ICFPTA'19:
International Conference on Fixed Point Theory and Applications

November 30, 2019
Mohammedia, Morocco

M. Kabil, N. Moussaid and A. Taik
Co-chairs of the organizing committee

ICFPTA'19:

International Conference on

Fixed Point Theory and Applications

30 November, 2019, Mohammedia, Morocco

Organized by:

University Hassan II-Casablanca

Faculty of Science and Technology

Department of Mathematics

Laboratory of Mathematics and Applications

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Preface

Fixed Point Theory and its Applications is very important tools for proving the existence and uniqueness of the solutions to various mathematical models (differential equation, integral equation, partial differential equation and variational inequalities etc.) representing phenomena arising in different fields, such as steady-state temperature distribution, chemical equations, neutron transport theory, topology, economics, game theory, dynamics, optimal control, epidemics, functional analysis and flow of fluids.

This volume contains the abstracts of 4 invited lectures and more than 100 communicated lectures for the second meeting on International Conference on Fixed Point Theory and Applications (ICFPTA$'19$) held in Mohammedia and attended by more than 200 participants.

The presentations selected are intended to be a good indication of the most recent and significant developments highlighting worldwide collaborative work of research scientists. We hope that the selected presentations will lead to further collaboration and allow students to participate and be inspired and motivated to develop their own ideas for future work.

ICFPTA$'19$ is organized by the Department of Mathematics and Laboratory of Mathematics and Application of the Faculty of Sciences and Technology of the University Hassan II of Casablanca. We are grateful for the help of the scientific committee and the organizing committee and the support of numerous organizations who have made this meeting possible.

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Laboratory of Mathematics and Applications

UNIVERSITÉ HASSAN II DE CASABLANCA

The 2nd International Conference on Fixed Point Theory & Applications

ICFPTA'19

Saturday November 30, 2019

Faculty of Sciences and Technologies – Mohammedia

CONFERENCE PROGRAMME

Programme overview			
Saturday November 30, 2019			
08:00 – 08:30	**Registration of participants**		
08:30 – 09:00	**Opening Ceremony**		
09:00 – 12:30	**Plenary Conferences**		
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09:45 – 10:30	**Pr. Osvaldo Mendez** Texas University, USA	**A modular uniform convexity property of variable exponent Lebesgue spaces and applications to Fixed Point Theory**	
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11:00 – 11:30	**Pr. Ahmed Zaghal** FST Tanger	**On some fixed point theorems for weak topology : application to singular neutron transport equations**	**Chairman:** **Pr. Mohamed Amine Khamsi**
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16:00 – 16:15	MNS1-7	Meryem Ameur, Cherki Daoui and Najlae Idrissi		**Stationary and Non-stationary hidden Markov models**
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16:30– 17:00			**Coffee Break**
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18:00 – 18:15	MNS1-13	Nossaiba Baba, Imane Agmour, Youssef El Foutayeni and Naceur Achtaich	**Lotka-Voltera model in protected zone and free acces zone**
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14:45 – 15:00	MNS2-2	Adil Meskaf	**Optimal control of a delayed HBV infection model with capsids, adaptive immune responses and cure rate**
15:00 – 15:15	MNS2-3	Youssef Joundy, Karam Allali, Ahmed Taik and Vitaly Volpertb	**Modeling the evolution of viral infection in a tissue in space and time**
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15:30 – 15:45	MNS2-5	Brahim Boukanjime, Mohamed El Jamali and Mohamed El Fatini	**A stochastic hepatitis B epidemic model driven by Lévy noise**
15:45 – 16:00	MNS2-6	Jaouad Danane, Karam Allali	**Optimal control of an HIV with CTL cells and exposed cells**
16:00 – 16:15	MNS2-7	Hamza Rouah, Ahmed Taik	**Effect of Lewis number on convective instability of reaction fronts in a liquid medium**
16:15 – 16:30	MNS2-8	Imane AGMOUR, Meriem Bentounsi, Naceur Achtaich and Youssef El Foutayeni	**A study of meteorological effects on the annuel profit of sinners using mathematical modelling**
16:30– 17:00			**Coffee Break**
17:00 – 17:15	MNS2-9	Omar Khyar, Jaouad Danane, Adil Meskaf and Karam Allali	**Optimal control of an HIV model with saturated infection rate and exposed cells**
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17:30 – 17:45	MNS2-11	Khalid EL HAIL, Mohamed KHALADI	**The basic reproduction number for a delayed epidemic model in periodic environment**
17:45 – 18:00	MNS2-12	Mohamed EL KHALIFI, Mohamed EL FATINI and Regragui TAKI	**Stochastic analysis of an epidemic model with cure, relapse and general incidence**
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18:15 – 18:30	MNS2-14	Rachid ghazzali	**On the control of a reaction–diffusion system: a class of SIR distributed parameter systems**

1. ++++++++++++++++++ Conferences ++++++++++++++++++

Plenary lectures

International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Caristi Fixed Point Theorem Revisited

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Abstract. In this talk, we will go over the famous Caristi fixed point theorem. We will start by setting the stage of its inception. Then we will discuss the connection between this theorem and Ekeland Variational Principle. The key in this connection is the Bronsted partial order. A close investigation of this order shows that both Caristi fixed point theorem and Ekeland variational Principle assumptions are not optimal. We will finish our talk by discussing the Kirk's problem related to Caristi fixed point theorem.

Key words: Caristi fixed point, Ekeland Variational Principle, Bronsted partial order, Kirk's problem.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
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A modular uniform convexity property of variable exponent Lebesgue spaces and applications.

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Abstract. It is well known that $L^{p(\cdot)}$ is uniformly convex if and only if the exponent is bounded away from 1 and ∞. We present a modular version of uniform convexity which only requires $\inf_{\overline{\Omega}} > 1$. Applications to Fixed Point Theory will be presented.

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On the spectral reconstruction problem for digraphs

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Abstract. The idiosyncratic polynomial of a graph G with adjacency matrix A is the characteristic polynomial of the matrix $A + y(J - A - I)$, where I is the identity matrix and J is the all-ones matrix. It follows from a theorem of Hagos (2000) combined with an earlier result of Johnson and Newman (1980) that the idiosyncratic polynomial of a graph is reconstructible from the multiset of the idiosyncratic polynomial of its vertex-deleted subgraphs. For a digraph G with adjacency matrix A, we define the idiosyncratic polynomial of G as the characteristic polynomial of the matrix $A+y(J-A-I)+zA^t$. By forbidding two fixed digraphs on three vertices as induced subdigraphs, we prove that the idiosyncratic polynomial of a digraph is reconstructible from the multiset of the idiosyncratic polynomial of its induced subdigraphs on three vertices. As an immediate consequence, the characteristic polynomial of a tournament is reconstructible from the collection of its 3-cycles. Another consequence is that all the transitive orientations of a comparability graph have the same skew characteristic polynomial.

Key words: Digraph, reconstruction problem, idiosyncratic polynomial, hemimorphy, module.

Introduction

Given a graph G, the subgraph obtained from G by deleting a vertex v and all its incident edges is called a *vertex-deleted subgraph*. The multiset of vertex-deleted subgraphs, given up to isomorphism, is called the *deck* of G. We say that G is *reconstructible* if it is uniquely determined (up to isomorphism) by its deck. The well-known Graph Reconstruction Conjecture of Kelly [7] and Ulam [12] states that all finite graphs on at least three vertices are reconstructible. A problem which is closely related to this conjecture is the reconstruction of graph invariant polynomials. We mean by a *graph invariant* a function $\mathcal{I}$ from the set of all graphs into any commutative ring

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such that $\mathcal{I}(G) = \mathcal{I}(H)$ if G and H are two isomophic graphs. We say that a graph invariant is *reconstructible* if it is uniquely determined by the deck. For example, Tutte [11] proved that the characteristic polynomial and the chromatic polynomial are reconstructible. A natural question is to ask if a graph invariant polynomial can be reconstructed from the polynomial deck, that is, from the multiset of the polynomials of the vertex-deleted subgraphs? For the characteristic polynomial the problem is still open. It was posed by Cvetkovic at the XVIII International Scientific Colloquium in Ilmenau in 1973. Hagos [4] proved that the characteristic polynomial of a graph is reconstructible from its polynomial deck together with the polynomial deck of its complement. The *idiosyncratic polynomial* of a graph G with adjacency matrix A is the characteristic polynomial of the matrix obtained by replacing each non-diagonal zero in A with an indeterminate x, that is, the characteristic polynomial of the matrix $A + x(J - A - I)$. Johnson and Newman [6] consider a slightly different polynomial. It can be viewed as the idiosyncratic polynomial of the complement of G. It follows from their main theorem that two graphs have the same idiosyncratic polynomial if only if they are cospectral, and their complements are also cospectral. Then by Hagos' theorem, the idiosyncratic polynomial of a graph G is recontructible from its idiosyncratic polynomial deck.

The reconstruction conjecture was also considered for tournaments and more generally for digraphs. In this area, Stockmeyer [10] construct for every integer n two non isomorphic tournaments B_n and C_n on the same vertex set $\{0, \ldots, 2^n\}$. For this he consider the tournament A_n defined on $\{1, \ldots, 2^n\}$ by (i, j) is an arc of A_n if only if $odd(j - i) \equiv 1 \pmod 4$, where $odd(x)$ is the largest odd divisor of x. The tournaments B_n and C_n are obtained from A_n by adding the vertex 0. In the tournament B_n, the vertex 0 dominates $2, 4 \ldots, 2^n$ and is dominated by $1, 3 \ldots, 2^n - 1$. The tournament C_n, the vertex v_0 dominates $1, 3 \ldots, 2^n - 1$ and is dominated by $2, 4 \ldots, 2^n$. It is proved in [10] that for $1 \leq k \leq 2^n$, the tournaments $B_n - k$ and $C_n - (2^n + 1 - k)$ are isomorphic. Then the pair B_n and C_n form a counterexample for the reconstruction conjecture. As mentioned by Pouzet [9], Dumont checked that for $n \leq 6$ the difference (in absolute value) between the determinants of B_n and C_n is 1. This fact is perhaps true for arbitrary n but we are not able to prove it. However, we have the following result.

Proposition 1. *For $n \geq 3$, the determinants of B_n and C_n do not have the same parity.*

Fraïssé [2] considered a strengthening of the reconstruction conjecture for the class of relations which contains graphs and digraphs. For digraphs, Fraïssé's problem can be stated as follow. Let G and H be two digraphs with the same vertex set V. Assume that for every proper subset W of V the subdigraphs $G[W]$ and $H[W]$, induced by W are isomorphic. Is it true that G and H are isomorphic? Lopez [8] proved that the answer is positive when $|V| \geq 7$. It follows that if $G[W]$ and $H[W]$ are isomorphic for every subset W of size at most 6, then G and H are isomorphic. Motivated by Lopez's theorem, we can ask the following question.

Question 2. *Let I be a digraph invariant polynomial. Let G be a digraph. Is the polynomial $I(G)$ reconstructible from the collection $\{I(H) : H \in \mathcal{H}\}$, where $\mathcal{H}$ is the set of proper induced subdigraphs of G?*

In this paper, we will address this question for idiosyncratic polynomial extended to digraphs. Let G be a digraph G with adjacency matrix A. The *generalized adjacency matrix* of G is $A(y, z) =$

$A + y(J - A - I) + zA^t$. The idiosyncratic polynomial of G as the characteristic polynomial of $A(y, z)$. The presence of zA^t comes from the fact that the adjacency matrix of a digraph is not necessarily symmetric. It is not difficult to see that if two digraphs have the same idiosyncratic polynomial then they have the same characteristic polynomial, moreover their complement and their converse are also the same characteristic polynomial.

We prove that Question 2 is not true for arbitrary digraphs. Our counterexamples are borrowed from [1] where they have been used in another context. All of these counterexamples contain one of two particular digraphs called *flag*. Following [1] a *flag* is a digraph with vertex set $\{u, v, w\}$ and whose arcs set is either $\{(u, v), (u, w), (w, u)\}$ or $\{(v, u), (u, w), (w, u)\}$. A *flag-free digraph* is a digraph in which there is no flag as induced subdigraph.

Our main result is stated as follow.

Theorem 3. *Let G and H be two flag-free digraphs with the same vertex set V of size at least 5. If for every 3-subset W of V, the induced subdigraphs $G[W]$ and $H[W]$ have the same idiosyncratic polynomial, then G and H have the same idiosyncratic polynomial.*

As an application, we obtain the following corollary about tournaments.

Corollary 4. *Two tournaments with the same 3-cycles have the same idiosyncratic polynomial.*

Posets form an important class of digraphs for which the reconstruction problem is still open. Ille and Rampon [5] proved that a poset is reconstructible by its deck together with its comparability graph.

Following Habib [3], a parameter of a poset is said to be *comparability invariant* if all posets with a given comparability graph have the same value of that parameter. The dimension and the number of transitive extension of a poset are two examples of comparability invariants.

The next corollary is another consequence of Theorem 3.

Corollary 5. *Two posets with the same comparability graph have the same idiosyncratic polynomial.*

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On some fixed point theorems for weak topology : application to singular neutron transport equations

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Abstract. In this talk, we give several fixed point theorems for operators satisfying conditions expressed mainly with the help of weak topologies and measures of weak noncompactness. Our operators are not necessary continuous. As application, we are concerned with the solvability of some nonlinear singular transport equations (i.e., transport equations with unbounded collision frequency and unbounded collision operators). Our analysis, based on new compactness results, uses the concept of Dunford-Pettis operators and a new version of Darbo's fixed point theorem for a measure of weak noncompactness introduced in this work.

Key words: Fixed point theorems; Nonlinear transport equation; Dunford-Pettis operators; existence result; compactness results; measure of weak noncompactness.
AMS subject classification: 47H10; 45K05; 35F20.

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Fixed point theorems for monotone mappings in ordered Banach spaces and application to differential equations

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Abstract. In this talk, we present several fixed point theorems for monotone nonlinear operators in ordered Banach spaces. The main assumptions of our results are formulated in terms of the weak topology. As an application, we study the existence of solutions to a class of first-order vector-valued ordinary differential equations. This talk is based on a joint work with A. Alahmari and M. Mabrouk [1].

Key words: Fixed point theorem; Order cone; Increasing operator; Decreasing operator; Weakly condensing; Measure of weak noncompactness.
AMS subject classification: 45N05; 47H10.

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2. ++++++++++++++++++ Session 1 ++++++++++++++++++

Fixed point and Applications

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On a fixed point theorem in Banach algebras with applications

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Abstract. In this talk, we present some fixed point theorems for the operators of the form $AB + C$ in Banach algebras, where B is (A, C)-convex-power-condensing. Our results extend some earlier works. Several examples are given to illustrate our results.

Key words: Banach algebras, Fixed point theorem, measure of weak noncompactness. weakly sequentially continuous operators, convex-power condensing operators.
AMS subject classification: 47H10; 47H08; 45G10.

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Fixed point theorems for mappings in r-normed spaces and application

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Abstract. In this talk, we present some fixed point theorems for mappings on s-convex sets in r-normed spaces ($0 < r \leq 1$, $0 < s \leq 1$). An application in r-normed spaces is presented.

Key words: r-normed space, s-convex set, fixed point theorems, topological vector space, Schauder's conjecture.
AMS subject classification: 47H10, 46A16, 46A50.

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Common coupled fixed point results for multivalued mappings and applications

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Abstract. In this paper, some fixed point theorems for the countably condensing multivalued mappings are proved in ordered Banach spaces. For that purpose, the notions of weakly inflationary mappings and they are further applied to an integral inclusion in Banach spaces for proving the existence of solutions.

Key words:Ordered Banach space, Coupled fixed point, Inflationary mapping,Multi-valued mapping, Condensing mapping, Integral inclusions..
AMS subject classification: [2010]47H10, 54H25, 47H30.

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Fixed Point Results On Fuzzy Metric Spaces Via $\mathcal{FZ}$-Simulation Functions

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Abstract. In this paper we introduce a new class of fuzzy contractive mapping and we show that such a class unify and generalize several existing concepts in the literature. We establish fixed point theorem for such mappings in complete strong fuzzy metric spaces and we give an illustrative example.

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Compactness and normal structure in relational systems and some related fixed point theorems

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Abstract. In this paper we study the existence of fixed point for a binary relation preserving mappings. These class of mappings generalises that of order and edge preserving mappings on posets and graphs respectively. As an application, we give a DeMarr-Type result for a family of binary relation preserving mappings.

Key words: Generlized metric spaces; Nonexpansive mappings; Fixed point; Normal structure; Compactness
AMS subject classification: Primary: 05, 06, 08, Secondary: 37C25.

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Approximating fixed points by a new iteration process

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Abstract. In this paper, we introduce a new iterative scheme to approximate fixed point of contractive mappings and we show that the most used fixed point iterative methods are convergent to the unique fixed point. A numerical comparison of these methods with respect to their convergence rate is given.

Key words: Iteration process, convergence, rate of convergence, fixed point, approximation.
AMS subject classification: 47H10, 54H25.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Relatively Cyclic P-Contractions in locally $\mathbb{K}$-Convex space

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Abstract. Our main goal of this research is to present the theory of points for relatively cyclic and relatively noncyclic p-contractions in complete locally **K**–convex spaces by providing basic conditions to ensure the existence and uniqueness of fixed points and best proximity points of the relatively cyclic and relatively noncyclic p-contractions map in locally **K**-convex space.

Key words: locally K convex space, fixed point, relatively cyclic p-contractions .
AMS subject classification:Fixed Point Theory And Applications .

