated by many scientists in (see, e.g., [1]- [4] and the references given therein). In the present paper, a space-dependent identification problem for parabolic-elliptic equations is investigated. The second order of accuracy r-modified Crank-Nicholson difference schemes for the numerical solution of the source identification parabolic-elliptic problems are presented. Numerical results are given.

Keywords: Source identification problem, parabolic-elliptic, r-modified Crank-Nicholson difference schemes, numerical experience.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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A numerical algorithm for the source identification telegraph problem

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The theory of local and nonlocal boundary value problems for partial differential equations and their applications have been investigated by many scientists in [1]-[5]. In the present study, a space-dependent identification problem for elliptic-telegraph equations is studied. A first order of accuracy absolute stable difference scheme for the numerical solution of the source identification one dimensional elliptic-hyperbolic equations with Dirichlet condition is presented. Some numerical results are presented.

Keywords: Source identification problem, telegraph, difference scheme, numerical experience.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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On the boundedness of solution of the Schrödinger type differential equation with time involution

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In the present paper, the initial value problem for the Schrödinger type involutory partial differential equation is studied. Applying Green's function of space operator, we get formula for solution of this problem. In applications, the theorem on stability of this problem is established. Furthermore, this formula is applied to the existence and uniqueness of bounded solution of nonlinear problem with involution.

Keywords: Schrödinger type differential equation; Boundedness; Involution.

2010 Mathematics Subject Classification: 35J25, 47E05, 34B27.

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A note on Parabolic Differential Equations on Manifold

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Abstract: Many researchers have been studied extensively local and nonlocal boundary value problems for parabolic equations in the Euclidean space, which is a flat manifold, (see, e.g. [1, 2, 3, 4], and the references therein).

The present abstract considers the differential equations on smooth closed manifolds, investigates and establishes the well-posedness of nonlocal boundary value problems (NBVP) in Hölder spaces. It also establishes new coercivity estimates in various Hölder norms for the solutions of such boundary value problems for parabolic equations.

Keywords: Differential equations on manifolds, well-posedness, self-adjoint positive definite operator.

2010 Mathematics Subject Classification: 58Jxx, 58J32, 58J99.

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Design Of Full State Feedback Controller for controlling Depth of underwater robots

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Abstract

Underwater robots have ability to go down the sea up to several meters of height without any fear of loss of human lives. These robots need autonomous control systems and guidance to carry out their tasks. One of the main objectives of any underwater robot is to reach a given depth under the water and also be able to maintain that depth throughout the operation period. In this paper a simple full state feedback controller (which is easy to be implemented on a very small platform) was designed to control the underwater robots depth, the controller despite all the external forces and disturbances will be able to make the underwater robot to maintained the attained depth during a given mission.

Keywords: Underwater robot, full state controller, Depth control.
2010 Mathematics Subject Classification: 15A24,65F05.

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Stability estimates for a third order of accuracy difference scheme elliptic overdetermined multi-point problem

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Abstract: In this presentation, we discuss a third order of accuracy difference scheme for approximately solution of the elliptic overdetermined multi-point problem in Hilbert space. Functional operator approach is used to study existence and uniqueness solution of difference problem. Stability, almost coercive stability and coercive stability estimates for solution of difference scheme are established.

Keywords: High order approximation, elliptic overdetermined problem, stability.
2010 Mathematics Subject Classification: 35N25, 65J22, 39A14.

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On Stable Difference Scheme for Identification Elliptic Problem with Integral and Second Kind Boundary Conditions

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Abstract: In $[0, 1] \times \Omega$, we consider the first order difference scheme for approximately solution of the following source identification elliptic problem

$$\left\{ \begin{array}{l} -v_{tt}(x, t) - \sum_{r=1}^n (a_r(x)v_{x_r}(x, t))_{x_r} + \sigma v(x, t) = f(x, t) + p(x), \\ x \in \Omega, t \in (0, T), \\ v(x, 0) = \varphi(x), v(x, T) = \int_0^T \mu(\lambda) v(\lambda, x) d\lambda + \psi(x), \\ v(\gamma, x) = \xi(x), x \in \bar{\Omega} \ (0 < \gamma < T), \\ \frac{\partial}{\partial \bar{n}} v(x, t) = 0, x \in S, t \in [0, T] \end{array} \right. \quad (1)$$

with integral and second kind boundary conditions. Here $\Omega = (0, 1)^n$, $S = \partial\Omega$, $\bar{\Omega} = \Omega \cup S$, $a_r, \zeta, \varphi, \psi, f$ are given functions, $a_r(x) \geq a > 0$ ($\forall x \in \Omega$).

Stability and coercive stability estimates for solution of difference scheme are described. Finally, test example with computation results is given.

Keywords: Difference scheme, elliptic inverse problem, stability.

2010 Mathematics Subject Classification: 35N25, 65J22, 39A14.

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Ab initio study of disordered inverse spinel MgIn_2S_4 , pressure effect and phase transition mechanism

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In order to untangle the effect of pressure on disordered inverse spinel phases as well as its high polymorphic defect- LiTiO_2 phase of the MgIn_2S_4 compound, we carried out in this paper first principles study within pseudo potential approaches. We show that the disordered occupation sites of both Mg and In anions are modeled through a Imma subgroup. Both stability and elastic constants components are studied as a function of pressure and show an abrupt jump at pressure equal to 8 GPa. Additionally, atom in molecule theory has been used to extract atomic basins and local bulk modulus. The results show that the bulk modulus of the investigated phase is governed by the atomic sulfur contribution and the ionic character becomes unchanged along the phase transition mechanism

Keywords: phase transition, local properties, topological analysis of electronic density.