Main result

Definition 6. *Let A and B be non empty subsets of locally $\mathbb{K}$-convex space (X, Γ). A relatively cyclic map $T : A \cup B \to A \cup B$ is said to be relatively cyclic p-contraction if there exists $0 \leq \gamma_p < 1$ such that for all $p \in \Gamma$ and $a \in A$ and $b \in B$ we have*

$$p\left(Ta - Tb\right) \leq \gamma_p p\left(a - b\right). \tag{2.1}$$

Theorem 7. *Let (X, Γ) be a complete Hausdorff locally $\mathbb{K}$-convex space, A and B be non empty closed subsets of X and $T : A \cup B \to A \cup B$ a relatively cyclic p-contraction map. Then T has a unique fixed point in $A \cap B$.*

Conclusion

This paper presents a study of fixed point theory in locally K convex space,We have followed the locally K convex space as defined by A.F Monna

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Reich's fixed point theorem in general topological spaces with $\tau-$distance

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Abstract. In the present paper, we prove a new version of the well-known reich's fixed point theorem in general topological spaces with $\tau-$distance. Our result generalizes and improves many known results in literature.

Key words: Fixed point, Hausdorff topological spaces, S-complete.
AMS subject classification: 47H10.

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Fixed point theorems and application to nonlinear integral equation

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Abstract. Recently, many authors were concerned in the study of nonlinear integral equation in Banach algebra via fixed point technique. Some of these equations can be formulated into the nonlinear operator equation $x = Ax.Bx + Cx$, the resolution of this equation was the main interest of many scientists and there results were very interesting. In this work, we study the existence of fixed points for the sum A.B + C in a Banach algebra relative to the weak topology. As an application we discus the existence of solution of a abstract nonlinear integral equation in the Banach algebra $C([0,1],X)$, and a concrete example of these nonlinear integral equation in the Banach algebra $C([0,1],\mathbb{R})$.

Key words: Banach algebras; Fixed point theorems; Measure of weak noncompactness; Weak topology; Integral equations.
AMS subject classification:47H09, 47H10, 47H30 .

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Caristi-type fixed point in a Menger space

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Abstract. In this work, we consider a generalization of the metric space. It is a probabilistic space that is an abstract set with a family of distribution functions satisfying certain conditions. In the setting of Menger space, probabilistic space with a particular T-norm, we study the existence and the uniqueness of common fixed point for a system of type-Caristi contractions.

Key words: Common fixed point; Caristi contraction; Menger space.
AMS subject classification: 47H10, 54H25, 54E70, 55M20.

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Fixed point for multivalued mappings in modular function spaces endowed with graph: ρ-compact and ρ-a.e compact cases

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Abstract. The aim of this talk is to give a fixed point theorem for G-monotone ρ-non-expansive multi-valued mappings for ρ-compact and ρ-a.e. compact sets in modular function spaces endowed with a reflexive digraph not necessarily transitive. We also extend some results obtained in modular function space which is endowed with a "natural" order, for the wider family of M.F.S endowed with graph. Examples are given to support our work.

Key words: Banach algebras; Fixed point theorems; Measure of weak noncompactness; Weak topology; Integral equations.
AMS subject classification:47H09, 47H10, 47H30 .

Main results

We've first established the following result:

Theorem 8. *Let $\rho \in \mathfrak{R}$ be convex, satisfies the Δ_2-type condition. Let $C \subset L_\rho$ be a nonempty convex, ρ-compact, and ρ-bounded subset, G a reflexive digraph compatible with the vector structure of L_ρ with the (P)-property. Let $T : C \to \mathcal{K}(C)$ be a G-monotone ρ-nonexpansive mapping, if $C_T := \{f \in C : f \in [g]_G \ for\ some\ g \in T(f)\}$ is nonempty, then T has a fixed point.*

Then we gived an equivalent version of the theorem above for ρ-almost every where compact subsets of L_ρ.

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30 Novembre 2019

Best Proximity Point in a Hausdorff locally Convex Space

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Abstract. In the present paper, we investigate some geometric properties and we show, under some conditions, the existence of best proximity points for a relatively non-expansive mapping.

Key words:. Best proximity pairs; Locally convex space; Relatively Non-expansive mapping.
AMS subject classification: .

Introduction

Let E be a Hausdorff locally convex space, and P a family of continuous semi-norms which generates the topology of E, and C an arbitrary convex subset belongs to E. For any two subsets A, B of E and $x \in E$, let

$$\begin{aligned} \delta_p(A,B) &= \sup\{p(x-y) : x \in A; y \in B\} \\ \delta_p(x,A) &= \sup\{p(x-y) : y \in B\} \\ dist_p(A,B) &= \inf\{p(x-y) : x \in A; y \in B\}. \end{aligned}$$

Recall that a mapping $T : C \to C$ is said to be $P-$non-expansive if for any $x, y \in C$ and $p \in P$

$$p(Tx - Ty) \leq p(x-y).$$

And $T : A \cup B \to A \cup B$ is said to be relatively $P-$non-expansive if for any $(x,y) \in A \times B$ and $p \in P$.

$$p(Tx - Ty) \leq p(x-y).$$

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Main Results

Definition 9. *A pair (A, B) of subsets of a Hausdorff locally convex space (E, P) is said to be $P-$proximal if for each $(x, y) \in A \times B$, $for\ any\ p \in P$ there exists $(x_p, y_p) \in A \times B$ such that*

$$p(x - y_p) = p(x_p - y) = dist_p(A, B)$$

Theorem 10. *Let (A, B) be a nonempty weakly compact convex pair in a Hausdorff locally convex space (E, P), and suppose (A, B) has P-proximal normal structure. Let $T : A \cup B \to A \cup B$ be a cyclic relatively P-non-expansive mapping. Then there exists $(x, y) \in A \times B$ such that*

$$p(x - Tx) = p(y - Ty) = dist_p(A, B).$$

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

On Browder's convergence theorem in nonlinear spaces

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Abstract. Recently, many of the standard ideas of nonlinear analysis have been extended to the class of so-called CAT(0) spaces. While many of the Banach space ideas carry over to a complete CAT(0) setting without essential change, often a more geometrical approach is required, with less emphasis on topological concepts caused by, among other things, the absence of a weak topology. There is an interesting class of spaces which are both complete CAT(0) spaces and hyperconvex metric spaces. These are the complete R-trees (or metric trees). Indeed, a CAT(0) space is hyperconvex if and only if it is a complete R-tree. In this survey we discuss some recent metric fixed point results in some of the settings just described, which have some interesting connections with classical fixed point results in topology.

Key words:. Fixed point, multivalued nonexpansive mapping, strong convergence, R-tree.
AMS subject classification: .

Introduction

We are interested in what happens in the field of topological fixed point theory, specifically the problem of the metric fixed point in the Banach spaces and Browder's strong convergence theorem. The most important idea in this area is, of course, the insertion of purely topological properties, namely geodesic connectedness properties. All this, in order to find the results of Browder convergences, but on nonlinear spaces.

Conclusion

these geodesic spaces which are initially characterized by the non-linearity, constitute for us a new area of extensions. This, for the convergence of Browder and other types of results.

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30 Novembre 2019

A generalization of fixed point theorems about θ-contraction in generalized asymmetric spaces

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Abstract. In this paper, we describe some fixed point theorems concerning θ-contraction. In this way, we give some examples to illustrate our results

Key words: Fixed point, θ-contraction, generalized asymmetric space.
AMS subject classification: 47A16.

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Common fixed points of monotone ρ-nonexpansive semigroups in modular spaces

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Abstract. In the present paper, we consider the class of monotone ρ-nonexpansive semigroups and we prove that the set of common fixed points, in uniformly convex modular spaces is nonempty.

Key words:. Fixed point, modular space, monotone ρ-nonexpansive semigroups, uniformly convex.
AMS subject classification: .

Introduction

A family $F = \{T_t : t \geq 0\}$ is called a semigroup on a subset C of a modular space X_ρ if $T_0(x) = x$ and $T_{s+t} = T_s \circ T_t$, for all s, t positive, for all $x \in C$.
The theory of semigroups is very interesting in mathematics and applications. As a situation, in the theory of dynamical systems, the space X on which the semigroup $\mathcal{S}$ is defined will represent the states space and the mapping

$$\begin{aligned} \mathbb{R}_+ \times C &\longrightarrow C \\ (t, s) &\longmapsto T_t(x) \end{aligned}$$

would represent the evolution function of the dynamical system.
The problem of the existence of common fixed points for semigroups still in its beginning. In [1], Bachar et al. gave some existence results of common fixed points for semigroups of monotone contractions and monotone nonexpansive mappings in Banach spaces. For semigroups acting in modular function spaces, Kozlowski [6] have proved that the set of common fixed points of any ρ-nonexpansive semigroups, on a ρ-closed convex and ρ-bounded subset of a uniformly convex modular function modular L_ρ, is nonempty and ρ-closed and convex.
Motivated by the cited results, The aim of this paper is to prove the existence of common fixed point of monotone ρ-nonexpansive semigroups in modular space.

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Main result

To confirm the existence of common fixed point for the class of monotone ρ-nonexpansive semigroups in uniformly convex modular spaces, we state the following theorem:

Theorem 11. *Let ρ be a convex modular satisfying the Fatou property and (UUC1). Let C be a nonempty ρ-closed convex ρ-bounded subset of a ρ-complete modular space X_ρ. Let $\mathcal{S} = \{T_t : t \geq 0\}$ be a monotone ρ-nonexpansive semigroup such that T_t is ρ-continuous for any $t \geq 0$. Assume that there exists $x_0 \in C$ such that $x_0 \leq T_t(x_0)$ (resp. $T_t(x_0) \leq x_0$) for all $t \geq 0$. Then, there exists a common fixed point $z \in Fix(\mathcal{S})$ such that $x_0 \leq z$ (resp. $z \leq x_0$).*

Conclusion

As a conclusion, we have established some existence results for monotone ρ-nonexpansive semigroups in uniformly convex modular spaces. Our results is a generalisation of several results mentioned in the introduction and the reference sections of this paper.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Fixed point theory in α-complete b-metric spaces.

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Abstract. In this paper, we introduce the notion of $(\alpha, \theta, k, \varphi)$-contractive multivalued mappings in b-metric spaces to generalize and extend the notion of (α, θ, k)-contractive mappings to closed valued multifunctions. We investigate the existence of fixed points for such mappings. We also construct an example to show that our result is more general than the results of (α, θ, k)-contractive closed valued multifunctions.

Key words:Fixed point, $(\alpha, k, \theta, \varphi)$-contractive mapping, b-metric space, weak α-admissible mapping..

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3. ++++++++++++++++++ Session 2 ++++++++++++++++++

Functional Analysis and Operators Theory

International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

On the Browder's theorem

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Abstract. We give a new characterization of Browder's theorem using spectra originated from Drazin-Fredholm theory.

Key words: Generalized Kato-Riesz decomposition, generalized Drazin-Riesz invertible, Browder's theorem, Riesz operator..
AMS subject classification: 47A53; 47A10. Y

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
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The Invariant Subspace in Finite dimensional Non-archimedean Spaces

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Abstract. We examine in this talk, The existence of the invariant Subspace for the operators in the finite dimensional Spaces over a non-archimedean valued fields, The non-archimedean structure of the fields makes a remarkable change from that of the classical case.

Key words: invariant subspace , non-archimedean.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Operator frame in Hilbert Modules

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Abstract. Frame theory is dynamic with applications to a wide variety of areas.

Hilbert C^*-modules form a wide category between Hilbert spaces and Banach spaces.

In this talk, we investigate some properties of Operator frame in Hilbert C^*-modules and we give a characterization of them.

We will also study tensor product of Operator frame in Hilbert C^*-modules.

Key words: Frame, Operator frame, C^*-algebra, Hilbert C^*-module.
AMS subject classification: 42C15, 46L05.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
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Perturbations of the generalized Drazin-Riesz spectra of operator matrices

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Abstract. Let $A \in \mathcal{B}(X)$, $B \in \mathcal{B}(Y)$ and $C \in \mathcal{B}(Y, X)$ where X and Y are infinite dimensional Banach or Hilbert spaces. Let $M_C = \begin{pmatrix} A & C \\ 0 & B \end{pmatrix}$ be 2×2 upper triangular operator matrix acting on $X \oplus Y$. In this paper, we consider some necessary and sufficient conditions for M_C to be generalized Drazin-Riesz invertible. Furthermore, the set $\bigcap_{C \in \mathcal{B}(Y,X)} \sigma_{gDR}(M_C)$ will be investigated and their relation between $\bigcap_{C \in \mathcal{B}(Y,X)} \sigma_b(M_C)$ will be studied, where $\sigma_{gDR}(M_C)$ and $\sigma_b(M_C)$ denote the generalized Drazin-Riesz spectrum and the Browder spectrum, respectively.

Key words: Operator matrices; Riesz operators; generalized Drazi-Riesz invertibility; generalized Drazin-Riesz spectrum; essentially Kato operators.
AMS subject classification: 47A10, 47A53 .

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Pseudo spectra and condition spectrum preservers

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Abstract. Let $\mathcal{B}(\mathcal{H})$ denotes the algebra of all bounded linear operators acting on a complex Hilbert space. The ϵ**-condition spectrum** of A for $0 < \epsilon < 1$ is defined by

$$\sigma_\epsilon(A) := \{z \in \mathbb{C} : \|z - A\|\|(z - A)^{-1}\| \geq \epsilon^{-1}\},$$

with the convention that $\|z - A\|\|(z - A)^{-1}\| = \infty$ when $z - A$ is not invertible.
The ϵ**-pseudo spectrum** of A, for $\epsilon > 0$ is defined by

$$\Lambda_\epsilon(A) := \{z \in \mathbb{C} : \|(z - A)^{-1}\| \geq \epsilon^{-1}\},$$

with the convention that $\|(z - A)^{-1}\| = \infty$ when $z - A$ is not invertible.

The aim of this talk concern the study of maps preserving those notions.

Key words: Condition spectra, Pseudo spectra, Nonlinear preservers problem.
AMS subject classification: 47A15,47B48 .

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On p-adic cosine families of bounded linear operators on free Banach space of countable type

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Abstract. In this paper, we initiate the investigation of p-adic cosine families of bounded linear operator on some Banach space. We study functional calcular for this class of one parameter of p-adic cosine families of bounded linear operator on $c_0(K)$ where K be a complete non-archimedean valued field, which is also algebraically closed.

Key words: Non-archimedean free Banach spaces of countable type , p-adic cosine operator, Shnirelman integral, functional calculas. , cosine families of bounded linear operators..
AMS subject classification: .

Introduction

In [3], M. Sova attempt to give a systematical study of the basic proprties of operator fuctions called cosine operator functions, i.e functions wich satisfy the well-know functional equation of d'Alembert. In the real case such a functional equation is satisfied by the class of all cos(at), coh(at) (coh- hyperbolic cosine, a arbittrary real number). In the ultrametric case, there is no paper about p-adic cosine operators class.

Conclusion

The main of this paper is to initiate the investigation of p-adic cosine families of bounded linear operator on some Banach space and we study functional calcular for this class of one parameter of p-

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adic cosine families of bounded linear operator on $c_0(K)$ where K be a complete non-archimedean valued field, which is also algebraically closed.

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Uniform ergodicity in the closed invariant subspace

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Abstract. In the present paper, We treat the question when an operator T, whose restriction S to a single invariant subspace Y is uniformly ergodic, must be uniformly ergodic throughout the space? One of the main result is that if T satisfies $\frac{T^n}{n} \to 0$ weakly (a necessary condition for uniform ergodicity) and $(I-T)X \subset Y$, then uniform ergodicity of $S = T|_Y$ implies uniform ergodicity of T. Consequently, we obtain other equivalent conditions concerning the theorem Mentioned in[5, theorem 1], also to the theorem of the Gelfand-Hille type.

Key words: Uniform ergodic theorem, Cesro averages, decomposition ergodic.
AMS subject classification: 47A35, 47A25, 47A15. .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
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On the local spectral subspaces preservers

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Abstract. In this talk we discuss the form of surjective maps from $\mathcal{B}(X)$ into itself satisfying

$$X_{\phi(A_1)*\cdots*\phi(A_k)}(\{\lambda\}) = X_{A_1*\cdots*A_k}(\{\lambda\})$$

for all $A_1, \cdots, A_k \in \mathcal{B}(X)$ and all $\lambda \in \mathbb{C}$, where $X_A(\{\lambda\})$ is the local spectral subspace of A associated with $\{\lambda\}$ and $A_1 * A_2 * \cdots * A_k$ is the generalized product of k operators $A_1..A_k \in \mathcal{B}(X)$.

Key words: Local spectral subspace, Nonlinear preservers problem, Generalised product.
AMS subject classification: 47A11, 47A15,47B48 .

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On some property of operator matrices

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Abstract. In the present talk, we investigate the limit points set of left and right spectra of upper triangular operator matrices $M_C = \begin{pmatrix} A & C \\ 0 & B \end{pmatrix}$. We discuss the equality $acc(\sigma_*(M_C)) \cup W_{acc\sigma_*} = acc(\sigma_*(A)) \cup acc(\sigma_*(B))$ where $W_{acc\sigma_*}$ is the union of certain holes in $acc(\sigma_*(M_C))$, which happen to be subsets of $acc(\sigma_l(B)) \cap acc(\sigma_r(A))$ and $\sigma_*()$ can be equal to the left or right spectrum. Furthermore, several sufficient conditions for $acc(\sigma_*(M_C)) = acc(\sigma_*(A)) \cup acc(\sigma_*(B))$ holds for every $C \in \mathcal{B}(Y, X)$ are given.

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Local Spectral Subspace Preservers

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Abstract. Let $\mathcal{B}(X)$ be the algebra of all bounded linear operators on Banach space X. For $T \in \mathcal{B}(X)$ and $\lambda \in \mathbb{C}$, let $X_T(\{\lambda\})$ denotes the local spectral subspace of T associated with $\{\lambda\}$. We determine the forms of mappings (not necessarily linear) $\phi : \mathcal{B}(X) \to \mathcal{B}(X)$ that preserve the local spectral subspace of either sum, product of operators or triple product of operators associated with a singleton.

Key words: Local spectral subspace, Nonlinear preservers problem, rank-one operator.
AMS subject classification: Primary 47A11; Secondary 47A15, 47B48.

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On linear Dynamical Systems of elementary operators.

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Abstract. Let X be a Banach space with $\dim X > 1$ such that X^*, its dual, is separable and $\mathcal{B}(X)$ the algebra of bounded linear operators on X. In the present work, we introduce the notion of mixing recurrent and we investigate the study of recurrent and mixing recurrent for elementary operators on an admissible Banach ideal of operators. Also, we study the passage of property of being supercyclic from an operator T on a Banach space X to the left and the right multiplication L_T and R_T on an admissible Banach ideal of operators $(\mathbf{J}, \|.\|_{\mathbf{J}})$. In particular, we show that

(i) T satisfies the supercyclicity criterion on X if and only if L_T is supercyclic on $(\mathbf{J}, \|.\|_{\mathbf{J}})$.

(ii) T^* satisfies the supercyclicity criterion on X^* if and only if R_T is supercyclic on $(\mathbf{J}, \|.\|_{\mathbf{J}})$.

(iii) $T \oplus T$ is recurrent on $X \bigoplus X$ if and only if L_T is recurrent on $(J, \|.\|_J)$.

(iv) T is mixing recurrent on X if and only if L_T is mixing recurrent on $(\mathbf{J}, \|.\|_{\mathbf{J}})$.

Key words: Supercyclicity, recurrent, mixing, left multiplication, right multiplication, tensor product, Banach ideal of operators.
AMS subject classification: Primary 47A80, 47A53; secondary 47A16, 47D60. .

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Locally convex hulls and inductive limit of locally convex spaces with sequential topologies

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Abstract. In this work we will adapt several results established by Köthe[10] by considering the sequential toplogical inductive limit of a family $(E_\alpha, \tau_\alpha^s, A_\alpha)_{\alpha\in\mathcal{I}}$ such as τ_α^s the sequential locally convex topologie associated with a topologie τ_α, for all $\alpha \in \mathcal{I}$.

Key words:. Locally convex hull, sequential hull topology, inductive limit, sequential topological inductive limit, sequential strict inductive limits, sequential quotient topology, $(LF^s)-$spaces.

AMS subject classification: .
MSC2010 : 46A03 - 46M40 - 54A05 - 54A10 - 54A20 - 54B05 - 54B15 - 54D55.

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COSINE FAMILIES IN QUOJECTION-FRÉCHET SPACES

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Abstract. We prove that if the Quojection-Fréchet space X is a Grothendieck space with the Dunford-Pettis property, then every C_0-cosine family is necessarily uniformly continuous and therefore its infinitesimal generator is a continuous linear operator.

Key words: Strongly continuous cosine families, semi-groups of operators, locally convex spaces, Quojection Fréchet spaces.
AMS subject classification: Primary 47D09, 46A04, Secondary 46A11.

Main result

In this communication, we investigate cosine families of continuous linear operators on sequentially complete locally convex Hausdoff spaces with a strong emphasis on Fréchet spaces which are quojections and possess the Grothendieck property as well as the Dunford-Pettis property (GDP spaces for short).
We showed that locally equicontinuous C_0-cosine families, on sequentially complete locally convex Hausdoff spaces, are strongly continuous, and some properties of its generator are recalled.
The main result of this communication is that contrary to a general sequentially complete locally convex Hausdorff space for a GDP quojection-Fréchet space the generator of every exponentially equicontinuous C_0-cosine family is a continuous linear operator defined on the whole space and the cosine family is even uniformly continuous.

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On the Strong and Uniform Kreiss Resolvent Condition

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Abstract. In the present paper, we extend the strong (uniform) Kreiss resolvent condition to a direct sum, and we show that if an operator on a Banach space satisfies the strong (uniform) Kreiss resolvent condition then so does the fractional powers of this operator.

Key words: Strong resolvent condition- Uniform resolvent condition- Banach space.
AMS subject classification: .

Introduction

Let $\mathcal{X}$ be a generally infinite-dimensional Banach space, and let $B(\mathcal{X})$ be the algebra of bounded linear operators on $\mathcal{X}$. Let us recall (see, e.g., [4]) that an operator T with $r(T) \leq 1$ is said to satisfy:
the uniform Kreiss resolvent condition if there exists a constant $L \geq 1$ such that

$$\left\| \sum_{k=0}^{n} \frac{T^k}{\lambda^{k+1}} \right\| \leq \frac{L}{|\lambda| - 1}, \ |\lambda| > 1, \ n = 0, 1, 2, \ldots, \ [UR]$$

the strong Kreiss resolvent condition if there exists a constant $M \geq 1$ such that

$$\| R^k(T, \lambda) \| \leq \frac{M}{(|\lambda| - 1)^k} \text{ for all } |\lambda| > 1, \text{ and } k = 1, 2, \ldots . [SR]$$

The first objective of this paper is to show that if the $[SR]$ condition ($[UR]$ condition) holds for an operator $T \in L(\mathcal{H})$, then it also holds for the operator T^r, for any rational $r = \frac{p}{q}$ $(p, q \in \mathbb{N}^*)$. We prove also the converse statement.

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Our second objective is to show that if two operators satisfying the $[SR]$ condition ($[UR]$ condition), so the direct sum satisfy the same condition. We prove also the converse statement.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Diskcyclicity of sets of operators and applications

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Abstract. In this paper, we introduce and study the diskcyclicity and disk transitivity of a set of operators. We establish a diskcyclicity criterion and we give the relationship between this criterion and the diskcyclicity. As applications, we study the diskcyclicty of C_0-semigroups and C-regularized groups. We show that a diskcyclic C_0-semigroup exists on a complex topological vector space X if and only if $\dim(X) = 1$ or $\dim(X) = \infty$ and we prove that diskcyclicity and disk transitivity of a C_0-semigroups (resp C-regularized groups) are equivalent.

Key words: Hypercyclicity, supercyclicity, diskcyclicity, C_0-semigroups of operators, C-regularized groups of operators.
AMS subject classification: 47A16.

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Capacities in fractional Sobolev spaces with variable exponents

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Abstract. In this paper we develop a capacities theory connected with the fractional Sobolev spaces with variable exponents. Two kinds of capacities are studied: Sobolev capacity and relative capacity. Basic properties of capacities, including monotonicity, outer capacity and several results, are studies. We prove that both capacities is a Choquet capacity and all borel sets are capacitable.

Key words: Fractional Sobolev spaces with variable exponents, Sobolev capacity, relative capacity, Choquet capacity, outer capacity..
AMS subject classification: Primary 31B15, 46E35. .

Introduction

The concept of capacity is indispensable to an understanding point-wise behavior of functions in a Sobolev space. In a sense, capacity is a measure of size for sets and they measure small sets more precisely than the usual Lebesgue measure.
Sobolev spaces and capacities theory is one of the significant aspects of fine topology, and the classical and fine nonlinear potential theory. In this setting, there are two natural kinds of capacities: Sobolev capacity and relative capacity. Both capacities have their advantages.
In this paper we develop a capacities theory connected with the fractional Sobolev spaces with variable exponents. Fundamental proprieties of capacity including Choquet capacity, capacitability and several results, are studied.

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4. ++++++++++++++++++ Session 3 ++++++++++++++++++

Functional Analysis and Partial Differential Equations

International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Study of some quasilinear elliptic systems

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Abstract. In this paper, we shall be concerned with the existence result for the quasilinear elliptic system of the form: $-\text{div}\sigma(x,u,Du) = f(x,u,Du)$, coupled with a Dirichlet boundary condition. Our appraoch is based on the measure theory and Galerkin method under some conditions on σ and f respected to N-funtion M which defines our functional space.

Key words: Quasilinear elliptic system, Orlicz space, Young measure, weak solution.
AMS subject classification: 35J57, 35D30, 46E30.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

REGULARIZING EFFECT OF ABSORPTION TERMS IN SINGULAR AND DEGENERATE ELLIPTIC PROBLEMS

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In this paper, we prove existence and regularity results for solutions of somme non linear Dirichlet problems for an elliptic equation defined by a degenerate coercive operator and a singular right hand side

$$\begin{cases} -div\left(a(x,u,\nabla u)\right) = \dfrac{f}{u^{\gamma}},\ in\ \ \Omega \\ u > 0\ \ in\ \Omega \\ u = 0\ \ in\ \delta\Omega \end{cases} \tag{4.1}$$

where Ω is bounded open subset of $\mathbf{R}^N$,$N \geqslant 2$,γ ,θ and p are real constants such that : $1 < p < N$**.**

Key words:Degenerate ellptic equation, singular non linearity, Sobolev spaces..

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Existence of solution for periodic parabolic nonlinear problem in Orlicz space

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In this talk, we study the existence of solution for nonlinear periodic parabolic problem with the m-laplacien operator in orlicz space , to achieve this goal we need to aply some technical of fixed point theorem

Key words: Periodic parabolic problem- Orlicz space- schauder fixed point theorem .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Multipe solutions for a nonlocal fractional (p,q)-Schrödinger-Kirchhoff system

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In this talk, we study the existence of multiple weak solutions for a Schrödinger-Kirchhoff type elliptic system involving nonlocal $(p,q)-$integro-differential operators. The technical approach is mainly based on three critical points theorem.

Key words: Nonlocal Schrödinger-Kirchhoff type system, fractional integro-deferential operators, fractional Sobolev spaces, three critical points theorem.
AMS subject classification: Primary 35R11; Secondary 35J20, 35J60. .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

On a fractional $p(x,.)$-Laplacian Dirichlet problems with weight

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Abstract. In this talk we discus the existence of three weak solutions for a problem involving the fractional $p(x,.)$-Laplacian operator, of the following form

$$(\mathcal{P}_w^s)\quad \begin{cases} \left(-\Delta_{p(x,.)}\right)^s u(x) + w(x)|u|^{\bar{p}(x)-2}u &= \lambda f(x,u) + \mu g(x,u) \ \text{ in } \ \Omega, \\ u &= 0 \qquad\qquad \text{in } \ \mathbb{R}^N \setminus \Omega. \end{cases}$$

The main tool used for obtaining our result is a recent three critical-points theorem established by Ricceri. Moreover, we establish a new continuous and compact embedding theorem of fractional Sobolev space with variable exponent $W^{s,p(x,y)}$ into the space $C^0(\overline{\Omega})$ in the case $sp^- > N$, where $s \in (0,1)$ and $p : \overline{\Omega} \times \overline{\Omega} \longrightarrow (1,+\infty)$ such that $p^- = \min\limits_{(x,y)\in\overline{\Omega}\times\overline{\Omega}} p(x,y)$.

Key words: Fractional $p(.,.)$-Laplacian operator, Weighted variable exponent space, Continuous and compact embeddings Three critical-points theorem.
AMS subject classification: 35R11, 46E35, 35J35, 35S15. .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Fuzzy Neutral Partial Differential Equation with Fuzzy nonlocal condition

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Abstract. In the present paper, fuzzy neutral partial differential equation with fuzzy nonlocal condition are introduced, we study the existence of fuzzy solution. Also the definition and the properties developed of the fuzzy solution. Our approach rest on the Banach fixed-point theorem.

Key words:. Neutral partial Differential Equation, Fuzzy mild Solution, nonlocal condition, fuzzy semigroups of linear operators.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Existence results for a fractional Kirchhoff Type elliptic system

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Abstract. In this talk, we study the existence of three weak solutions for a Kirchhoff type elliptic system involving nonlocal fractional p-Laplacian with homogeneous Dirichlet boundary conditions. The approach is based on the three critical points theorem and some variational methods.

Key words: Fractional Sobolev spaces. Three critical points theorem. Nonlocal Elliptic system.
AMS subject classification:35J50, 35R11 .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Invariant analysis of time fractional generalized Burger equation

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Abstract. Lie symmetry analysis represent a very powerful tool to solve nonlinear partial differential equations. This paper suggests Lie group method for fractional partial differential equations. A time-fractional generalized Burgers equation is used as an example to illustrate the effectiveness of Lie group method to solve this time fractional equation.

Key words: Lie Symmetry analysis, fractional calculus, Riemann-Liouville fractional derivative,fractional Burgers equation, .

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 November 2019

Fuzzy topological spaces, fuzzy super-connected subspace

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Abstract. The purpose of this talk, is to define the fuzzy super-connected spaces, and fuzzy super-connected subset also we prove some characterization between a fuzzy super-connected subset and using the notion of fuzzy continuity. Our approach is based on the idea of fuzzy connected topological spaces and its properties.

Key words: fuzzy, super-connected spaces.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

Pseudo-Almost Automorphic Solutions to a Abstract Integral Equation

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Abstract. This work is concerned with pseudo almost automorphic functions, which are more general and complicated than pseudo almost periodic functions. Upon making some suitable assumptions, we obtain new existence and uniqueness theorem of pseudo almost automorphic solutions to a abstract integral equation.

Key words: pseudo almost periodic functions; weighted pseudo almost automorphic functions; abstract integral equation.
AMS subject classification: 43A60, 34D10, 34K40 .

Introduction

This paper is concerned with pseudo almost automorphic functions, which are more general and complicated than pseudo almost periodic functions. Upon making some suitable assumptions, we obtain new existence and uniqueness theorem of pseudo almost automorphic solutions to a Abstract Integral Equation of the form :

$$u(t) = f(u(h_1(t))) + \int_t^\infty \Gamma(s, u(s), u(h_2(s)))C(t-s)ds + g(t) \tag{4.1}$$

Where $f, g, h_1, h_2, C : \mathbb{R} \to \mathbb{R}$ are continuous functions and $\Gamma : \mathbb{R} \times \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ is jointly continuous.

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International Conference on Fixed Point Theory and Applications (ICFPTA'19). Mohammedia-Maroc
30 Novembre 2019

NEW FRACTIONAL DERIVATIVE IN COLOMBEAU ALGEBRA

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Abstract. In this paper we introduce an approach to fractional derivatives involving singularities based on the theory of algebras of generalized functions in the Colombeau algebra G, using new definition of fractional derivative called conformable fractional derivative introduced by the authors Khalil and Al in [1].

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Nonlinear degenerate parabolic problems with variable exponent and L^1-data

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Abstract.
In this communication, we prove existence results of entropy solutions to a class of nonlinear degenerate parabolic p(.)-Laplacian problem with Dirichlet-type boundary conditions and L^1 data. The main tool used here is the Rothe method combined with the theory of variable exponent Sobolev spaces.

Key words: Degenerate parabolic problem, entropy solution, existence, semi-discretization, Rothe's method , weighted Sobolev space.
AMS subject classification: 35A02, 35J60, 35J65, 35J92.

Introduction

Let $\Omega \subset \mathbb{R}^d, (d \geq 2)$ be a open bounded domain with a connected Lipschitz boundary $\partial\Omega$ and T be a fixed positive real number. Our aim of this communication is to prove existence results of entropy solutions for the nonlinear degenerate parabolic problem with variable exponent

$$\begin{cases} \dfrac{\partial u}{\partial t} - \operatorname{div}\left(\omega|\nabla u|^{p(.)-2}\nabla u\right) = f \ \ in \ \ Q_T :=]0,\ T[\times\Omega, \\ u = 0 \ \ on \ \ \ \Sigma_T :=]0,\ T[\times\partial\Omega, \\ u(.,0) = u_0 \ \ in \ \ \Omega, \end{cases}$$

where $p(.)$ is a continuous function defined on $\overline{\Omega}$ with $p(x) > 1$ for all $x \in \overline{\Omega}$ and ω is a measurable function on Ω, strictly positive and satisfying the following hypotheses

(H_1) : $\omega \in L^1_{loc}(\Omega)$ and $\omega^{\frac{-1}{p(x)-1}} \in L^1_{loc}(\Omega)$,

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(H_2) : $\omega^{-s(x)} \in L^1_{loc}(\Omega)$ where $s(x) \in \left(\frac{N}{p(x)}, \infty\right) \cap \left(\frac{1}{p(x)-1}, \infty\right)$.

The datum f is in $L^1(\Omega)$.

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Boundedness of multidimensional Dunkl-Hausdorff operators

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Abstract. In the present paper, we introduce the multidimensional Dunkl-Hausdorff operator $\mathcal{H}_\kappa$ and we give simple sufficient conditions in order that these operators be bounded on the weighted lebesgue spaces $L^p_\kappa(\mathbb{R}^d)$ and in the Hardy space $H^1_\kappa(\mathbb{R}^d)$ associated with the Dunkl operators. We also determine the Dunkl-Hausdorff operator $\mathcal{H}^*_\kappa$ which is adjoint to $\mathcal{H}_\kappa$.

Key words:Dunkl transformation, DunklHausdorff operator, Riesz transformation, Boundedness, Adjoint operator..
AMS subject classification:47G10;47B38;43A32 .

Introduction

The Hausdorff operator is one of the important operators in harmonic analysis, and it is used to solve certain classical problems in analysis. In the one-dimensional case Hausdorff operators on the real line were introduced in [1] and studied on the Hardy space in [2]. The natural generalization in several dimensions was introduced and studied in [5, 7]. The reader can see a recent survey article [4] by E.Liflyand which contains the main results on Hausdorff operators in various settings and bibliography up 2013.