2010 Mathematics Subject Classification: 65Z05.

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Basic Reproduction Number and Effective Reproduction Number for North Cyprus for Fighting Covid-19

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The aim of this paper is to show how North Cyprus fight with Covid-19 by using R_0 and R_t . North Cyprus is the first country to free from Covid 19 epidemic in European countries. One of the important reason of this is the government decided for tackling Covid 19 pandemic by using R_0 and R_t daily. For R_0 we constructed a new SEIR model by using real data for North Cyprus [2]. During 11th March 2020 till 15th May 2020 R_0 varies from 0.65 to 2.38 [3]. For finding valeus it is used the real data for North Cyprus [1, 4]. **Keywords:** Covid-19, Northern Cyprus, epidemics, mathematical model

2010 Mathematics Subject Classification: 37M05, 93A30, 92B05

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The Applications of Non-Polynomial Spline to the Numerical Solution for Fractional Differential Equations

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This paper presents a computation and discuss on non-polynomial spline of fractional order to solve the differential equations with Caputo fractional derivative. Taylor series is applied to discretize the time derivative of the function. Several examples are considered to confirm the accuracy of the spline method and to show the completion of non-polynomial spline. In addition, we discuss the numerical computations provident and can be used to solve complex problems, also the results are obtained to be in a nice error estimation with known exact solutions.

Keywords: Spline approximation; fractional derivative; Convergence analysis; error bound.
2010 Mathematics Subject Classification: 41A15; 26A33; 65Bxx; 65L70.

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A Fourth Order Accurate Approximation of the Solution of Laplace's Equation on a Rectangle Using the Two-Stage Difference Method

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In this paper, two stage difference method is presented to solve the Dirichlet problem for the Laplace equation on rectangle. In the first stage, the sum of the pure fourth order derivatives of the required solution is approximated on a square grid. Then, by using the quantities that are determined in the first stage, the system of difference equations which approximates the Dirichlet problem, is computed during the second stage. The difference equations found in the stages are formulated by using the 5– point averaging operator. Due to these facts that, the boundary values are continuous and sixth times differentiable at the edges of the rectangle, the derivatives of them satisfy Hölder condition and at the end, their second and fourth order derivatives meet the matching condition implied by the Laplace equation. We proved that the difference solution of the Dirichlet problem is uniform convergent with the order $O(h^4)$, where h denotes the mesh size.

Keywords: Numerical solution to the Laplace equation, error estimations, Laplace's equation on rectangle.
2010 Mathematics Subject Classification: 65M06, 65M12, 65M22.

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A note on the hyperbolic-parabolic identification problem with nonlocal condition

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Numerous source identification problems for hyperbolic-parabolic equations and their applications have been extensively investigated (see, e.g., [1]-[4] and the references given therein). In the present paper, a source of identification problem for hyperbolic-parabolic equation with nonlocal condition is studied. Stability estimates for the differential equations of the source identification hyperbolic-parabolic problem are established. Furthermore, stability estimates for the difference scheme of the source identification hyperbolic-parabolic problem are presented.

Keywords: hyperbolic-parabolic equation, source identification problem, difference scheme.

2010 Mathematics Subject Classification: 65M06, 65N06, 35M13, 35R30.

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Solution of Inverse Cauchy Problem for an Elliptic Equation by Differential Transform Method

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In this work, one of the ill-posed problems of elliptic type partial differential equation is studied. We gave a numerical solution of inverse Cauchy problem for an elliptic equation by differential transform method.

Keywords: inverse elliptic problem, differential transform method.
2010 Mathematics Subject Classification: 35J25, 65M30, 34K17.

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Qualitative analysis of solutions for a system of viscoelastic wave equations of Kirchhoff type with logarithmic nonlinearity

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In this presentation, initial boundary value problem for a system of viscoelastic wave equations of Kirchhoff type with logarithmic nonlinearity is considered. Studies of logarithmic nonlinearity have a long history in physics as it appears in nuclear physics, in supersymmetric field theories, in quantum mechanics [1, 2]. In recent years, problems involving logarithmic nonlinearity have been studied in many papers, we refer to [3, 4, 5]. We studied global existence by applying the potential well method, which introduced by Sattinger and Payne, we consider decay of solutions with $E(0) < d$.

Keywords: Global existence, Asymptotic behavior, Kirchhoff type equation, Logarithmic nonlinearity
2010 Mathematics Subject Classification: 35G20, 35L55, 35A01, 35B40.

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Numerical approach of the nonlinear reaction-advection-diffusion equation with time-space-conformable fractional derivatives

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In this paper, a numerical approach is proposed for solving one dimensional nonlinear time-space-fractional reaction-advection-diffusion equation with non-homogenous Dirichlet boundary condition. The fractional derivatives are described in the conformable sense. The numerical approach is based on shifted Chebyshev polynomials of the fourth kind. The unknown function is written as Chebyshev series with m term. The nonlinear time-space- fractional reaction-advection-diffusion equation is reduced to a system of nonlinear ordinary differential equations by using the properties of Chebyshev polynomials. The finite difference method is applied to solve this system of equations. Finally, some numerical examples are presented to confirm the reliability and effectiveness of the proposed numerical scheme.

Keywords: Conformable fractional calculus, Finite difference method, Reaction-advection-diffusion equation, Shifted Chebyshev polynomials of the fourth kind.

2010 Mathematics Subject Classification: 34K37, 74S25, 65M06, 35L05.

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On the stability of nonlocal boundary value problem for Schrödinger-parabolic equations

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In the present article, a problem for a Schrödinger-parabolic equation with nonlocal boundary value condition is considered. The stability estimates are established for the solution of Schrödinger-parabolic problem. An example is considered and some error results of numerical experiments are presented in order to verify theoretical statements.

Keywords: Partial differential equation, Nonlocal boundary value problem, Stability.

2010 Mathematics Subject Classification: 65L10, 34B10, 65M12.

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A note on the stability of the solution for elliptic-Schrödinger type nonlocal boundary value problem

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In the present paper stability estimates for the solution of elliptic-Schrödinger nonlocal boundary value problem is obtained. A theorem, with proof, for stability of the solution of this problem and a conclusion section is presented.