Dunkl theory generalizes, classical Fourier analysis on $\mathbb{R}^d$. It started twenty years ago with Dunkl's seminal work in [8] and was further developed by several mathematicians. In the frame of extending these results to the context of Dunkl theory, wa have introduced and studied recently in [9] the DunklHausdorff operators In the one-dimensional case on the spaces $L^p_\kappa(\mathbb{R})$ and $H^1_\kappa(\mathbb{R})$, now we are going to study the multidimensional Dunkl-Hausdorff operators in the spirit of those in [5, 7] . We can only establish a complete result for the finite reflection group $G \simeq \mathbb{Z}_2^d$ with the associated measure μ_κ given for every $x = (x_1, \ldots, x_d) \in \mathbb{R}^d$ by

$$\mathrm{d}\mu_\kappa(x) = h^2_\kappa(x)\,\mathrm{d}x, \tag{4.1}$$

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with h_κ the $\mathbb{Z}_2^d$-invariant function defined by

$$h_\kappa(x) = \prod_{j=1}^{d} |x_j|^{\kappa_j} = \prod_{j=1}^{d} h_{\kappa_j}(x_j),$$

where $\kappa_1, \ldots, \kappa_d$ are nonnegative real numbers .

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Extension of the Bessel-Wright transform in the class of Boehmians

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Abstract. In this paper, we first construct a suitable Boehmian space on which the Bessel-Wright transform can be defined and some desired properties are obtained in the class of Boehmians. Some convergence results are also established.

Key words: Bessel-Wright operator; Bessel-Wright transform; generalized function; Boehmian space.

Introduction

The space of Boehmians is constructed using an algebraic approach that utilizes convolution and approximate identities or delta sequences. If the construction is applied to a function space and the multiplication is interpreted as convolution, the construction yields a space of generalized functions. Those spaces provide a natural setting for extensions of the Bessel-Wright transform newly introduced by Fitouhi et al. [3].

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Titchmarsh's Theorem on the Unit Sphere

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Abstract. In this talk, we discuss an analog of Titchmarsh's theorem for functions satisfying a certain Lipschitz conditions defined by a translation operator on the unit sphere.

5. ++++++++++++++++++ Session 4 ++++++++++++++++++

Big data and Artificial Inteligence

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ECG Beat Classification Based on 1-D Convolutional Neural Network

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Abstract. ECG processing is a non-invasive technique that is frequently used for diagnosis of cardiac diseases. In this work, we propose a new method for ECG classification based on Deep learning approach using the One Dimensional Convolutional Neural Network (1-D CNN). In our scheme, 1-D CNN was used in order to classify four types of ECG heartbeats. The results obtained show that the proposed system yields very promising classification performances.

Key words: ECG Beat Classification, Deep Learning, 1-D Convolutional Neural Networks.

Introduction

For an automatic ECG diagnosis system, ECG beat classification is a preliminary step. The ultimate goal of this step is to achieve a robust discrimination between normal and abnormal beats for an ECG record, using machine learning algorithms. Several approaches have been reported in the literature including Support Vectors Machine (SVM) [5] and K-Nearest Neighbors (KNN) [3]. However, the majority of these works require a pre-pocessing steps called feature extraction. To deal with the drawbacks of classical machine learning algorithms, Deep Learning approaches like Convolutional Neural Networks (CNN) have attracted much attention in recent published works [3, 4]. In this work, we propose a novel accurate ECG classification system using the well known 1-D Convolutional Neural Networks.

Convolutional Neural Networks (CNN)

During the last decades, different deep learning architectures have been proposed like Convolutional Neural Networks(CNN). In particular, CNN have attracted special interest in the field of ECG signal classification. The main idea behind using 1D-CNN architectures ,in this work, is to extract the meaningful features from the processed ECG data using a series of spatial convolutions with different filters, and further to classify between normal and pathological ECG heartbeats.

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Proposed Method

The schematic diagram of our proposed ECG classification approach is displayed in Fig 1. The

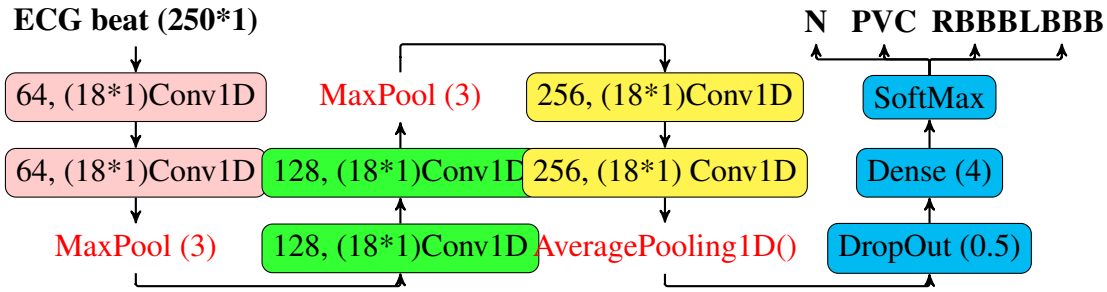

Figure 1: Schematic illustration of the proposed ECG beat classification system based on 1D-CNN

different steps of our proposed approach can be summarized as follows :
Step 1: ECG data with length of 250 samples are extracted from the well known database MITDB;
Step 2: 64 1-D filters with 18 samples are convolved with ECG data two times to extract the features;
Step 3: MaxPooling function is applied at this stage to reduce the number of samples;
Step 4: Steps 2 and 3 are repeated with 128 1-D filters (18 samples);
Step 5 : The output of the previous layer was convolved two times with 256 1-D filters with 18 samples. Further, Global Average Pooling filter was applied to the output of this layer;
Step 6: DropOut function with a probability of 0.5 was applied, aiming the eliminate some non useful interconnections between the layers of the network;
Step 7: The output layers of the DropOut step were condensed to make the final output equal to the number of dataset classes (i.e. 4 in this work);
Step 8: In order to define the probability of prediction of each class, the standard SoftMax function was applied to the output of the Network.

Numerical Results

In this paper, as well as numerous deep learning models, the cross-entropy function was used as an objective function to train our model. Also, to minimize the loss function, we have used the Adam optimizer with a learning rate of 10^{-4}. Also, to evaluate the performances of the proposed method, we have used real ECG data taken from MITDB sampled at 360 Hz. In this paper, we have tested our Model by taking high number of beats as follows : 17000 Normals, 5000 PVC, 7000 RBBB and 8000 LBBB. The dataset has been divided into 80% proportion (29600) to train the model and a 20% of the overall dataset (7400) to test the model. The experimental results have shown that the proposed algorithm can gives higher classification accuracy both for training and testing stages with an overall accuracy that exceeds 99.70% for the two phases.

Conclusion

In this work, we have proposed a new tool for ECG beat classification based on the 1-D convolutional Neural Network. The proposed algorithm is tested and evaluated over real ECG beats taken from MITDB. The obtained results have shown the great efficiency of our classification model to discriminate between normal and abnormal beats with an overall accuracy that exceeds 99%.

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A study on ship automatic berthing using artificial neural networks

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Abstract. Automatic berthing has been known as one of the most difficult problems in ship control, since berthing operation could be characterized by the following: reduction of controllability at low speed, complicated and nonlinear differential equations of motion, effect of environmental disturbances and other problems. To ensure a safe and appropriate berthing maneuver, a concept named virtual window, which consists of changing ship position as well as ship heading, has been introduced using Artificial Neural Networks. By taking the calculated rudder as proposed by the optimal method, it is guaranteed for each ship, with different heading and from desired starting point of that window, to reach the so-called imaginary line well ahead as well as to ensure minimum time maneuver. Computer simulations of automatic berthing were carried out to verify the effectiveness of the system. The results of the simulations showed good performance for the proposed berthing control system.

Key words: Automatic berthing, controllability, virtual window, Artificial Neural Networks, minimum time.

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Seq2Seq acoustic model based on CNN and BLSTM with CTC-Attention

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Abstract. This paper presents a Sequence-to-Sequence (Seq2Seq) acoustic model for Automatic Speech Recognition (ASR). We evaluate our results with Phoneme Error Rate (PER) on the TIMIT corpus with Log-Filter-Bank features.

Key words:. Speech Recognition, Sequence-to-Sequence, Connectionist Temporal Classification, Attention.

1. Introduction

Automatic speech recognition systems aim to convert the speech signal into its corresponding sequence of words or utterances. This paper focuses on building a Seq2Seq acoustic model. It is based on two end-to-end training methods the Connectionist Temporal Classification (CTC) [4] and Attention (Att) [1], while combining both the convolutional neural network (CNN) [5] and Bidirectional Long Short-Term Memory (BLSTM) [3]. The rest of this paper is organized as follows: the next section evaluates the performance of different models and the results are discussed. Finally, section3. gives a conclusion of the paper.

2. Experimental setup and results

We carry out the experiments on the TIMIT corpus [2]. The raw audio was encoded into a 40-dimensional log Mel-Filter-Bank (plus energy) coefficients, together with their first and second temporal derivatives. We used the 61 phoneme labels during training and decoding and then mapped them to 39 classes for scoring [7]. We started our experiments with a model, we call it CBLSTM, composed of three 1D Convolutional (ConvNet). After every single one, we applied a Batch Normalization (BN).The filter size is 5 across the layers with a stride of 2 and the activation function used is Rectified Linear Unit (ReLU). After, we stack a BLSTM layer of 250 units.

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Table 1: PER comparison after adding Att layer and MP layer

Network	CBLSTM	CBLSTM + Att	CBLSTM+ BN + Att
PER(%)	28.536	24.585	40.719

Table 2: PER comparison of different number of BLSTM levels

Levels	1	2	3	4
PER(%)	24.585	23.801	22.580	25.537

We used the CTC loss function and the CTC beam search decoder to get the predicted sequences. We then added an Att layer to observe the impact of the attention mechanism on the system. Table 1 show that the PER has dropped by a ± 4 %. We then proceeded to add a Max Pooling (MP) layer following the first ConvNet, which provide a discriminative feature maps for the phonemes recognizing [6]. The error rate has increased as shown in Table 1. Finally, we increased the number of layers, which led to a longer training time but as presented in Table 2 the error rate decreased. The recognition effect regressed after adding the fourth layer. The best decoding result are observed for CBLSTM with 3 BLSTM layers with a PER of 22.58 %.

3. Conclusion

In this paper, we analyze the advantage of combining CTC criterion and attention mechanism and stacking multiple BLSTMs after ConvNet. Experimental results showed that the best system is the model with 3 ConvNetBN, 3 BLSTM , Att layer and CTC.

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Convolutional neural network for decoding EEG signal

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Abstract.

In this paper, we propose a new convolutional neural network (ConvNet) with a complex structure for The brain-computer interface (BCI). The obtained results show that deep learning classifiers can challenge the existing methods where our ConvNet got state-of-the-art performances.

Key words: Electroencephalography, Deep learning, Neural network, Classification.
AMS subject classification: .

Introduction

Brain-computer interfaces (BCI) are systems that link the human mind with machines for medical or entertainment applications [1]. They are based on neurosciences, signal processing, and machine learning to detect and decode brain activities to commands. The existing approaches use parametric methods, time-frequency representations, covariance matrix, support vector machine, and Riemannian techniques [2]. But, The drawback of those is that they are sensitive to noises or ignore frequency information. Deep learning is a sub-field of machine learning that uses neural networks inspired by biological neurons to extract relevant features from raw data automatically. Those networks achieved state-of-the-art performances in other domains. Hence, we propose to use deep learning on BCI applications where we use a convolutional neural network with complex architecture to decode motor imagery signals. Our method contains several convolutional layers with an optimal number of feature maps and deeper architecture.

Method & Results

Figure 2 represents the architecture of our methods. The first convolution extracts the frequency features. Then, a second convolution spatially filters the data. The remaining layers extract more

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complex frequency features. The separable convolution aims to reduce any risk of overfitting. The hyper-parameter werechosen by manual tuning.

Figure 3 gives the results in terms of accuracy values for the classification problem of the BCI competition IV dataset IIa where the baseline is the filter bank common spatial pattern [3]. Our method outperforms the baseline for subjects 4, 5, 6, 7, 8, and 9. The baseline got the highest result for subjects 1, 2, and 3. The average performance ranks our method better than the baseline.

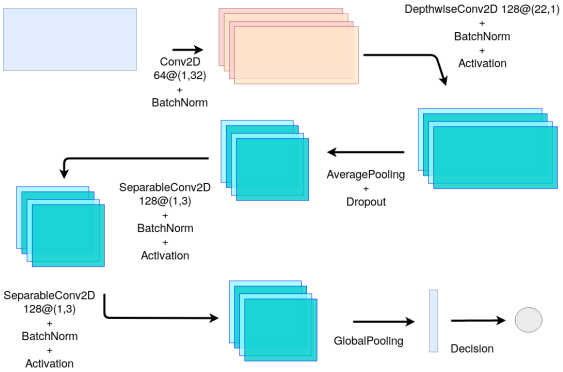

Figure 2: Details of the proposed method

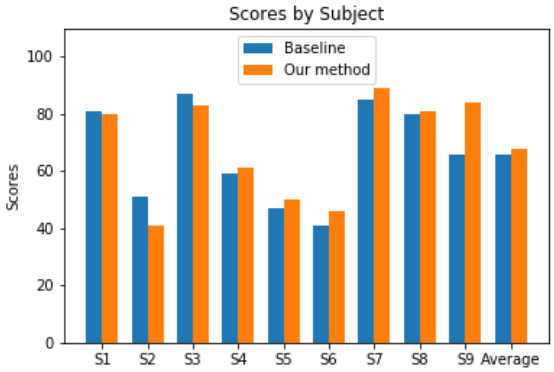

Figure 3: Performances in term of accuracy of the proposed method and the baseline

Conclusion

In this work, we designed a new neural network for BCI signal decoding. The proposed method was used to extract the temporal and spatial features, the remaining layers give additional processing to the data. With the previous observations, we conclude that the proposed architecture can achieve state-of-the-art performances. The proposed method and the baseline use the same architecture but, the automatic nature of the learning gives our method the advantage of extract what the human can miss.

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Minimizing makespan in permutation flow shop scheduling problem

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Abstract. In this paper, we propose a set of local search meta-heuristics to solve the permutation flow shop scheduling problem. The goal is to minimize the maximum completion time called makespan under constraint of sequence-dependent setup time. The algorithms presented are the greedy randomized adaptive search procedure, the iterative local search and the iterative greedy algorithms. The developed meta-heuristics are initialized by a set of heuristics based on the priority rules. The problem dealt with is a set of m machines arranged in series and a set of n jobs. Each job goes through the first machine and ends its production cycle with the last one. A comparative study is conducted on a set of instances of different sizes to verify the effectiveness of the algorithms. The simulation study records good performance of the iterative greedy algorithm over the other two in terms of the speed of convergence and the good quality of the solution.

Key words: Permutation flow shop scheduling problem, sequence-dependent setup time, meta-heuristics, makespan.
AMS subject classification: 68T20, 90B30, 90B36, 90C59 .

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Flowshop scheduling with sequence independent setup time

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Abstract. In this paper, we study the resolution of a permutation flow shop problem with sequence independent setup time. The objective is to minimize the maximum of jobs completion time called also, the makespan. In this contribution, we propose three methods of resolution, a mixed-integer linear programming (MILP) model; two heuristics, the first based on Johnson's rule, the second is based on the NEH algorithm and finally two metaheuristics, the iterative local research algorithm and the iterative greedy algorithm. A set of test problems is simulated numerically to validate the effectiveness of our resolution approaches. For relatively small size problems, it has been revealed that the adapted NEH heuristic has the best performance than that of the Johnson-based heuristic. For the relatively medium and large problems, the comparative study between the two metaheuristics based on the exploration of the neighborhood shows that the iterative greedy algorithm records the best performances.

Key words: flow shop; sequence independent setup time; mixed-integer linear programming; iterative locale search; iterated greedy.

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An end-to-end deep learning architecture for Arabic machine translation

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Abstract. In this work, a recipe for developing a good Arabic-French neural machine translation is suggested. The use of both Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) are investigated. The experiment results show the effectiveness of the deep learning Arabic machine translation based architecture.

Keywords: Arabic machine translation, CNNs, GRU, Neural machine translation, RNNs .

1. Introduction

Machine Translation (MT) is an intricate process that use a computer application to translate texts or speech or even captures from one natural language to another [1]. Many approaches from traditional rule-based approaches to the recent statistical methods have been applied since the introduction of MT [7]. Due to the excellent performance that achieve Deep Learning (DL) on difficult problems such as speech recognition [4, 6], visual object recognition [3, 8, 9, 10] and in MT [12, 2, 5] for a small amount of steps, Google, that translate more than 100 languages, have investigated the use of DL to develop its own machine translation system in November 2016. For the implementation of a free online automatic machine translation, Linguee team have also developed DeepL based on Convolutional Neural Networks (CNNs) that support a various number of languages such as French, Spanish, English and others. In this paper, we aim to investigate an end-to-end MT system based on DL that has drawn more attention recently. First, in order to map the input sentence to a single low dimensional vector a CNN architecture with differents filters is used. The features generated are utilized as inputs to a Gated Recurrent Unit (GRU) architecture. During training, RMSprop optimizer algorithm is used. A popular regularization technique named dropout is added in order to prevent problems of learning such as overfitting. The remainder of this paper is organized as follows. Section 2 describes the proposed system model for implementing the Arabic Machine Translation (AMT) system. Section 3 details the experimental setup and results. Finally, the conclusion is summarized in Section 4.

2. The system description

Figure 1 depicts the structure of the end-to-end MT system. It consists of extracting the inputs's features using 4 filters with size 4, 4, 3, 3 and max pooling of 2, 2, 3, 3 respectively. Then, the minimum of each two filters which have the

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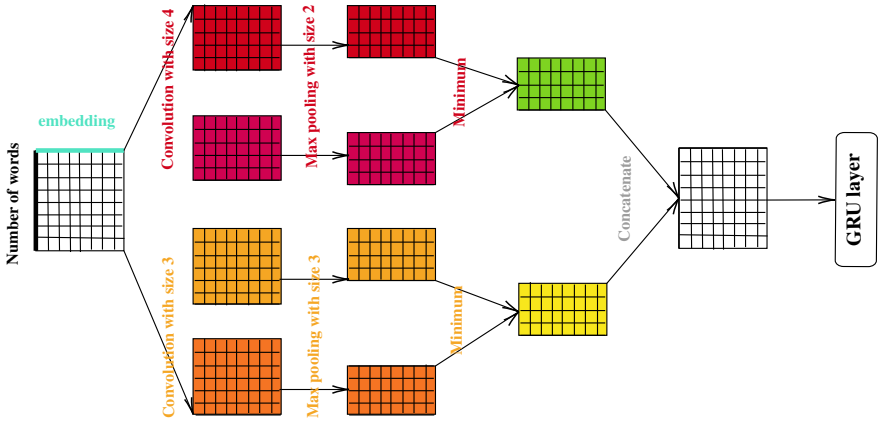

Figure 1: The structure of the end-to-end MT system

same size is selected, and the two filters obtained are concatenated. The caracteristics obtained are used as inputs to a GRU layer. Finaly, the proposed architecture is evaluated on MT task using our own dataset that contains 158988 words in French and 118745 words in Arabic.

3. Experimental setup and results

In order to investigate the performance of the end-to-end system, the whole date is divided randomly into 3 sets. 9208 sentences for both arabic and french languages were reserved for training, 1024 for validation while 1137 were used for testing. An embedding dimension of $\mathbf{R}^{10}$ and $\mathbf{R}^{10}$ have been used for the inputs and the outputs respectively, in order to accelerate the training, a mini-batch of size 512 has been added. The obtained results are shown in Table 1 using the cased BLEU score [11] and GLEU score [13] to evaluate the quality of our translations.

Table 1: BLEU and GLEU scores of the presented end-to-end MT system

	BLEU score (1 gram)	BLEU score (2 grams)	BLEU score (3 grams)
Arabic-French MT	45.41%	43.72%	42.96%
	GLEU score (1-2 grams)	GLEU score (1-3 grams)	GLEU score (1-4 grams)
Arabic-French MT	48.10%	44.93%	42.22%

4. Conclusion

In this work, we have presented an end-to-end deep learning architecture for the task of MT between Arabic and French texts. Experimental results effectively showed that the presented approach demonstrates a promising new direction for MT applications by achieving 45.41% using BLEU score and 48.10% using GLEU score.

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A new hybrid feature selection method for text classification in Big Data

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Abstract. In big data era, text categorization becomes the key technology to find relevant and timely information from a volume of digital documents. To ease the classification task, feature selection methods have been introduced to reduce the dimensionality of the feature space and choose highly distinguishing features for improving the performance of a classifier. Thus, many feature selection algorithms have been proposed through literature. Chi-square (CHI) is one of the most efficient feature selection methods, however it has a major weakness; it only counts whether the feature occurs or not in a document ignoring the feature frequency. In this work, we propose a novel hybrid filter method for feature selection. In order to assess the effectiveness of the proposed method, several experiments are performed on real-world datasets. The obtained results are compared to the state-of-the-art filter methods. The reported results show that, in most cases, the new parallel filter method gives better classification performance than traditional methods.

Key words: Big Data; Feature Selection; Chi-square..

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A comparative analysis of machine learning algorithms for emotion classification

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Abstract. This paper presents a study of various machine learning algorithms for speech emotion recognition. Experiments on RAVDESS database prove the suitability of deep learning over all the other algorithms discussed in this paper for the accurate prediction of emotions.

Keywords: speech emotion classification, machine learning, deep learning.

Introduction

Speech Emotion Recognition (SER) is the process of detecting speakers' emotional state from their speech utterances. A SER system is mainly composed of two modules that are: feature extraction and classification. Over the past decade, several techniques have been employed for classification. They are mainly divided into two categories: the traditional Machine Learning (ML) [2] and the Deep Learning (DL) techniques [3]. However, there is a lack of studies comparing both methods. In the proposed study, we made a comparison between several algorithms. They consist of the most commonly used classifiers in SER which are Decision Tree (DT), Support Vector Machines (SVM), Random Forest (RF), Naive Bayes (NB), K-Nearest Neighbors (KNN) and Convolutional Neural Networks (CNN).

Experiments

In order to investigate the performance of the considered algorithms, emotion recognition experiments were carried out on Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS) [1]. It consists of 24 professional actors speaking and singing with various emotions: neutral, calm, happy, sad, angry, fear, disgust and surprise. Only speaking utterances are used in this study. The data is split into training and testing sets. The training set consists of 80% of the

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available data and the remaining 20% are kept for testing. First, we derive 40 Mel Frequency Cepstral Coefficients. The mean of the output is further input to each of the classifiers. For SVM, the linear kernel is used. The number of neighbors for KNN is 3. The CNN architecture consists of a two convolutional and a softmax layers. Relu is used as an activation function and dropout of 10% is used at the end of each of the convolutional layers. The model performance is evaluated in terms of accuracy and the obtained results are shown in Table 1. In comparing the overall accuracies of

Classifier	**Accuracy (%)**
Decision Tree	40.62
Random Forest	57.29
Support Vector Machines	70.83
Naive Bayes	70.83
K-Nearest Neighbors	58.33
Convolutional Neural Network	**79.17**

Table 1: Accuracy of the SER system using different classifiers

the considered classifiers, CNN is determined to have an advantage over others and improves the recognition accuracy by 8.34% compared to NB and SVM.

Conclusion

In this work, we have analyzed various techniques for speech emotion classification and compared them. The individual methods were then evaluated on the speaking utterances of RAVDESS database. It has been shown that the CNN model achieved the best result. Among the models tested, CNN requires the highest number of parameters. One possibility for future research would be to find a better architecture that achieves better overall accuracy.

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Big Data Traffic Management in vehicular network

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Abstract. Nowadays, traditional data management tools cant anymore manage the voluminous data which is generated by different domains, thats why big data was born to remedy this kind of problem and it becomes very essential to many domains and without its support the task is very difficult to manage; one of those domains that uses big data technologies is vehicular ad-hoc network to manage their voluminous data. In the present paper, we will continue our previous work by adding the use of learning machines to our methodology. We first propose the precedent method that aims to detect anomalies in the road and calculate the time spent in each road section in real time, which will allow us to have a base containing the estimated time spent in all sections in real time. This base will also allow us to use it like inputs for machine learning to predict the places and times where the risk of congestions or accidents is higher.

Key words: VANET; Big Data; Traffic management; Traffic Congestions Prediction; Intelligent Transportation Systems (ITS), machine learning..

Introduction

As part of the "smart city" project, we are interested in ITS (Intelligent Transport System) which is a domain of research that interest research community especially in the field of computer science due to social and economic challenges or the safety of the citizens. Nowadays, the data which is generated from different data sources characterized by its variety in type and velocity have become difficult to manage, fortunately big data technologies have come to deal with this massive data in real time, one of those domains that uses big data technologies is vehicular ad-hoc network to manage their voluminous data. Our cities are facing the growing trend of non-stop vehicles.

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Classifier	Time	ACC	AUC
Naive Bayes	0.04	83,5	63
Random Forest	23	88,3	61

Figure 4: DRF and NB classification results

Numerical Results

As we said, this work is derived from the precedent work which aim to have a base that contains the estimated time spent in all sections of each road in real time, we used this base, in addition to this base we used the average speed every fifteen minute of each section on the road, and also density traffic of it, and the hour time, we used this features like inputs for machine learning to predict the places and times where the risk of congestions or accidents is higher. Two main classifiers are used and compared, that is, Naive Bayes (NB) and Discriminant Random Forest (DRF) to detect places where there will be congestion or accident. The class attribute in this model is the congestion degree. Congestion degree in the dataset has three different values: minor, intermediate and major. For instance, with the Nave Bayes method, accuracy can reach about 83.5 percent, while with DRF, the values can be about 88.3 percent. The Nave Bayes classifier had the lowest time of computation. Figure one shows the summarized results of classification for the two classifiers. For DRF, despite of the classification results are better that the Nave Bayes results, it took more time.

Conclusion

Due to the serious threat that road accidents pose to the lives of human beings, and in order to solve the problem of predicting the risk of vehicle accidents, this article uses the techniques of big data in order to improve traffic management, a real-time anomalies detection system was developed in an instantaneous manner with parallel data processing, which makes execution faster.

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Educational and Educational Guidance Systems in Morocco, France: Comparative Study

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Abstract. The need for secondary and High school or university students to make choices of orientation between the different sectors or the different professions proposed to them by the institution according to their abilities, their academic results or according to socio-economic constraints. is a source of difficulties for the majority of Moroccan students. These difficulties favor a bad orientation and afterward the dropping out of school. The purpose of this article is to make a comparison between the two French and Moroccan educational systems also the way to make the decision of school guidance according to the process of French and Moroccan orientation Finally to establish a synthesis by releasing various factors intervening in educational guidance and to better understand the interrelationship between these different factors that influence students' academic guidance process in order to integrate and model them in an E-orientation system; What is the difference between the French educational system and the Moroccan education system? What are the common points between the French school guidance process and the Moroccan school guidance system? What are the factors that influence the student's decision to choose one or another stream?

Key words:.
Comparison of the education system, school guidance process, E-Orientation.

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Contribution to the comparison of Machine Learning algorithms

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Abstract. Diabetes is considered one of the most deadly and chronic diseases that causes an increase in blood sugar levels. Many complications occur if diabetes remains untreated and unidentified. The tedious identification process results in a patient visiting a diagnostic center and a consulting doctor. However, the rise of machine learning approaches solves this critical problem. The purpose of this study is to determine the algorithm that accurately detects the risk of diabetes in the patient. In this context, we tested the performance of 7 algorithms, the decision tree, k-nearest neighbor, logistic regression, linear regression, SVM, naive Bayes and neural network. We conduct the experiments based on Pima Indian Diabetes Data (PIDD), which comes from the UCI Machine Learning repository. We evaluate the performances of the seven algorithms on different measures such as accuracy, specificity, sensitivity, F-Measure and Error. Accuracy is measured by the number of classified and wrongly classified instances. The results got show that the linear regression machine learning algorithm outperforms the greatest accuracy of 79.33% compared to other algorithms.

Key words: Diabetes, Linear regression, Naive Bayes, Decision tree, Accuracy, K-cross validation, KNN, Neural networks, Logistic regression, decision tree, SVM, Machine Learning..
AMS subject classification: Artificial intelligence .

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6. ++++++++++++++++++ Session 5 ++++++++++++++++++

Algebra and Discrete Mathematics

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Strongly Co-hopfian Abelian Group

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Abstract. An abelian group A is called strongly co-hopfian if for every endomorphism α of A the chain $Im(\alpha) \supseteq Im(\alpha^2) \supseteq Im(\alpha^3) \supseteq Im(\alpha^4) \supseteq \cdots$ is stationary. In this work we characterize some properties of the strongly co-hopfian abelian group. Then we show that the p-component of strongly co-hopfian abelian group is also strongly co-hopfian but for the torsion part we construct strongly co-hopfian abelian group whose the torsion part is not strongly co-hopfian.

Key words: strongly co-Hopfian, Abelian groups, $p-$group, torsion group, p-divisible, pure-subgroup, algebraically compact group, basic subgroups.
AMS subject classification: 35A07, 35Q53 .

Introduction

Let $End(A)$ be the group of all endomorphisms on an abelian group A, and denote by $ker(f)$ and $IM(f)$ the kernel and image, respectively, of any endomorphism $f \in End(A)$. The group A is called *Hopfian* if every epimorphism on A is an automorphism on A, and is said to be *co-Hopfian* provided that if every monomorphism on A is an automorphism on A. Equivalently, A is Hopfian if and only if it is not isomorphic to any of its proper quotients, and it is co-Hopfian if and only if it is not isomorphic to any of its proper subgroups. It is called *strongly Hopfian* if the chain $ker(f) \subseteq ker(f^2) \subseteq ker(f^3) \subseteq ker(f^4) \subseteq \ldots$ stabilizes for all endomorphisms $f \in End(A)$, and is *strongly co-Hopfian* if the chain $IM(f) \supseteq IM(f^2) \supseteq IM(f^3) \supseteq IM(f^4) \supseteq \cdots$ is stationary for all endomorphisms $f \in End(A)$. Note that every strongly Hopfian group is Hopfian, and an abelian group is co-Hopfian provided that it is strongly co-Hopfian.

The concept of Hopfian and co-Hopfian have arisen before 1960s, and are said to be in honor of Heinz Hopf and his use of the concept of the Hopfian group in his work on fundamental groups of surfaces. These classes of groups were first studied by Bear [8] under the names $\mathbb{Q}$ group and S group, and were intensively studied by several mathematicians; see for instance [6], [7], [8], [9] and the references therein. Obviously the finite groups are the prototypes for both Hopfian and co-

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Hopfian but there are infinite Hopfian and co-Hopfian abelian groups as shown by Crawely in [9]. While in [7], Beaumont showed that every finitely generated abelian group is Hopfian. However, it is still unknown whether a direct sum of two co-Hophian groups which are not torsion free is co-Hophian; see [13]. For that we are interested in the strongly co-Hopfian property, which it stronger than co-Hopfian. In [15], A. Hmaimou, A. Kaidi and E. Sanchez studied strongly Hopfian and strongly co-Hopfian modules in certain class of modules, and established the equivalence between strongly co-Hopfian and Hopfian terms for a module over a semi-simple ring. They also proved that for a commutative ring A, the polynomial ring $A[X]$ is strongly Hopfian if and only if A is strongly Hopfian.

Results

Theorem 12. *A reduced torsion abelian group A is strongly co-Hopfian if only if there exists a positive integer n_0 such that $card(A_p) \leq p^{n_0}$ for all prime numbers p.*

Theorem 13. *For a reduced algebraically compact abelian group A, the following statements are equivalent.*

1. *A is strongly co-Hopfian.*
2. *There exists a positive integer n_0 such that $card(\overline{A_p}) \leq p^{n_0}$ for all prime integers p. Here, $\overline{A_p} = \bigcap_{q \neq p} \bigcap_{n \in \mathbb{N}^*} q^n A$.*
3. *There exists a positive integer n_0 such that $card(B_p) \leq p^{n_0}$ for all prime numbers p. Here, B_p a p-basic subgroup of A.*

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The $\mathcal{F}$-Topology on $\beta(I)$

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Abstract. Let I be a infinite index set. Thoughout this work, we assume that R is a commutative ring. We also denote by $Spec(R)$, $dim(R)$, $\beta(I)$, $\mathcal{F}-\lim$, respectively the prime spectrum, the Krull dimension of R, the set of all ultrafilter on I, and the $\mathcal{F}-$limit of a collection of ideals with $\mathcal{F} \in \beta(I)$. The $\mathcal{F}$-Topology where $I = \mathbf{N}$, was further studied in [3]. In this work, we study this topology for any set I

Key words: Kurll dimension, Ultrafilter, Product of rings, $\mathcal{F}$-topology.
AMS subject classification: 13A15; 13B02. .

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3-uniform hypergraphs: modular decomposition and realization by tournaments

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Abstract. Let H be a 3-uniform hypergraph. A tournament T defined on $V(T) = V(H)$ is a realization of H if the edges of H are exactly the 3-element subsets of $V(T)$ that induce 3-cycles. We characterize the 3-uniform hypergraphs that admit realizations by using a suitable modular decomposition.

Key words: hypergraph, 3-uniform, module, tournament, realization..
AMS subject classification: (2010): 05C65, 05C20.

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Tournament with large arrow-simplicity

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Abstract. An n-tournament T with vertex set V is simple if there is no subset M of V such that $2 \leq |M| \leq n-1$ and for every $x \in V \setminus M$, either $M \to x$ or $x \to M$. The arrow-simplicity of a tournament T is the minimal number $s(T)$ of arcs whose reversal yields a simple tournament. Müller and Pelant (1974) proved that $s(T) \leq \frac{n-1}{2}$, and that equality holds if and only if $n \equiv 3 \pmod 4$ and T is doubly regular. In this paper, a refinement of this bound is given for $n \not\equiv 3 \pmod 4$.

Key words: Tournament, Arrow-simplicity, Module, inversion.
AMS subject classification: 05C20 .

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On graded nil-good rings

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Abstract. In this paper we introduce and study the notion of a graded nil-good ring which is graded by a group. We prove that the class of graded rings which are nil-good and the class of graded nil-good rings are not comparable. Also, we investigate extensions of graded nil-good rings to graded group rings. Moreover, we give some properties concerning graded nil-good rings.

Key words: Graded rings and modules, nil-good rings.
AMS subject classification: Primary: 16W50. Secondary: 16U99, 16S34, 16S50.

Introduction

In 1977, W.K Nicholson has introduced in [2] a new class of rings called *clean rings* whose every element can be written as a sum of an idempotent and a unit. Since then, many works have been done about rings in which elements can be written as a sum of two elements with certain properties. In particular, some authors have investigated rings in which elements can be written as a sum of a nilpotent element and an element with a certain property. As an example of these rings there is, *nil-clean rings*, *fine rings* and *nil-good rings* introduced respectively in [3], [1] and [1].