Keywords: Partial differential equation, Nonlocal boundary value problem, Stability.
2010 Mathematics Subject Classification: 65L10, 34B10, 65M12.

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6.6 Computer Science and Technology

Session Organizers: Raif Önvural and Sahin Uyaver

The session of “Computer Science and Technology” of International Conference of Mathematical Sciences organized by Maltepe University of Istanbul, Turkey was held between 17-21 June 2020. The conference was executed as an online conference, especially due to the outbreak of COVID-19 virus. But the conference was quite successfully done and it served a very fruitful platform for the participants. In this respect the conference participants did not feel any missing big facility of a typical scientific meeting.

The session was attracted by many local and international scientists. During the talks the participants had the chance to ask their questions or make their contributions. The talks covered many trending problems from fundamental science and engineering sciences involved in computer science and technology. In this respect the session of the conference is believed to make a good contribution to the related literatures.

Numerical simulation of the reduced field influence on the evolution of nitrogen oxides present in the mixture $N_2/O_2/H_2O/CO_2$ bathed in an out-of- equilibrium plasma

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The industrial and technological development of the last century has led to increasing energy consumption, which has led to an increasing increase in the discharge of gaseous pollutants into the atmosphere. In these discharges, nitrogen oxides account for a large part of the environmental pollutants and are there fore directly or indirectly responsible for certain diseases when their concentration in the air is high.

In this work, we propose to numerically simulate the evolution of the density of NO_x nitrogen oxides present in the gas mixture $N_2/O_2/H_2O/CO_2$ which is subjected to different values of the reduced electric field: 110 to 210 Td ($1Td = 10^{-17} V.cm^2$). We are particularly interested in the NO , NO_2 and NO_3 species that are the main components of nitrogen oxides.

The simulation runs from 10^{-9} s up to 10^{-3} s. The model takes into accoun twenty species reacting with each other following two hundred chemical reactions. The results obtained clearly show the effectiveness of the reduced electric field in the destruction of nitrogen oxides.

Keywords: Non equilibrium plasma, Chemical kinetics, Nitrogen oxides.

2010 Mathematics Subject Classification: 68-XX, 68Rxx.

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A Mathematical Decision Model Proposal for Firewall Selection

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Along with the widespread use of the Internet, the importance of protecting institutions, corporations and mobile internet users against the cyber security threats is increasing day by day. The protection of personal data and the registration of internet traffic of the users are among the measures that institutions are obliged to fulfill. The software or hardware used to provide internet and network security are described as firewalls. In addition to the technical features of firewalls, there is a cost structure that is affected by many criteria such as the number of users, license duration and annual maintenance fee. In this study, a mathematical decision model is proposed to support the firewall selection decision of the institutions. The main criteria used in this decision model defined as linear function was examined in three main groups as cost, capacity and performance. Through this study, a solution proposal was brought to the firewall selection problem of IT managers in terms of cost and capacity with the help of a mathematical decision model.

Keywords: Firewall, Linear Model, Decision Making.

2020 Mathematics Subject Classification: 68U35, 68M12, 90B50.

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AI-V2T: AI-based Sound Classifier via Voice to Text Conversion

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Thanks to the progress on machine learning algorithms, many academic studies have been made to relate voice recognition and speech recognition systems in recent years. This has led us to propose an AI-based sound classifier that uses voice to text conversion (AI-V2T). In this proposed method, Google's sound analyzer is used as a service for voice to text conversion. It enables to record, the sound waves as a text. Afterwards, the Hidden Markov Model as an artificial intelligence algorithm is used in the proposed system architecture due to the enhancement of voice recognition. Here, an mathematical model is defined for HMM to obtain observation series. As a result, the proposed AI-V2T estimates the subject relating to the text recorded with an acceptable accuracy rate.

Keywords: Machine learning, concurrent sound analysis, asynchronous sound analysis, text categories.

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A Research on New Generation Technologies to be Used in the Retail Industry After COVID-19

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Abstract. Rapid advances in digital technologies and applications today lead to radical transformations in many business processes. This transformation is expected to increase exponentially in the retail sector after Covid-19. It is of great importance now that existing traditional shopping processes are abandoned in physical merchandising processes and new retail processes are put into practice quickly instead. In this new modeling, it has become a necessity to consider many factors such as minimizing human contact, providing a minimum hygienic environment, maintaining social distance, contactless and faster processes.

In this study, the results of the research on the next generation technology, application and solutions that can be used to meet the expectations of the retail sector from the IT sector after Covid-19 will be shared.

Keywords: COVID-19, Retailing, Fast Cash, QR, Next Generation IT
2020 Mathematics Subject Classification: 68M11, 68M18, 68U35, 94A11

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Concentration Effects on the Self-Assembly of Tyrosine Molecules: A Molecular Dynamics Simulation

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Molecular self-assembly as an ubiquitous phenomena is a new approach to produce new materials with various biomedical engineering applications. It also has opened a way in understanding biology and a variety of diseases at the molecular level. At this study, we have studied the self-assembly of tyrosine and simulated its various concentrations by different box sizes at constant temperature to resemble it to that of plasma. The temperature of the system is computed from the systems total kinetic energy and is set by thermostat code. We consider the systems in free energy landscapes describing the height and the number of assembled monomers at the lowest energy structure as the equilibrium state. We present the number of monomers at each time frame and show that, through the time steps, there is a critical aggregation concentration (CAC) that molecules behave in a distinguished manner.