Some authors have given a graded versions of some of the previous class of rings, such as *Graded nil-clean rings* introduced in [11], and *graded 2-nil-good rings* introduced in [2]. In this work, we define and study *graded nil-good rings* as a graded version of nil-good rings introduced in [1]. In [1], a *nil-good* ring is defined as a ring whose every element is either nilpotent or a sum of a unit and a nilpotent. This class of rings is a generalization of the notion fine rings (see [4]), whose every nonzero element can be written as a sum of a unit and a nilpotent element. In this paper, we define *graded nil-good* ring as a group graded ring whose every homogeneous element is either nilpotent or can be written as a sum of a homogeneous unit and a homogeneous nilpotent. Moreover, we give an example of a graded nil-good ring which is not nil-good, and another example of a nil-good ring which is not graded nil-good. Also, we give some basic properties of graded nil-good rings.

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On the capitulation and $D_F^{(i)}$-Wild-primitive sets

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Abstract. Let F be a number field. The goal of this paper is to give a lower bound for the capitulation kernel and cokernel in term of the local degree $n_v = [F_v : \mathbb{Q}_p]$ and $\delta_{v,i}$ the $\mathbb{F}_p$-dimension of $H^0(F_v, \mathbb{Q}_p/\mathbb{Z}_p(i))$, where v varies in a subset of the set of p-places which we call $D_F^{(i)}$-wild-primitive. As an application we give a sufficient condition for the validity of a weak version of Greenberg generalized conjecture proposed by Nguyen and Vauclair (see [3, 1]).

Key words: Capitulation, étale cohomology, wild-primitivity, Tate kernel..
AMS subject classification: 11R34, 11R70, 19F27. .

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Integral basis of a some quartic number fields

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Abstract. In this paper we propose to determine explicitly an integral basis of the number field $K = \mathbb{Q}(p^{\frac{1}{4}})$, where p is a prime number.

Let K be a number field of degree n and let R be the ring of integers of K.

R is a free $\mathbb{Z}$-module of rank n. we call the integral basis of K any basis of the $\mathbb{Z}$-module R. It is known to determine explicitly an basis of K in the following cases:

$K = \mathbb{Q}(\sqrt{m})$ ($m \in \mathbb{Z}$), $K = \mathbb{Q}(\sqrt[4]{m})$ (m natural number without cubic factors), K cyclotomic field...

For the case $n = 4$, several authors have determined an integral basis of K, ([2], [3], [4] ...). For the general case, Daniel A.Marcus [1] (a) gives a "theoretical" method to determine an integral basis of K.

Using the Marcus method, we propose an explicitly method for determining an integral basis of $K = \mathbb{Q}(\sqrt[4]{p})$where p is a prime number,

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On HILALI Conjecture for odd graded homotopy groups

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Abstract

The Hilali Conjecture (also known as conjecture H) predicts that for any rationally elliptic and simply connected topological space X we always have $\dim(\pi_*(X)\otimes\mathbb{Q}) \leqslant \dim H^*(X;\mathbb{Q})$.

The goal of this work is to prove the Hilali conjecture for topological spaces with odd homotopy groups satisfying some conditions, we point out to the fact that over the last years many works have tried to solve this conjecture in several particular cases.

Key words: Conjecture H, Elliptic topological space, Sullivan minimal model, rational homotopy groups, rational cohomology groups
AMS subject classification: 55P62

Introduction

We assume familiarity with rational homotopy theory overall. Let X be an elliptic simply connected topological space, Hilali's conjecture is stated like the following :

Conjecture H (Topological version). *Let X be an elliptic and simply connected topological space, then* $\dim(\pi_*(X)\otimes\mathbb{Q}) \leqslant \dim(H^*(X;\mathbb{Q}))$.

By the theory of minimal models of Sullivan [2], the rational homotopy type of X is encoded in a differential algebra (A,d) called $the\ minimal\ model$ of X. This is a free graded algebra $A=\Lambda V$, generated by a graded vector space $V=\bigoplus_{k\geqslant 2}V^k$, with decomposable differential, it satisfies:

$$\begin{cases} V^k=(\pi_k(X)\otimes\mathbb{Q}) \\ H^k(\Lambda V,d)=H^k(X,\mathbb{Q}) \end{cases}$$

So that the Hilali conjecture has an algebraic version:

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Conjecture H (Algebraic version). *If $(\Lambda V, d)$ is a Sullivan minimal model of an elliptic and simply connected topological space X, then* $\dim H^*(\Lambda V, d) \geqslant \dim V$.

The main Theorem

Let X be an elliptic and simply connected topological space with a Sullivan minimal model $(\Lambda V, d)$, such that $V = \mathbb{Q}(a_1, \cdots, a_n)$ with $|a_i|$ are odd integers for all i, $1 \leq i \leq n$. Let $\{\alpha_1, \cdots, \alpha_r\}$ an homogeneous basis of $H^*(\Lambda(a_1, \cdots, a_{n-1}), d)$, for all i, $1 \leq i \leq n$ we put $A_i = \Lambda(a_1, \cdots, a_i)$, $da_i = P_i \in A_i$ and for all k,$1 \leq k \leq r$, $\alpha_k = [\omega_k]$.

Theorem. *Let X be a rationally elliptic and simply connected topological space with a Sullivan minimal model $(\Lambda V, d)$ where $V = \mathbb{Q}(a_1, \cdots, a_n)$ with $|a_i|$ are odd integers. If we have for all i, $1 \leq i \leq n$, $A_i = \Lambda(a_1, \cdots, a_i)$, $da_i = P_i \in A_i$, such that $[P_i^2] = 0$ in $H^*(A_{i-1})$, then* $\dim H^*(A_n) \geqslant n$.

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Group law and the Security of elliptic curves on $\mathbb{F}_p[e_1, ..., e_n]$.

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Abstract. In this paper, we study the elliptic curve $E_{a,b}(A_P)$, with A_P the localization of the ring $A = \mathbb{F}_p[e_1, ..., e_n]$ where $e_i e_i = e_i$ and $e_i e_j = 0$ if $i \neq j$, in the maximal ideal $P = (e_1, ..., e_n)$. Finally we show that $Card(E_{a,b}(A_P)) \geqslant (Card(E_{a,b}(\mathbb{F}_p))-3)^n + Card(E_{a,b}(\mathbb{F}_p))$ and the execution time to solve the problem of discrete logarithm in $E_{a,b}(A_P)$ is $\Omega(N)$, sch that the execution time to solve the problem of discrete logarithm in $E_{a,b}(\mathbb{F}_p)$ is $O(\sqrt{N})$. The motivation for this work came from search for new groups with intractable (DLP) discrete logarithm problem is therefore of great importance.

Key words:. The Discrete Logarithm Problem, group Low, The Localization of the Ring, the maximal ideal, Complexity
AMS subject classification: Algebra and Cryptography.

Introduction

The elliptic curves are a very fashionable subject in mathematics. They are the basis of the demonstration of Fermat's great theorem by Andrew Wiles, it was proposed for cryptographic use independently by Neal Koblitz in [7] and Victor Miller in 1985, claim that elliptic curve cryptography requires much smaller keys than those used in conventional public key cryptosystems, while maintaining an equal level of security.The elliptic curves over local ring $\mathbb{F}_p[\epsilon] = \mathbb{F}_p[X]/(X^2)$ is introduced in [1], and the generalization of this result for the ring $\mathbb{F}_p[\epsilon] = \mathbb{F}_p[X]/(X^n)$ is introduced in [3] . The construction of the ring $\mathbb{F}_p[e_1, e_2, e_3]$. The elliptic curve $E_{a,b}(\mathbb{F}_p[e_1, e_2, e_3])$ and the demonstration of the result: $Card(E_{a,b}(\mathbb{F}_p[e_1, e_2, e_3])) \geq (Card(E_{a,b}(\mathbb{F}_p))-3)^3 + Card(E_{a,b}(\mathbb{F}_p))$ are cited in [1].
In this paper we generalize the construction of $\mathbb{F}_p[e_1, e_2, e_3]$ to $\mathbb{F}_p[e_1, .., e_n]$, and we define a group law in $\mathbb{F}_p[e_1, .., e_n]$, also we localize the ring $\mathbb{F}_p[e_1, .., e_n]$ in a maximal ideal, and we give it a group

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law, as a result we show that $Card(E_{a,b}(\mathbb{F}_p[e_1,..,e_n])) \geq (Card(E_{a,b}(\mathbb{F}_p))-3)^n+Card(E_{a,b}(\mathbb{F}_p))$, then show that the discrete logarithmic complexity is $\Omega(N)$ Such that $N = Card(E_{a,b}(\mathbb{F}_p))$ by using the baby step/giant step attack and $\rho-$Pollard attack.

Numerical Results

Result 1
Let $a, b \in \mathbb{F}_p$, the mapping

$$\begin{array}{ccc} \varphi : E_{a,b}(A_P) & \longrightarrow & E_{a,b}(A) \\ [\frac{x}{s_1} : \frac{y}{s_2} : \frac{z}{s_3}] & \longrightarrow & [xs_2s_3 : ys_1s_3 : zs_1s_2] \end{array}$$

is surjective.

Result 2
Let $a, b \in \mathbb{F}_p$. Then

$$Card(E_{a,b}(A)) \geqslant (Card(E_{a,b}(\mathbb{F}_p)) - 3)^n + Card(E_{a,b}(\mathbb{F}_p))$$

Result 3
Let $Card(E_{a,b}(A_P)) = M$, $Card(E_{a,b}(\mathbb{F}_p)) = N$, $n \geq 3$, and $N \geq 7$.
the execution time to solve the problem of discrete logarithm in $E_{a,b}(A_P)$ is $\Omega(N)$ such that the the execution time to solve the problem of discrete logarithm in $E_{a,b}(\mathbb{F}_p)$ is $O(\sqrt{N})$.

Conclusion

In this paper we study the elliptic curves over a special ring $\mathbb{F}_p[e_1, ..., e_n]$. It is a generalization of the work in [1]. And we construct a new groups with a very difficult discrete logarithm problem, This allows to define more secure cryptographic cryptosystems.

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Prime 3-uniform hypergraphs

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Abstract. Given a 3-uniform hypergraph H, a subset M of $V(H)$ is a module of H if for each $e \in E(H)$ such that $e \cap M \neq \emptyset$ and $e \setminus M \neq \emptyset$, there exists $m \in M$ such that $e \cap M = \{m\}$ and for every $n \in M$, we have $(e \setminus \{m\}) \cup \{n\} \in E(H)$. For example, $\emptyset$, $V(H)$ and $\{v\}$, where $v \in V(H)$, are modules of H, called trivial. A 3-uniform hypergraph is prime if all its modules are trivial. Given a prime 3-uniform hypergraph, we study its prime, 3-uniform and induced subhypergraphs. Our main result is: given a prime 3-uniform hypergraph H, with $v(H) \geq 4$, there exist $v, w \in V(H)$ such that $H - \{v, w\}$ is prime.

Key words: hypergraph, 3-uniform, module, prime.
AMS subject classification: (2010): 05C65, 05C20.

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The extension property in the category of a direct sum of cyclic modules over an integral domain such that $M/Tor_A(M) \sim_A A$

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Abstract. Describing all the automorphisms that satisfy the extension property in a categories, is a very difficult problem. However, there are some very important papers in the group category, P.E.Schupp [5] proved that the automorphisms satisfying the extension property in the category of groups, characterize the inner automorphisms. Then, in order to generalize the result of Schupp, S.Abdelalim [1] characterized the automorphisms having the extension property, in the category of abelian groups. It is therefore legitimate to see what happens other than abelian groups. Is it possible to have similar results in the category of modules over an integral domain ? In this work, we aim to extend the result in [1] to a special category of a direct sum of cyclic modules. Let A be an integral domain. Consider M a direct sum of cyclic modules over A such that $M/Tor_A(M) \sim_A A$ and α an automorphism of M. We will prove that α satisfies the extension property if and only if $\alpha = kid_M$, where k is a unit of A.

Key words: integral domain, module, torsion, torsion-free and automorphism.
AMS subject classification: Algebra and Number Theory .

Introduction

Let A be an integral domain and M a module over A. We say that α, an automorphism of M, satisfies the extension property if for all monomorphisms $\lambda : M \longrightarrow N$ there exists $\widetilde{\alpha}$ such that :

$$\begin{array}{ccc} M & \xrightarrow{\lambda} & N \\ \alpha \downarrow & & \downarrow \widetilde{\alpha} \\ M & \xrightarrow{\lambda} & N \end{array}$$

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is commutative. ie $\lambda \circ \alpha = \widetilde{\alpha} \circ \lambda$.
We know that, all automorphisms of a vector space satisfy the extension property. Then it is legitimate to see what happens other than vector space. There are some very important results in the group category, P.E.Schupp [5] proved that the automorphisms satisfying the extension property in the category of groups, characterize the inner automorphisms. Then, L.Ben Yacoub [3] proved that this result is not true in the algebra category. In order to generalize the result of Schupp, S.Abdelalim [1] characterized the automorphisms having the extension property, in the category of abelian groups. Is it possible to have similar results in the category of modules over an integral domain ? In this paper, we are interested to extend the result in [1] to a special category of a direct sum of cyclic modules over A an integral domain (not a field). Let $M = \bigoplus_{i \geqslant 1} Ax_i$ be a direct infinite sum of cyclic modules over A, such that $Tor_A(M) \sim_A A$. Firstly, we will briefly give some important necessary results. In the second part, let n be an integer such that $n \geqslant 2$ and $M_n = \bigoplus_{i=1}^{i=n} Ax_i$ be a finite direct sum of cyclic modules over A such that $Tor_A(M_n) \sim_A A$. We will prove that an automorphism $\alpha : M_n \longrightarrow M_n$, satisfy the extension property if and only if there exists a unit k in A such that $\alpha = k.id_{M_n}$. And in the last part, we will also show that an automorphism $\alpha : M \longrightarrow M$, satisfy the extension property if and only if there exists a unit k in A such that $\alpha = k.id_M$.

Conclusion

The automorphism $\alpha : M \longrightarrow M$, satisfy the extension property if and only if there exists a unit k in A such that $\alpha = k.id_M$.

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A computational approach to the BC conjecture regarding the PMAP problem for skew-symmetric matrices

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Abstract. In the present paper, a computational approach to the *BC conjecture* -named after A. Boussairi and B. Chergui- regarding an equivalence relation between skew-symmetric matrices having equal corresponding principal minors is discussed under certain conditions, further more, we present an algorithm generating the transformations of an arbitrary skew-symmetric matrix leading to matrices having equal principal minors of all orders.

Key words: Principal Minors, Skew-symmetric matrix, Algorithm..
AMS subject classification: 15A15, 15F10.

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7. ++++++++++++++++++ Session 6 ++++++++++++++++++

Modeling and Numerical Simulation

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Existence results to Steklov system involving the (p, q)-Laplacian

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Abstract. In the present paper, a quasilinear elliptic system involving a pair of (p,q)-Laplacian operators with Steklov boundary value conditions is studied. Using the Mountain Pass Geometry, we prove the existence of at least one weak solution. For the infinitely many weak solutions, we based on Bratsch's Fountain Theorem [2].

Key words: Quasilinear elliptic equations with p-Laplacian, weak solution, Mountain Pass Geometry.
AMS subject classification: 35J92, 35D30, 47J30, 35J50.

Introduction

Let Ω be a bounded domain in $\mathbb{R}^N$ $(N \geq 2)$, with a smooth boundary $\partial\Omega$, and $1 < p < \infty,\ 1 < q < \infty$. We consider the system:

$$\begin{cases} -\Delta_p u = 0 & \text{in } \Omega, \\ |\nabla u|^{p-2}\frac{\partial u}{\partial \nu} + |u|^{p-2}u = \frac{\partial F}{\partial u}(x,u,v) & \text{on } \partial\Omega, \\ -\Delta_q v = 0 & \text{in } \Omega, \\ |\nabla v|^{q-2}\frac{\partial v}{\partial \nu} + |v|^{q-2}v = \frac{\partial F}{\partial v}(x,u,v) & \text{on } \partial\Omega, \end{cases} \tag{7.1}$$

Numerical Results

Theorem 14. *If the hypotheses $(H_1), (H_2)$ and (H_3) hold true, then the problem* (7.1) *has at least one weak solution.*

Theorem 15. *If the functional $F(x, u, v)$ is even in u, v and the hypotheses (H_1) and (H_2) hold true, then the problem* (7.1) *has infinitely many (pairs) weak solutions.*

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Conclusion

In this paper, we proved two results; the existence of a nontrivial weak solution and the infinitely many weak solutions.

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Existence and multiplicity of solutions for a Steklov problem involving the $(p(x) - r(x))$-Laplacian

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Abstract. Using variational methods, we prove in a different cases the existence and multiplicity of solutions for the following Steklov problem:

$$\begin{cases} \triangle_{p(x)}u + \triangle_{r(x)}u = 0, & \text{in } \Omega, \\ (|\nabla u|^{p(x)-2} + |\nabla u|^{r(x)-2})\frac{\partial u}{\partial \nu} + |u|^{p(x)-2}u + |u|^{r(x)-2}u = \lambda(|u|^{q(x)-2}u - \varepsilon|u|^{s(x)-2}u), & \text{on } \partial\Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^N (N \geq 2)$ is a bounded domain with smooth boundary $\partial\Omega$ and ν is the unit outward normal vector on $\partial\Omega$. $p,\ r,\ s,\ q : \overline{\Omega} \mapsto (1, +\infty)$ are continuous functions and $\varepsilon \in \{0, 1\}$.

Key words:.
Variable exponents; Steklov eigenvalue problem; $(p(x)-r(x))$-Laplacian; Recceri's variational principle; Mountain Pass Theorem.