Keywords: Self-Assembly, Concentration Effects, Molecular Dynamics

2020 Mathematics Subject Classification: Other natural sciences (mathematical treatment)

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Facial Expression Recognition using Deep Learning

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Facial expression recognition has become an increasingly important area of research in recent years. Neural network-based methods have made amazing progress in performing recognition-based tasks, winning competitions set up by various data science communities, and achieving high performance on many datasets. Miscellaneous regularization methods have been utilized by various researchers to help combat over-fitting, to reduce training time, and to generalize their models. In this paper, by applying the Haar Cascade classifier to crop faces and focus on the region of interest, we hypothesize that we would attain a fast convergence without using the whole image to analyze facial expressions. We also apply label smoothing and analyze its effect on the databases of CK+, KDEF, and RAF. The ResNet model has been employed as an example of a neural network model. Label smoothing has demonstrated an improvement of the recognition accuracy up to 0.5% considering CK+ and the KDEF databases. While the application of Haar Cascade has shown to decrease the achieved accuracy on KDEF and RAF databases with a small margin, fast convergence of the model has been observed.

Keywords: CK+, Deep learning, Emotion, Facial expression, Haar cascade, KDEF, Label smoothing, RAF, ResNet, Recognition.

2020 Mathematics Subject Classification: Artificial intelligence, Artificial neural networks and deep learning,

References

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Numerical modelling of chemical kinectisc effect on No_x removal for various electrical fields by negative coranal discharge

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This study presents a chemical kinetic analysis of different species involved in nitrogen-oxygen mixed gas treated by stationary negative corona discharge at atmospheric pressure. We take account 16 different chemical species reacting following 120 selected chemicals reactions. The mathematical model used consists of a system of equations that takes into account the variation of the density and the chemical kinetics of the environment. The reaction rate coefficients are taken from the literature. We analyse especially, the temporal evolution (10^{-9} s up to 10^{-3} s) of NO, NO₂, NO₃ and N₂O₅ species under different values of electrical field. The results show that the evolution of these nitrous oxides is substantially affected by the application of the electrical discharge. This allows us the important role played by the negative corona discharge in NO_x removing.

Keywords: chemical kinetic, corona discharge, nitrogen oxide, reduced electric.

2010 Mathematics Subject Classification: 68-XX, 68Rxx.

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The Hasse-Minkowski Theorem for Quadratic Forms in Two and Three

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Determining the solvability of equations has been an extended and fundamental study in Mathematics. The local-global principle states two objects are equivalent globally if and only if they are equivalent locally at all places. By applying this principle, the Hasse - Minkowski theorem is able to identify the existence of rational solutions of an equation. This paper explores the application of the Hasse-Minkowski theorem to homogeneous quadratic forms in two and three variables. After providing some of the necessary proofs and definitions, some programming codes for the Hasse-Minkowski theorem are introduced.

Keywords: Hasse-Minkowski, quadratic form, number theory, software.
2010 Mathematics Subject Classification: 11C04.

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Conceal Secret Script Encryption in Video Frames Based on Magic Square

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This paper conceals secret texts in video using encryption secret message in video, the objective this work is hide large data in video frame. The speed of growth in high rapidity connections networks technologies and make to send of data simple. Therefore, it can be proposed new method for hide secret texts that large size into video frames efficiently, robustness and high capacity. This method consists of three phases major: the first phase: divide texts and encryption, the second phase: divide video to a set of frames, and the final phase: conceal secret texts in video frame using secret key is magic square. The outcome of result is good in hide large text without sensitives by attacker, through applied the measurement in each frame video PSNR, MSE, Entropy, Histogram, and correlation coefficient.

Keywords: Conceal Texts, Encryption, LSB, Magic Square, Video Frame.

2020 Mathematics Subject Classification: Data encryption (aspects in computer science)

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Detection of Blood Vessels from Retinal Fundus Images and Prediction Diabetic Retinopathy via Artificial Neural Network

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Diabetic Retinopathy is a vascular disease affecting the retina due to long-term diabetes and is one of the causes of visual impairment. The early screening of diabetic patients for the development of diabetic retinopathy can significantly reduce the risk of blindness in patients. In this presentation, artificial neural networks and image processing techniques were used to detect the disease from the retinal images early.

Detecting diabetic retinopathy has provided great benefits by using artificial neural networks, one of the automated methods. For this reason, artificial neural networks are used in our system to classify the vascular image, which is removed from the images using the kirsch method and cleaned with the gaussian filter.[1,2,3]

Keywords:Image Processing, Neural Network, Diabetic Retinopathy.

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New Generation Low Code Development Platform to Meet Increasing Software Demands: SetXRM

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Abstract. The dependence on technology and the need for digital transformation in every field of business and life increases exponentially with each passing day. It is anticipated that this need will increase further after the COVID-19 pandemic. The desire to digitize everything possible comes with the need to develop or update many application software. It is very difficult to produce flexible solutions for these dynamic and changing demands on time with traditional software development methods. Writing and updating complex program codes contains problems that need to be solved, such as the provision of human resources trained in this field and the cost. Low code software development platforms offer solutions for the solution of such problems. These platforms aim to produce flexible and less costly programs in a process design logic by using drag-and-drop components via visual interfaces without requiring deep programming knowledge.

This study is based on a detailed examination of SetXRM application, which is one of the new generation low code applications, which helps to produce more flexible and short time solutions for increasing software needs.

Keywords: Low Code, Next Generation Coding, SetXRM, Software
2020 Mathematics Subject Classification: 68M11, 68N19, 68U35, 94A29

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An ab initio and DFT study of structure and conformers of glycerol

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In this paper, the effect of the simultaneous rotation of two different groups, hydroxyl and hydroxymethyl groups, on the basic properties of Glycerol are comprehensively studied. Relative energies are reported at the HF/ aug-cc-pVDZ //b3lyp/ aug-cc-pVDZ levels with corrections for zero-point vibrational energies. Structural parameters, electric dipole moment and HOMO-LUMO difference of the identified conformers are also tabled. An inverse correlation between the relative energy and homo lumo difference is seen.

Keywords: Glycerol, B3lyp, HF, Dipole moment, HOMO, LUMO
2010 Mathematics Subject Classification: 68U99

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Canopy with K-Means Clustering Algorithms for Big Data Analytics

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Recently, Big Data is gathered from various sources in different types, and it is difficult to analyze them by traditional methods. Apache Hadoop is one of the vital solutions to the problems of saving and processing large datasets by providing HDFS (Hadoop Distributed File System) and MapReduce for storing and processing data. One of the essential methods for analyzing big data to discover new patterns is clustering algorithms. In this paper, we have used the canopy clustering algorithm provided by Distributed Machine Learning with Apache Mahout as preprocessing steps for the K-means clustering algorithm. The result shows using canopy as a preprocessing speed up the time of managing the massive scale of healthcare insurance dataset and reduced time execution of k-means by provided initial centroids of a given dataset.

Keywords: Big Data, Hadoop, Map Reduce, K-mean Clustering.
2010 Mathematics Subject Classification: 28A80, 37F05, 81Q35.

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A Research on Current Virtualization Approaches in Terms of Cost and Labor Gain

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Abstract. Well-consolidated servers are needed in the execution of information technology processes. Data processing units turn into unplanned, heterogeneous, problematic, cumbersome and complex structures with fast digitalization. In these structures, which are difficult and irregular to manage, resources that are not used effectively are wasted. Information technology resources such as CPU, memory, disk, operating system, network, and human are costly components. Solutions are produced with virtualization technology against such high-cost complex structures. With a well-structured virtualization solution, both flexible structure, low cost, high performance, safe, fast and uninterrupted dynamic structures are created, as well as labor gain in installation, maintenance and management requiring technical expertise.

This study focuses on research results of technical and operational innovations to increase efficiency based on cost and labor gains in a virtualization.

Keywords: Cloud, Data Center, Virtualization, Hyper-V, VMware
2020 Mathematics Subject Classification: 68M12, 68M14, 68P30, 90B25

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Classification OF Fake News Using MLP

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“Fake news is defined as a made-up story to deceive or to mislead”. The problems of fake news, the wrong information, and recognition are an essential concern nowadays. The ratio of this information is overgrowing due to the massive amount of information supplied by webs like social media, blogs, online journals, and another internet source. In this paper, we display the solution of fake news detection problems by using the TF-IDF (Term Frequency Inverse Document Frequency) as feature extraction and Multi-Layer Perceptron (MLP) algorithm as a classifier. Two phases (feed-forward and back-propagation) are used with a three-layer input layer, one hidden layer, and output layer. After running our suggested algorithms on a benchmark fake news set, outstanding accuracy reached to 95.47% is achieved.

Keywords: Machine Learning, Natural Language Processing, Text Classification, Multi-Layer Perceptron, TF-IDF.

2010 Mathematics Subject Classification: 28A80, 37F05, 81Q35.

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Diophantine Attack on Prime Power Modulus $N = p^r q$

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Abstract

This paper reports new short decryption exponent attack on prime power modulus $N = p^r q$ for $r \geq 2$ using continued fraction method which makes it vulnerable to Diophantine attack and breaks the security of the cryptosystem by factoring the modulus into its prime factors since the hardness relies on the integer factorization problem. The paper also proves that if the short decryption exponent $d < \frac{1}{\sqrt{2}} \sqrt{N - 2^{\frac{2r+1}{r+1}} N^{\frac{r}{r+1}}}$, then one of the convergents $\frac{k}{d}$ can be found from the continued fraction expansion of $\frac{e}{N - \left\lfloor 2^{\frac{2r+1}{r+1}} N^{\frac{r}{r+1}} \right\rfloor}$ which leads to the successful factorization of prime power modulus $N = p^r q$ in polynomial time, for $r \geq 2$. The second part of the paper proposed cryptanalysis attacks on simultaneous factorization of t prime power with moduli $N_s = p_s^r q_s$ for $s = 1, \dots, t$ using simultaneous Diophantine approximations and lattice basis reduction methods which produced the prime factors of the form (p_s, q_s) for $s = 1, \dots, t$ in polynomial time. In all the presented attacks, the paper was able to found improved bounds as that are greater than reported bounds.

Keywords: Diophantine, Attack, Prime Power Modulus.

2010 Mathematics Subject Classification: First, Second, Third.

6.7 Mathematical Methods in Science and Engineering

Session Organizers: Özey Gürtuğ and Filiz Çağatay Uçgun

The session “Mathematical Methods in Science and Engineering” is organized in ICMS 2020, Maltepe University, Istanbul, Turkey, on 17th - 21th June, 2020. The programme of this session is mainly oriented towards some recent developments in quantum field theory, gravity and cosmology, nonlinear systems, special functions, boundary problems and some relevant mathematical methods.

We hope that all attending this meeting will recall it as a useful and pleasant event. We wish to thank all lecturers and other speakers for their interesting and valuable talks. We also thank all participants for their active participation. And special thanks to our sponsors for their financial supports, which were very significant for realization of this scientific activity.

Monotonicity properties of unreliable retrial queue with balking and generalized service time

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In this paper, we discuss various monotonicity properties of an $M/G/1$ retrial queue with unreliable server by incorporating the features of balking and reneging. The balking situation occurs when the customer by estimating the longer queue, becomes reluctant from joining the queue. During repair time, the customer in service either remains in the service position or enters a service retrial orbit and returns later to continue service. After the repair is complete, the server resumes service immediately if the customer in service has remained in the service position. Note that the service time is not the length of time measured from when a customer begins to be served until the service is completed because of possible breakdowns. We define the generalized service time as the length of time from when a customer begins service until service completion [2]. In this study, a particular interest is devoted to the stochastic comparison method based on the general theory of stochastic orders [1].

Keywords: Retrial queues, monotonicity properties, stochastic comparison.

2010 Mathematics Subject Classification: 60K25, 90B22, 60E15.

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Global existence and exponential decay of solutions for a variable-coefficient wave equation

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In this paper, we consider a variable-coefficient wave equation with damping and source terms. Under suitable conditions on the initial data we show that the solution exists globally in time and we derive exponential decay of the energy solution.