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Energy harvesting in a van der Pol device using time delay

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Abstract. In the present paper, we investigate quasi-periodic (QP) vibration-based energy harvesting (EH) in a nonlinear device consisting in an excited van der Pol oscillator coupled to a delayed piezoelectric coupling mechanism. The governing equations for this harvester can be written in the dimensionless form as:

$$\ddot{x}(t) + x(t) - [\alpha - \beta x(t)^2]\dot{x}(t) - \chi v(t) = f\cos(\omega t) \tag{7.1}$$

$$\dot{v}(t) + \lambda[v(t) - v(t-\tau)] + \kappa\dot{x}(t) = 0 \tag{7.2}$$

where $x(t)$ is the relative displacement of the rigid mass m, α and β are the mechanical damping coefficients, f, ω are, respectively, the amplitude and the frequency of the harmonic excitation, $v(t)$ is the voltage across the load resistance, χ is the piezoelectric coupling term in the mechanical attachment, κ is the piezoelectric coupling term, λ is the reciprocal of the time constant of the electrical circuit and τ is the time delay.

We consider the case of primary resonance for which the frequency of the harmonic excitation is near the natural frequency of the oscillator. Analytical approximation of the QP response and the corresponding power output are obtained using the double-step multiple scales method. The effect of time delay on the EH performance is studied; It is shown that for appropriate combination of time delay parameters, QP vibration can be used to scavenge energy over a broadband of the excitation frequency away from the resonance with a significant performance. An optimum range of the system parameters where the QP vibration-based EH is maximum is determined. Numerical simulations are conducted to support the analytical predictions.

Key words: Energy harvesting, van der Pol oscillator, quasi-periodic vibrations, delayed piezoelectric coupling.

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Exact determinantions of maximal output admissible set for a class of semilinear discrete systems

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Abstract. In the present paper, we consider the semilinear system defined by

$$\begin{cases} x(i+1) &= Ax(i) + f(x(i)), \quad i \geq 0 \\ x(0) &= x_0 \in \mathbb{R}^n \end{cases}$$

and the corresponding output signal $y(i) = Cx(i)$, $i \geq 0$, where A is a $n \times n$ matrix, C is a $p \times n$ matrix and f is a nonlinear function. An initial state $x(0)$ is output admissible with respect to A, f, C and a constraint set $\Omega \subset \mathbb{R}^p$, if the output signal $(y(i))_i$ associated to our system satisfies the condition $y(i) \in \Omega$, for every integer $i \geq 0$. The set of all possible such initial conditions is the maximal output admissible set $\Gamma(\Omega)$. In this paper we will define a new set that characterizes the maximal output set in various systems (controlled and uncontrolled systems). Therefore, we propose an algorithmic approach that permits to verify if such set is finitely determined or not. The case of discrete delayed systems is taken into consideration as well. To illustrate our work, we give various numerical simulations.

Key words: Discrete-time, output admissible set, semilinear system, asymptotic stability, uncontrolled system ,controlled system, delayed system..

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On non polynomial $\mathcal{C}^1$ splines Hermite interpolation

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Abstract. In this work, we propose a new kind of $\mathcal{C}^1$ cubic Hermite interpolation based on algebraic trigonometric (AT) functions. The presented AT-interpolant is a parametric curve which interpolates values and first derivatives of a given function and preserve the monotonies of the given data. As a second part of this work, a construction of smooth quadratic AT-splines with a low polynomial degree in terms of data points preserving interpolation shape is introduced. A numerical examples are provided to prove the satisfactory shape of our interpolation operator.

Key words: Algebraic trigonometric splines, Hermite interpolation, composite splines
AMS subject classification: .

Introduction

Numerically, in order to establish a relation if exist between two different variables, we either perform computations or make a measurements. Then, the result can be given as a set of data in a plane. This relationship can be represented as a smooth curve, which pass throughout all points of the beginning data set.

In literature, there are several mathematical tools of approximating and interpolating a single-value function from a given set of data, but their application to curve fitting sometimes results in a curve that is very different from the one desired. The main raison is that the resulting curve sometimes shows abnormal wiggles. It seems inevitable if assumptions are made about the functional form of all data points other than the continuity and regularity of the curve. This problem was discussed by a lot of authors, in [1] H. Akima proposed a method of interpolation and smooth curve fitting that is based on a piecewise function with slopes at the junction points locally determined under a geometrical condition. K. Ichida et al [8] are applied the Hermite type cubic splines in order to obtain a suboptimal algorithm in least squares data fitting problems. In [3], the author developed a new optimal property for cubic interpolating splines of Hermite type applied to prob-

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lems arising from data fitting area. Recently, X. Han and X. Guo [7] are presented a optimal cubic Hermite interpolation method. The method developed by the two authors is consist of optimize the interpolant's derivatives.

Conclusion

In this work, we have presented a non polynomial Hermite interpolant. The operator constructed here has the abilities of reproduce of both polynomial and trigonometric function. Due to this excellent property, this operator can be used as good tool for constructing curves and smoothing functions

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Mathematical analysis of an augmented Solow model

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Abstract. The question concerning the interactions between the economic growth and population growth is a topic of current interest that has always attracted the interest of researchers. This subject is of great importance both for the mathematician who finds inspiration to improve new models, and for the economist who uses these models to bring new elements of understanding of economic reality. In this work, we present Solows economic growth model taking into account the subdivision of the total population into three compartments according to the individuals status in the labor market. The obtained model is a system of four differential equations with two delays. The stability problem and Hopf bifurcation phenomenon, occurring around the two equilibria of this model, is analyzed analytically according to the two time delays.

Key words: Solow growth model, delay differential equations, Stability, Hopf bifurcation.

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Stationary and Non-stationary hidden Markov models

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Abstract. This work presents two comparative studies; the first one is between two stationnaries hidden Markov models: hidden Markov chain and pairwise Markov chain. The second one is between the stationary model of Markov hidden Markov chain and the non-stationary model triplet Markov chain used in image segmentation. These comparisons are in level of segmentation quality, we calculate the PSNR and the error rate of each model. The obtained results show that, in the first study pairwise Markov model is better than classical model. In the second study triplet Markov model provides the better results of segmentation than stationary model.

Key words:.
Stationary model, Non-stationary model, HMC, PMC, TMC. .

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Smooth reverse subdivision of UAT B-spline curves and wavelets

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Abstract. In this work, we have constructed a general formula of the refinement equation for any order k of Algebraic Trigonometric B-splines, indeed, we will use it to construct refinement equation for UAT B-spline curves, and to build subdivision schemes. Then, we give an explicit form of inverse subdivision scheme associated with the cubic UAT B-splines. Numerical tests for illustrating trigonometric B-spline curves and subdivision scheme are presented. Finally, we are interested in multiresolution analysis built from reverse subdivision schemes, accompanied by an algorithm and some numerical tests.

Key words: UAT B-splines, Curves, Reverse subdivision scheme, Multiresolution Analysis, Wavelets..

Introduction

During the last three decades, the problem of interpolation or approximation of data has been the subject of several research studies. Many researchers are still interested in the development of these methods. So far, B-spline functions are universally recognized as very powerful tools in approximation theory and have become basic tools in many application domains such as drawing and surface data compression, image analysis, signal processing etc.

In this study,

- we present a new kind of uniform B-splines, which are generated over the space spanned by $\Gamma_\alpha = \{1, \phi, \phi^2, \ldots, \phi^{k-3}, \cos(\alpha\phi), \sin(\alpha\phi)\}$ in which k is an integer larger than or equal to 3 and α is a tension parameter.
- we prove the main result of this paper which is the refinement equation of UAT B-spline.
- we study the linear subdivision schemes.
- construct the inverse subdivision scheme associated with the cubic UAT B-spline

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Conclusion

In this paper, we have constructed new formula of the refinement equation for any order k of Uniform Algebraic Trigonometric B-splines. This work presented also a reverse subdivision approach based on UAT B-splines. A multiresolution representation based on reverse subdivision approach is also studied in this paper and has interesting applications. Some of these applications will be developed in our forthcoming work. In addition, all the obtained results for curves can be easily extended to multiresolution surfaces by using tensor product of UAT B-splines.

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Direction of Hopf Bifurcation in an economic growth model

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Abstract. This paper is concerned with a delayed model of mutual interactions between the economically active population and the economic growth. The main purpose is to investigate the direction and stability of the bifurcating branch resulting from the increase of delay. By using a second order approximation of the center manifold, we compute the first Lyapunov coefficient for Hopf bifurcation points and we show that the system under consideration can undergo a supercritical or subcritical Hopf bifurcation and the bifurcating periodic solution is stable or unstable in a neighborhood of some bifurcation points, depending on the choice of parameters.

Key words: Solow growth model, delay differential equations, Stability, Hopf bifurcation..
AMS subject classification: .

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Infill Sampling Criteria for Kriging-Based Optimization

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Abstract. In the present paper, we discuss the benefits of different infill sampling criteria used in kriging-based optimization. Among all the infill criteria, expected improvement (EI) is the favorite one while others are also still in use. However, there is little research compared these criteria when kriging-based optimization method is applied in the global optimization.

Key words: Expected Improvement, Infill Criteria, Kriging.
AMS subject classification: Modelling and Simulation .

1. Introduction

In this paper we address optimization problems of the following type:

$$\begin{aligned} \underset{x}{\text{Minimize}} \quad & f(x) \\ \text{subject to} \quad & x_l \leq x \leq x_u \end{aligned} \tag{1.1}$$

where: $f : R^d \longrightarrow R$, represents a continuous, deterministic, computationally expensive, black-box objective function, and x_l, x_u are the lower and upper bounds of the decision variables.

Many approaches have been used to find the global optimum for (1.1). Among the most popular are metaheuristic methods [5]. Such heuristic methods are essentially population based methods, i.e., they make use of multiple candidate solutions at each step of their iteration, requiring a large number of fitness evaluations before they can locate the global optimum or a near-optimal solution. However, many black-box optimization problems involve computationally intensive numerical simulations, which can take a few minutes, hours or even days of CPU time to evaluate the performance of candidate solutions [4].

One of the most efficient methods for decreasing computational expense is to approximate the objective function. The basic concept of approximation is to sample a certain number of points and use them to build a mathematical model, known as a surrogate model, to later use for predicting other points instead of evaluating the true response. Among many of the surrogate models, kriging [3, 2] is the most popular one due to its ability to provide a global prediction of the objective values and a measure of uncertainty.

During the process of Kriging-based optimization, the global optimum cant be found if we only use the kriging model built from a few initially sampled data, as the model is not globally accurate. Hence, new sample points should be added in order to refine the model. This process is repeated until a stop condition is reached.

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This paper aims to compare 3 typical infill sampling criteria involving: minimizing the predicted mean (PM),maximizing the mean squared error (MSE), and expected improvement (EI), when applied to the unconstrained problem.

2. Numerical Results

The function to minimize is a one-dimensional benchmark function presented in Equ. 2.1.

$$f(x) = (6x-2)^4 sin(12x-4), \quad x \in [0,1] \tag{2.1}$$

5 initial DoE are generated using a stochastic Latin Hypercube Sampling. 20 points are added using the predicted mean (MP) ,mean squared error (MSE) and EI criterion. Table 1 displays the mean best value attained with the corresponding standard deviation. PM allows us to quickly converge upon the predicted minimum value -6.0207. However, the addition of new samples does not necessarily improve the capability of the kriging model ($sd = 1.0043$). MSE criterion gives good results, because it explore all the design space, which make the approximate model more accurate. However, the mean predicted value and the sd of the results is lower for expected improvement, which make it better than the other criteria, this is because EI takes the mean and uncertainty estimate of the surrogate model both into account. Thats why the Expected Improvement does both: **exploitation** and **exploration** [1].

Table 1: Comparative results of three infill criteria

Infill criteria	The mean predicted value	standard deviation
Predicted Mean	-6.0207	1.0043
Mean Squared Error	-5.9677	0.037166
Expected Improvement	**-6.0207**	**0.28373**

3. Conclusion

In this paper, a comparaison between three infill sampling criteria was for Kriging surrogate modelling presented, and the results show that expected improvement strike a good balance between local optimization efficiency (Exploitation) and global optimization accuracy (Exploration). In the future, We can expect that, different infill sampling criteria can be used simultaneously, that is, several points added at a time and running the simulations in parallel will be more efficient.

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On HIV model with logistic growth and infected cells in eclipse phase: An optimal control analysis

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Abstract. A mathematical model of the human immunodeficiency virus infection with logistic growth, infected cells in eclipse phase and therapy is investigated. The model includes four nonlinear differential equations describing the evolution of uninfected $CD4^+$ T cells, infected $CD4^+$ T cells in latent stage, productively infected $CD4^+$ T cells and free virus. Two types of treatments are incorporated into the model; the purpose of the first one consists to block the viral proliferation while the role of the second is to prevent new infections. The positivity and boundedness of solutions are established. The local stability of the disease free steady state and the infection steady states are studied. An optimal control problem is proposed and investigated. Numerical simulations are performed, confirming stability of the free and endemic equilibria and illustrating the effectiveness of the two incorporated treatments via an efficient optimal control.

Key words: HIV infection ; Logistic growth ; Treatment ; Stability ; Viral dynamics ; Optimal control.
AMS subject classification: 34D20, 37M05, 37N25, 92D30 .

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Photovoltaic generator modelling for power system simulation studies

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Abstract. Photovoltaic (PV) systems are generally modeled by non-linear equations, that may introduce numerical instability problems during power system simulation.
The paper investigates the numerical instability problems caused by the PV generator model. To overcome such problems while keeping high computational efficiency of the simulation, a new representation of the PV generator model is proposed. We use fixed point method to modify and linearize the equations. The obtained modifying model is proved to be stable and guarantee that the terminal voltage is not far from the input pv generator. We We give numerical simulation that prove the efficiency of the new model.

Key Words: Modified fixed point method, Non linear equations, Photovoltaic modeling and stability..
AMS subject classification: .

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Lotka-Voltera model in protected zone and free acces zone

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Abstract. In the present paper, we describe a model of the interaction between the Aristeus Antennatus and Sardine marine species in two different areas: the first one is a preserved area against fishing and the second one is a free access fishing area. The Aristeus Antennatus in the preserved area grows according to the logistic model. If the Aristeus Antennatus population is in the preserved zone then it is protected against fishing but if not, i.e, if it is in the free acces fishing zone, it is captured. This paper has as objective to study the existence and to prove the equilibrium points stability by using eigenvalues analysis. As results, we found that the conditions that ensure the existence of the Aristeus Antennatus and Sardine marine populations are hold, and their coexistence is shown in the numerical simulations results.

Key words: Lotka-Volterra model, Sustainability of marine resources, Protected fishing area, Free access fishing zone, Aristeus antennatus population.
AMS subject classification: .

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Modelling the mechanics of the cochlea

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Abstract

The cochlea plays a crucial role in mammal hearing. The basic function of the cochlea is to map sounds of different frequencies onto corresponding characteristic positions on the basilar membrane . Sounds enter the fluid-filed cochlea and cause deflection of the basilar membrane due to pressure differences between the cochlear fluid chambers. These deflections travel along the cochlea, increasing in amplitude, until a frequency-dependent characteristic position and then decay away rapidly. The hair cells can detect these deflections and encode them as neural signals. Modelling the mechanics of the cochlea is of help in interpreting experimental observations and also can provide predictions of the results of experiments that cannot currently be performed due to technical limitations.In this present paper, we present the different models already founded in the literature in order to define our own model for studding the dysfunction of human ear.

Keywords: Mathematical model, cochlea, dysfunction, models

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8. ++++++++++++++++++ Session 7 ++++++++++++++++++

Modeling and Numerical Simulation

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30 November 2019

Modeling of the dispersion of polluting particles

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Abstract. The air inside the buildings is a mixture of physical, chemical and biological pollutants which originate from the surrounding air, materials, the devices of combustion and the human activities. For materials, we can distinguish the emission from volatile organic compounds, paintings with lead and fibers. The attendance time of the townsmen inside the buildings can be more important for certain fragile or critical populations like younger children, the elderly people or patients, or also of the particularly sensitive people. Interior air quality becomes an increasing concern of our fellow-citizens, partly due to the presence of symptoms or diseases related to the buildings In this paper, we are presenting some numerical models which have been to simulate the dispersion of pollutants in the atmospheric boundary layer in different stability, and During our work, we are going to study the dispersion of the fine particles inside a room, with the Discretization in 3 dimensions by the finite volume method of the flow of the incompressible air polluting occupying this room, modeled by the Navier-Stokes equations . We chose to couple them with the equation of the heat in the case where the viscosity depends on the temperature with conditions in the limits concerning the speed and the temperature.

Key words: Pollution, Particles, Dispersion, Discretization, Emission, Algorithms, The volume Finite Method, Navier-Stokes..
AMS subject classification: Partial Derivative Equations, Modelling and Simulation .

Introduction

External pollution (atmospheric) has its fact, but its implication in the constitution of the disease is very difficult to show. Its effects on the respiratory function have been really studied only for about twenty years, thanks to studies of troops, long and tiresome, which explains the controversies concerning their conclusions and the difficulties of highlighting results statistically signicances. These difficulties are all the more large as pollution is made of a set of molecules (gas, particles)

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[1]. The role of the modeling of atmospheric dispersion can appear secondary compared to the legislative measures of reduction of the emissions. Modeling makes it possible to better understand the concerned physical phenomena and constitutes essential tools to conceive the means of fight against pollution. Thus the place of modeling in the problems of industrial pollution is at several levels.