Keywords: Exponential decay, Global existence, Wave equation.
2010 Mathematics Subject Classification: 35B35, 35L71, 35L15.

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Optimality conditions for dynamics of forward backward doubly SDEs of mean-field type

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In this work, we consider a control problem for dynamics driven by a nonlinear forward-backward doubly stochastic differential equations of mean-field type (MF-FBDSDEs). In particular, we establish necessary as well as sufficient optimality conditions for the existence of both optimal relaxed control and optimal strict control for this kind of control problem of mean-field forward-backward doubly SDEs.

Keywords: Mean-field, forward backward doubly SDEs, necessary and sufficient optimality conditions.
2010 Mathematics Subject Classification: 60H10, 60G55, 93E20.

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A New Design of NTRU Encryption with high Security and Performance Level

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The multidimensional QTRU public key cryptosystem is an alternative design of NTRU by replacing the original NTRU ring, $Z[X]/(X^N - 1)$ by the quaternion algebra. In this paper, we introduced QMNTR as an improved system of QTRU using a new mathematical structure consisting of two public keys and five private key. This modification enhances the robustness and security of such public key systems.

Keywords: NTRU, QMNTR, quaternion algebra.

2010 Mathematics Subject Classification: 11T71, 94A60.

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On the 3D Polynomial Matrix Reduction to First Order Form

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In this paper, we present a multi-step reduction method for the reduction of an arbitrary 3D polynomial system matrix to a first order form, often encountered in the study of certain classes of 3D systems. We show that the transformation of zero-coprime-system-equivalence forms the basis of the connection between the original polynomial system matrix and its associated first order form. This transformation has been shown by many authors to play an important role in the theory of multidimensional systems.

Keywords: 3D system, Polynomial system matrix, Zero-coprime-system-equivalence.

2010 Mathematics Subject Classification: 47N70, 15A21, 41A63.

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A Numerical Study of a First Order Modular Grad-Div Stabilization for Magnetohydrodynamic Equations

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This report studies a first order modular grad-div stabilization method to simulate the magnetohydrodynamics equations (MHD). The proposed method combines modular grad-div steps with the usual MHD finite element method based on backward-Euler time discretization. The main idea in these intrusive steps is to penalize the divergence of the fluid unknowns by introducing two stabilization parameters. By this way, the method maintains the positive effect of the usual grad-div stabilization, and remains resistance to solver breakdown when larger stabilization parameters are used. The report proves that the method is optimally convergent both in time and space, and provides some numerical experiments showing its similar positive effect on the velocity/magnetic errors as in the usual grad-div stabilization.

Keywords: Modular grad-div, finite element method, magnetohydrodynamics equations.

2020 Mathematics Subject Classification: 65L05, 65L60, 35Q35.

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Stochastic analysis of a single server unreliable queue with balking and general retrial time

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In this investigation, we consider an $M/G/1$ queue with general retrial times allowing balking and server subject to breakdowns and repairs. In addition, the customer whose service is interrupted can stay at the server waiting for repair or leave and return while the server is being repaired. The server is not allowed to begin service on other customers until the current customer has completed service, even if current customer is temporarily absent. This model has a potential application in various fields, such as in the cognitive radio network and the manufacturing systems [3]. The methodology is strongly based on the general theory of stochastic orders [1, 2]. Particularly, we derive insensitive bounds for the stationary distribution of the embedded Markov chain of the considered system. Therefore, the obtained bounds (lower and upper) in this paper are easy to calculate and seem to be good approximations for stationary distribution of the embedded Markov chain of the considered system.

Keywords: Queueing models, Markov chain, stochastic orders.

2010 Mathematics Subject Classification: 60K25, 90B22, 60E15.

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Mathematical Modeling of the Effect of Counseling in the Transmission Dynamics of Drug-resistant Tuberculosis

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Tuberculosis (TB) is an ancient and deadly disease caused in humans mainly by infection with *Mycobacterium tuberculosis*. TB is transmitted from person to person through the air by an infected persons coughing, sneezing, speaking or singing. TB disease typically affects the lungs, but it can also affect other parts of the body such as the brain, the kidneys or the spine. Despite all efforts put in place to control the spread and transmission of TB disease, the disease still poses a threat to public health. One of the major threats to TB control is the emergence of drug-resistant TB which is primarily driven by acquired drug resistance during treatment and transmission of drug-resistant TB from source cases to contacts. Several authors developed models to address the transmission dynamics of drug-resistant TB. In this study, a fractional-order mathematical model for the transmission dynamics of TB with counseling is formulated in the sense of Caputo derivative by stratifying the total human population into seven compartments. The model is solved numerically using the Generalized Euler Method. This method provides accurate results when compared with Runge-Kutta method of order four for integer case. Numerical simulation further shows that the dynamics of TB continuously depends on the order of fractional derivatives.

Keywords: Tuberculosis, mathematical modeling, drug resistance, fractional-order, Caputo derivative

One parameter effect on the bifurcation and the stability analysis of the reduced Greitzer's system

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Bifurcation analysis plays an important role in determining the transition phases of aerodynamic instability. As well as, one of the main methods used for the study of non-linear systems in the permanent state. In our case, this analysis is applied on the Greitzer model for axial compressors, in order to determine the transition spaces. Our model is developed by reducing Greitzer's model to a dynamic system of two equations, under certain constraints, where its states are mass flow, m_r , and pressure, p_p . A parametric analysis of eigenvalues has made it possible to define the different areas of instability where a set of detailed conditions guarantees the existence of the bifurcation. In addition, the application of the theory of normal form, in this work, specifies the bifurcation's direction and types. The application of the theoretical results is proven by a numerical simulation.

Keywords: Hopf Bifurcation, Quasi linear dynamics system , aerodynamics instabilities.
2010 Mathematics Subject Classification: 39A28, 34C23, 35B35.

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A New Approach for the Characteristic Polynomial of a Complete Tripartite Graph

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The case $k = 3$ of a complete k -partite graph is called a complete tripartite graph $T_{p,q,r}$. It is a graph that its vertices are decomposed into three disjoint sets such that no two graph vertices within the same set are adjacent. Recently, it has attracted much attention due to its importance in several applications. Especially in chemistry, in which some of the molecular orbital compounds correspond to the structure of the tripartite graph. One method of capturing graph structure is through the computing of the characteristic polynomial for the matrix characterization M of a graph. For graphs with a large number of vertices, the calculation of the characteristic polynomials required high computational complexity. In this paper, a new approach of the characteristic polynomial for a complete tripartite graph $T_{i,i,n-2i}$, with $n \geq 4$, based on the adjacency matrix is introduced. It shows good efficiency because it reduces the complexity and the difficulty of the computation compared to some well-known methods, especially for large number of vertices.

Keywords: Tripartite graph, Adjacency matrix, Characteristic polynomial.

2010 Mathematics Subject Classification: 68R10, 81Q30, 97K30.

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Implicit Method of High Accuracy on Hexagonal Grids for Approximating the Solution to Heat Equation on Rectangle

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Taking into consideration that the hexagonal grid is a more natural choice to emulate the isotropy of the Laplacian operator, the approximation of the solution of the Dirichlet type boundary value problems for the two dimensional Laplace equation [1] and the heat equation [2] were of interest. The high accurate implicit schemes on triangular nets whose meshes are equilateral triangles for the two dimensional homogeneous diffusion equation were studied in [2]. However, the approximation to diffusion problem with heat source on rectangle for hexagonal grids that have centers $\frac{h}{2}$ units away from the sides of the rectangle at any time moment t with neighboring points emerging through these sides were not considered. In this study a two layer implicit method on hexagonal grids is proposed for approximating the solution to first type boundary value problem of heat equation on rectangle. It is proven that the given implicit scheme is unconditionally stable and converges to the exact solution on the grids of order $O(h^4 + \tau^2)$ where, h and $\frac{\sqrt{3}}{2}h$ are the step sizes in space variables x_1 and x_2 respectively and τ is the step size in time.

Keywords: Two dimensional heat equation, Hexagonal grid, Error Bounds.

2010 Mathematics Subject Classification: 65M06,65M12,65M22.

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Implicit Method of High Accuracy on Hexagonal Grids for Approximating the Solution to Heat Equation on a Domain with Smooth Boundary

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The use of Lagrange interpolation polynomial to solve the Dirichlet problem for Poisson's equation by the finite difference method on hexagonal grids was given in [1]. The hexagonal grid approximation for the two dimensional homogeneous diffusion equation was studied in [2] and for the Dirichlet problem for Laplace's equation on rectangle was given in [3]. It is the purpose of this paper to develop highly accurate finite difference method on hexagonal grids for the approximation of the solution to first type boundary value problem of 2D heat equation on a bounded domain with smooth boundary. For the regular grids 14-point implicit scheme is given whereas, for the construction of difference equations at irregular grids a third degree Lagrange interpolation polynomial is applied. The stability analysis is given and $O(h^4 + \tau^2)$ order of convergence of the method is justified by the numerical results. Here, h and $\frac{\sqrt{3}}{2}h$ are the step sizes in space variables x_1 and x_2 respectively, and τ is the step size in time.

Keywords: Two dimensional heat equation, Hexagonal grid, Error Bounds.

2010 Mathematics Subject Classification: 65M06,65M12,65M22.

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An Efficient Methodology for enhancing Fractal Coding Technique based on Hybridization of Crowding and Scattered Methods

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Fractal image coding is one of the active techniques for image compression. It always motivates for designing efficient algorithms to optimize the search space and reduce computation efforts, which is the main disadvantage of this technique. Hybridizing the metaheuristic methods has a vital interest in the optimization field. In this work, an intelligent search technique based on combining of crowding genetic and scattered search methods is proposed, in which the essential steps (generating a collection of diverse trial solutions, and the combined solutions method) in scattered search replaced by the two essential steps (the recombination and the mutation) in crowding method. Satisfactory results in reducing the computation cost of the fractal image compression technique are obtained.

Keywords: Fractal Image Compression (FIC), Genetic Algorithm (GA), Crowding Method (CM), Scatter Search Algorithm (SSA).

2010 Mathematics Subject Classification: 28A80.

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6.8 Applied Statistics

Session Organizers: Müjgan Tez and Kadri Ulaş Akay

The modern world is full of data on which many important decisions are based. Therefore, accurate analysis and data interpretation capabilities are required almost everywhere. STATISTICS, which manages this process, is a branch of science that manages the process of obtaining usable information starting from collecting raw data. It is the basis of research in all scientific disciplines. There are statistics wherever data is available. Even people who are illiterate use statistics in their daily life without realizing it. In general, statistics can be group under two main headings. These are theoretical statistics and applied statistics. The development of methods used in the discovery of the pattern in the data is the work of theoretical statistics. This process involves randomness. The use of these methods on data and inference is a field of applied statistics. Applied statistics is a branch of statistics that is developing with significant momentum from past to present. Applied Statistical Methods cover the basic understanding of statistics necessary to deal with a wide range of practical problems.

In particular, in many cases arising from the COVID-19 outbreak, statistics have turned out to be important. The importance of statistics has emerged in the studies on the role of outbreaks, statistics around the world, prevention of outbreak. In addition, statistical methods are at the center of topics such as artificial intelligence and machine learning. This situation shows the importance of statistics.

One objective of this session is to provide an environment in which recent developments in applied statistics are discussed. Another purpose is to contribute to the development of science by targeting scientific interaction among the participants. Besides, it is aimed to prepare a joint working platform with participants from different disciplines.

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Mathematical Model for Market Competition in the Telecommunication Industries in Nigeria

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This model was formulated by using some basic assumptions and the method of linearization was used to investigate the stability of the system and the data that has been used in this research has been obtained from national communication commission (NCC). Thus secondary data has been employed to achieve the objectives of the study from the year 2016 to 2018. The Lotka-Volterra competition model was used to analyze the competition for market supremacy among the three Nigerian telecommunication companies namely; MTN, AIRTEL and GLO. Firms market shares have been used to refer the competition among them. Estimation of market equilibrium and testing of stability has been performed in this study. The research result shows that MTN will be superior company in the long term and the study provides valuable information to the players for strategic planning and also for making informed decisions.

Keywords: Market , Telecommunication , Lotka-Volterra.
2010 Mathematics Subject Classification: :91Bxx

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An extended Liu-type estimator for the Inverse Gaussian Regression Model

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The Inverse Gaussian Regression Models (IGRM) are used when the response variable is positively skewed and follows the inverse Gaussian distribution. The maximum likelihood method is the well-known estimation technique to estimate the parameters in the IGRM. However, due to multicollinearity, unstable parameter estimates are obtained. Therefore, biased estimators are widely used to alleviate the undesirable effects of these problems. In this study, we proposed an extended Liu-type estimator as an alternative to other proposed biased estimators. The superiority of the new biased estimator over the existing biased estimators are given under the asymptotic matrix mean square error criterion. Furthermore, Monte Carlo simulation studies are executed to compare the performances of the proposed biased estimators. Finally, the obtained results are illustrated in real data.

Keywords: Inverse Gaussian Regression Model, multicollinearity, maximum likelihood estimator; Liu-type estimator

2010 Mathematics Subject Classification: 62J07, 62J12.

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A new kind of biased estimator for linear regression models

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In recent years, the biased estimators with two biasing parameters have been proposed as an alternative to Ridge and Liu estimators for linear regression models. We can say that the aim here is to combine several estimators to provide more suitable estimators. However, there are some difficulties for estimating bias parameters of these estimators. For this reason, a new ridge type estimator is proposed to overcome these difficulties in this article. Also, we investigate the superiority of the proposed Ridge-Type estimator to the other biased estimator under the matrix mean squared error criterion. Monte Carlo simulation studies are executed to illustrate the theoretical findings. A numerical example is given to demonstrate the performance of the proposed biased estimator over the other biased estimators.

Keywords: Biased regression, Multicollinearity, Ridge regression, Liu estimator
2010 Mathematics Subject Classification: 62J05, 62J07.

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Maximal inequalities with exponential decay under weak dependence conditions

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Under weak dependence restrictions, we establish large deviation inequalities with exponential decay, for the maximum of partial sums of subgaussian random variables. Our statements strengthen well-known inequalities such as those of Hoeffding and Azuma.

Theorem. Let $\mathcal{X} = \{X_k, k \geq 1\}$ be a sequence of subgaussian random variables and assume that the sequence of its partial sums is a $d_{\tilde{u}, \alpha}$ -subgaussian process, for some sequence of positive real numbers $\tilde{u} = \{u_k, k \geq 1\}$ with $\mathbf{u} := \sum_{k \geq 1} u_k < \infty$ and $0 < \alpha \leq 1$. Then

$$\forall n \geq 1, \forall t \geq 0, \quad P \left\{ \sup_{n \geq 1} \left| \sum_{k=1}^n X_k \right| \geq t \right\} \leq 2 \exp \left(-\frac{C(\alpha)t^2}{\mathbf{u}^{2\alpha}} \right),$$

for some $C(\alpha) > 0$.

Keywords: Exponential inequality, subgaussian process, acceptable sequences.
2010 Mathematics Subject Classification: 60F10, 60E15, 60G50.

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Hyperbolic-trigonometric Tension B-spline Galerkin Approach for the Solution of RLW Equation

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A numerical approach is defined to get the solution of the Regularized long wave (RLW) equation. The Hyperbolic-trigonometric tension (HTT) B-spline is adapted as a trial function to the Galerkin method. Space integration of the RLW equation is managed through HTT B-spline Galerkin method over the finite elements. Resulting system of ordinary differential equations is integrated using the Crank Nicolson technique. Thus RLW equation is fully integrated into system of nonlinear algebraic equations. Solution of this system gives the approximate solution of the RLW equation over the given problem domain.

Keywords: Hyperbolic-trigonometric Tension B-spline, Galerkin method, RLW equation.
2010 Mathematics Subject Classification: 41A15, 65N30, 65M60.

Rayleigh Gamma Gompertz Distribution: Properties and Applications

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In this paper, Rayleigh Gamma Gompertz (RGGom), as a new compound distribution, is introduced. Various fundamental statistical properties of RGGom distribution, including explicit expressions for the non-central r^{th} moments, order statistics, quantile function, characteristic function, relative and Shannon entropies, and stress strength reliability model, were studied and inspected. The unknown parameters of RGGom have been estimated using the estimation method of maximum likelihood. Furthermore, the RGGom distribution is applied upon a simulation study and real data set to assess its usefulness and flexibility.

Keywords: Rayleigh Distribution, Gamma Gompertz Distribution, Stress-Strength.

2010 Mathematics Subject Classification: 62Exx, 62E10, 62E17.

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Marshal Olkin Marshal Olkin Gompertz Distribution

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The aim of this paper is to propose a new flexible compound distribution named Marshal Olkin Marshal Olkin Gompertz (MOMOGO) distribution. Reliability characteristics besides several statistical properties of the proposed distribution have discussed. The maximum likelihood method, under a complete sample, is used to estimate the distribution parameters. Furthermore, two real data sets are considered to investigate the applicability of the proposed MOMOGO distribution.

Keywords: Marshal Olkin distribution, Gompertz distribution, reliability characteristics.
2010 Mathematics Subject Classification: 62Exx, 62E10, 62E17.

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