PROBLEMATIC AND HYPOTHESIS

Our study falls under the set themes of the dispersion of the polluting particles inside the buildings and more particularly on the development of a digital tool of prediction of the behavior of particles by using modeling based on the Discretization of Navier-Stokes equations [4] with the methods of finite volumes. The problem of the prediction of the movement of the particles is introduced by the study of the elementary forces which are exerted on the particles. This study is devoted to develop one digit code of calculation of the particle concentrations inside. We regard in this code the air polluted as a single entity, and treat the exchanges with the outside and on the walls of the building in their globalities.

NUMERICAL SIMULATION

Various steps to model a complex system: - Search for a mathematical model representing physics. Setting in the equation. - Development of a grid. Discretization of the equations of physics. - Resolution of the discrete equation (often linear systems to solve). - Data-processing, transcription and programming of the discrete relations. - Digital simulation and analysis of the results. The engineer can have to intervene on one or several of these various stages

ALGORITHM OF CALCULATES

1. The whole of steps calculation intervening in the resolution of the Navier-Stokes equations using the algorithm below:
2. Read the definition of the grid, the conditions at the borders and to build the grid shifted for the components speed;
3. Define a field of pressure estimated P';
4. Calculate the intermediate components speed U^*, V^* and W^* with the nodes of their grids shifted from solving the conservation equations of the momentum;
5. Calculate the correction P', pressure necessary to correct the field of speed in order to satisfy the equation with continuity;
6. Calculate the field of pressure P by associating P' with P^*;
7. Calculate the components of speed U, V and W;

8. Solve the equations discretized for K, C and T;

Conclusion

We noted that this deposit rate relatively invariant according to the rate of flow of air. Once we know the concentration of the pollutant particle which really penetrates inside a part, it remains us to determine the influence of ventilation in the buildings on the particulate pollution, and will show that the movement of the particles of the interior air depends not only on the ventilation rate, but also on the way borrowed by the flow of air in the environment. An experimental study at the University of Rochelle in France showed that the influence of the positions of the entry and the exit of air was stronger for the fine particles than for the more important particles of size, and then an increase in the ventilation rate necessarily a higher deposit of the suspended particles did not imply. In order to highlight this phenomenon, we chose to use either a comprehensive approach of the phenomenon, but a fine modeling.

In other words, we are going to use Fluent which will make it possible to simulate the flows of air of the cell, for the same type of coating.

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Optimal control of a delayed HBV infection model with capsids, adaptive immune responses and cure rate

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Abstract. We present in this paper a delay-differential equation model that describes the interactions between hepatitis B virus (HBV) with DNA-containing capsids, the liver cells (hepatocytes), the antibodies and the cytotoxic T-lymphocyte (CTL) cells. Both two treatments, the intracellular delay and the cure rate of infected cells are incorporated into the model. The first treatment represents the efficiency of drug treatment in preventing new infections, whereas the second stands for the efficiency of drug treatment in inhibiting viral production. Existence for the optimal control pair is established, Pontryagin's maximum principle is used to characterize these two optimal controls. The optimality system is derived and solved numerically using the forward and backward difference approximation. Finally, numerical simulations are established to show the role of optimal therapy in controlling viral replication.
Key words: HBV infection, abaptive immune response, delay, optimal control, numerical simulation.
AMS subject classification: 34K20, 37L15, 92C37

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Modeling the evolution of viral infection in a tissue in space and time

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Abstract. The spread of a viral infection in living tissue depends, among other things, on the nature of the tissue, the host cells and the way in which the virus multiplies. In order to take into account all these factors, we have represented our model with a delay reaction-diffusion equation. The propagation regime is determined by the immune response and the initial conditions.

Key words: infection spreading; tissue; immune response; mathematical model; reaction-diffusion equation; time-delay.
AMS subject classification: 34K20, 37L15, 92C37

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Gauss-Seidel Method for Solving Magneto-elastohydrodynamic Reynolds Equation on Inclined Slider Bearings

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Abstract. A mathematical model of magneto-elastohydrodynamic (MEHD) lubrication problem in a finite inclined slider bearing has been analysed. In this study, the rheological behaviour of the lubricant, blended with additives of long-chain molecules, is modelled by the micro-continuum Stokes theory [1]. A generalized MEHD Reynolds-type equation including bearing deformation is used to precisely predict the lubrication characteristics of slider bearings. It is an elliptical PDE deduced from the MEHD motion equations along with the continuity equation under lubrication assumptions [2]. This Reynolds-type equation is discretized using second order finite difference formula. The resulting algebraic equations are solved iteratively using the over-relaxation Gauss-Seidel technique. Numerical results are presented for different values of the couple stress, Hartman number and compliance coefficient.

Key words: Finite difference methods; Iterative Gauss Seidel technique; Reynolds equation; Magneto-elastohydrodynamic lubrication.
AMS subject classification: Partial Derivative Equations, Modelling and Simulation.

Introduction

Bearings such as thrust bearings and slider bearings have wide application in various industries such as machinery and equipment, automotive and aerospace. Analysis of these bearings is most importantly occurring in MEHD lubrication theory and it is also most difficult and complex to solve due to integration of the Reynolds equation. Different numerical techniques for solving Reynolds equation have been used by many researchers. Tayal et al. [3] used finite element methods (FEM) to investigate the effect of nonlinearity on the performance of journal bearings. Chandrawat and Sinhasan [4] presented a comparison between the Gauss-Seidel iterative method and the linear

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complementarity approach for determining the pressure field in the analysis of plain and two-axial groove journal bearings in laminar flow operation. Gero and Ettles [5] carried out a comparison of finite difference methods (FDM) and FEM in solving 1D and 2D Reynolds equation. Their results for two-dimensional bearings demonstrated that the relative errors of the FDM solutions were smaller than those associated with the FEM approach. In this paper, using iterative over-relaxation Gauss-Seidel technique, the film pressure of plane inclined elastic slider-bearings is numerically solved from the MEHD Reynolds-type equation.

Numerical Results

The derived 2D modified Reynolds equation is of elliptic type in nature, which is highly non-linear and thus too complicated to be solved analytically for pressure, hence, we solve it numerically using a standard second order finite difference scheme. The resulting algebraic equations are solved using the iterative overrelaxation Gauss-Seidel technique in order to accelerate the convergence rate. Once the film pressure is obtained, the bearing load-capacity and friction coefficient are numerally evaluated using a Simpsons rule integration. Numerical results of these bearing characteristics are presented and discussed for different values of the compliance coefficient, couple stress and Hartman number.

Conclusion

According to the numerical results, it is found that the bearing deformation diminishes the load-capacity and increases the friction coefficient in comparison with the rigid case. However, the non-Newtonian effect increases load-capacity but decreases the friction coefficient. Moreover, the use of a transverse magnetic field increases both friction coefficient and load capacity.

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A stochastic hepatitis B epidemic model driven by Lvy noise

Brahim Boukanjime[95] **, Mohamed El Jamali and Mohamed El Fatini**

Abstract. In the present paper, we investigate a stochastic hepatitis B epidemic model driven by Lvy noise. We prove the existence of a unique global positive solution and we present sufficient conditions to derive extinction and persistence of the disease.

Key words:. Epidemic model; Lvy process; Lyapunov function

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Optimal control of an HIV with CTL cells and exposed cells

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Abstract. This paper deals with an optimal control problem for an human immunodeficiency virus (HIV) infection model with cytotoxic T-lymphocytes (CTL) immune response and exposed cells. The model under consideration describes the interaction between the uninfected cells, the exposed cells, the productively infected cells, the free viruses and the CTL cells. The two treatments represent the efficiency of drug treatment in inhibiting viral production and preventing new infections. Existence of the optimal control pair is established and the Pontryagins minimum principle is used to characterize these two optimal controls. The optimality system is derived and solved numerically using the forward and backward difference approximation. Finally, numerical simulations are performed in order to show the role of optimal therapy in controlling the infection severity.

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Effect of Lewis number on convective instability of reaction fronts in a liquid medium

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Abstract. In this work, we are interested to the influence of Lewis number on frontal polymerization. The model is governed by the equation of heat, the equation of concentration and the Navier-Stockes equation under the Boussinesq approximation. We consider the case where the liquid monomer is converted into solid polymer. We carry out a linear stability analysis to find the dispersion relation. It's solved numerically to obtain the conditions for the cellular and oscillatory instability.

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A study meteorological effects on the annual profit of sinners using mathematical modelling

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Abstract. In this work, we search to show the impact of the wind speed on the annual profit of purse seiners by using mathematical modelling. We consider a bioeconomic model of marine species exploited by seiners in a maritime zone of Morocco. A zone characterized by major wind speed changes. We calculate the fishing effort and the amount of catch that allows seiners to have a maximum annual profit taking into account changes of wind speed in the reporting year and the sustainability of the marine populations stocks. We compare our results with those obtained by the" Institut National de Recherche Halieutique (INRH)" (National Institute of Fisheries Research).

Key words: Bioeconomic model, Fish populations, Annual profit, Fishing effort, Wind speed, Nash equilibrium
AMS subject classification: 92B05; 91B02; 91B06; 91B50.

Introduction

The management of renewable resources has been the subject of an abundant literature, much of which is devoted to the study of joint exploitation, particularly in the case of fisheries resources [1, 2, 3, 4, 5, 6, 7, **?**]. In these papers, the authors sought to maximize the profit of one or more fishermen, who exploit one, two or more marine species that are in competition or predation between each other. Also, they studied the impact of different parameters variations on the profits of fishermen. In the bioeconomic models existing in the literature the authors did not involve these meteorological constraints in their mathematical studies. So, in this paper, we take a look at the importance of including meteorological effects in the study and modeling of bioecnomic models, to give more relevant results that are closer to the reality. We consider the three marine species: Sardina pilchardus, Scomber colias and trachurus.

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Numerical Results

We prove by this work that the purse seiners will undertake a reasonable number of fishing trips when they take into consideration the wind speed level before fishing access. In this situation, the quantities caught will be more reasonable, and will ensure the abundance of marine species. Because, as already mentioned, the wind speed plays a primordial role in the abundance of the species.
It can be seen from the above points that the study and analysis of a bioeconomic model for the management of fisheries must take into account the meteorological effects to be more realistic, and to obtain the best result reasonably achievable having regard to the sustainability of marine resources. That may help us better to understand the reality and to give real world valid interpretations.

Conclusion

In this work, we have shown that wind speed must be taken into consideration when seiners choosing a spot to fish. The wind blows phytoplankton, zooplankton, aquatic insects and terrestrial insects towards the windward shore which attracts crustaceans and bait fish. These bait fish attract larger predator species that feed on them. When fishing in the wind it is best that fishermen position themselves on or near the windward shore, even though these can be challenging conditions to fish in.

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Optimal control of an HIV model with saturated infection rate and exposed cells

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Abstract. This paper deals with an optimal control problem for a modified human immunodeficiency virus infection model. The model under consideration describes the interaction between the uninfected cells, the latently infected cells, the productively infected cells and the free viruses. A saturated infection rate and therapy are incorporated into the suggested model. The two treatments represent the efficiency of drug treatment in inhibiting viral production and preventing new infections. Existence of the optimal control pair is established and the Pontryagin's minimum principle is used to characterize these two optimal controls. The optimality system is derived and solved numerically using the forward and backward difference approximation. Finally, numerical simulations are performed in order to show the role of optimal therapy in controlling the infection severity.

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Nonlinear vibrations in an absorber harvester device

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Abstract. In the present paper, we investigate periodic vibration-based energy harvesting (EH) in a nonlinear absorbers coupled with a delayed piezoelectric circuit. The harvester consists of an excited single degree of freedom system with a nonlinear absorbers having hardening or hardening Duffing nonlinearity under harmonic excitation and coupled to a delayed piezoelectric transducer circuit. The equation of motion of the coupled nonlinear system non-dimensional are given by:

$$\ddot{x_1} + \xi_1 \dot{x_1} - \mu\xi_2\beta(\dot{x_2} - \dot{x_1}) + x_1 - \mu\beta^2(x_2 - x_1) - \mu\beta^2\alpha(x_2 - x_1)^3 + \mu\beta^2\chi v = F\cos(\omega\tau) \quad (8.1)$$

$$\ddot{x_2} + \xi_2\beta(\dot{x_2} - \dot{x_1}) + \beta^2(x_2 - x_1) + \beta^2\alpha(x_2 - x_1)^3 - \chi v = 0 \quad (8.2)$$

$$\dot{v} + \lambda v + \kappa(\dot{x_2} - \dot{x_1}) = Kv(\tau - \tau_d) \quad (8.3)$$

Where the various parameters are defined as ξ_1 and ξ_2 are the damping factors, μ is the mass ratio, β is the tuning ratio, α is the strength of nonlinearity, F is the static displacement, τ is the non-dimensional time, λ is the reciprocal of time constant ,χ is the non-dimensional mechanical coupling coefficient, κ is the non dimensional electrical coupling coefficient,V_0 is a reference voltage and ω is the non-dimensional frequency,K is the delay amplitude, τ_d is the time delay. the number of primes denote the differentiation with respect to the non dimensional time τ.

Analytical approximation of the response and the corresponding voltage amplitude are obtained using the averaging complexes method (A-CXM), the stability analysis for stationary solutions is performed and bifurcation diagram is determined. The effect of time delay on the EH performance is studied; It is shown that for appropriate values of delay amplitude, the energy harvesting performance is improved over a certain range of system parameters. Numerical simulation is conducted to support the analytical predictions.

Key words: Energy harvesting, Duffing oscillator, delayed piezoelectric coupling, complexification-averaging method.

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The basic reproduction number for a delayed epidemic model in periodic environment.

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Abstract. Threshold dynamics of epidemic models in periodic environments attract more attention [2, 3]. But there are few papers which are concerned with the case where infected compartments satisfy a delay differential equation [3]. For this reason, we introduce the basic reproduction number for a delayed SIR epidemic model as in [1] but in periodic environment using method devoloped in [4, 5]. And then investigate the dynamical behavior of this model.

Key words:. Epidemic model, Delay, periodic environment, The basic reproduction number.
AMS subject classification: . Dynamic Systems, Numerical Analysis and Scientific Computation

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Stochastic analysis of an epidemic model with cure, relapse and general incidence

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Abstract. In this paper, we consider a stochastic epidemic model with relapse, cure and a nonlinear incidence rate function. We prove the existence and uniqueness of a global positive solution. Then, We show the extinction of the disease under sufficient conditions. The persistence in mean of the epidemic is established. Numerical simulations are presented to illustrate the theoretical results.

Key words: Epidemic model, Extinction, Persistence, Threshold.

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Numerical investigation of lubrication of finite porous elastic bearings

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Abstract. The purpose of this study is to investigate numerically the viscous shear effect on finite porous elastic journal bearings lubricated with non-Newtonian couple stress fluid. Using the micro-continuum theory of Stokes, the modified Reynolds equation including bearing deformation is derived. The porous flow is modeled using Brinkman model (BM) which account for the viscous shear forces. The obtained algebraic equations are sequentially resolved by fixed-point iteration method. The numerical results of the present simulations show that all these effects have a significant influence on journal bearings performances.

Key words: Numerical simulation; Non-Newtonian lubricants; Brinkman model; Porous elastic bearings, Fixed-point method.
AMS subject classification: Partial Derivative Equations, Modelling and Simulation.

Introduction

Porous journal bearings (PJBs) are broadly used in numerous industrial applications such as jet engine manufacturers, compressors and turbines. Only few investigations have been found related to couple stresses [1] lubricants on such bearings [2]. Recently, SAKIM et al. [3] examined the combined effects of couple stresses and deformation of the porous bearing. The analysis was based on the Slip-flow model (SFM), where the porous bearing flow was described by Darcys law considering Beavers-Joseph slip conditions at the film-porous elastic bearing interface. However, the SFM is valid only in a dense porous bearing of large thickness so that the variation of velocity in the porous bearing can be neglected. Moreover, many porous bearings involve porous layers with shallow dept and with porosity close to unity. In these PJBs the velocity is no longer uniform and thus the distortion of velocity yields the viscous shearing stresses. Therefore, the Darcy equation has to be modified to better describe the flow phenomena and to account for the higher permeability

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associated with the flow. The Brinkman model (BM) accounting for the viscous shear effects and the viscous damping effects (Darcy resistance) can surmount the above obstacles. However, we have no idea how the viscous shear forces of the BM affect such bearings lubricated by non-Newtonian couple stresses fluid. Therefore, the study is needed.

Numerical Results

The EHD modified Reynolds equation [3] in the film, those of Brinkman and Laplace equations in the porous bearing are coupled at the film-porous elastic bearing interface by the continuity of pressure, velocities and viscous shear stresses. Since this fluid-porous bearing interaction problem requires numerical solution, finite difference method is employed to discretize the set of equations. In order to easily perform finite differences discretization, dimensionless variables are introduced and the physical domain is transformed to a rectangular domain. The successive over-relaxation scheme is used to resolve iteratively the obtained algebraic equations. This coupled problem is sequentially solved based on fixed point technique. The numerical results of the present simulations show that all these effects have a significant influence on journal bearings performances. Comparing with those of SFM, the effects of viscous shear forces of the BM provide an increase in the load capacity, as well as a reduction in the friction factor. In addition, couple stresses because of the lubricant mixed with additives oppose fluid motion and after that improve the load capacity while decrease the friction factor.

Conclusion

A numerical simulation of the combined non-Newtonian and viscous shear effects on finite flexible porous journal bearings characteristics has been presented. It is found that, couple stresses increase the load capacity while decrease the friction factor. On the whole the SFM underestimates the bearing characteristics as compared to that obtained from BM. Introducing the viscous shear term, the BM considers more correctly the resistance encountered by the fluid flowing toward the porous elastic bearing and thus predicts more realistic characteristics.

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On the control of a reactiondiffusion system: a class of SIR distributed parameter systems

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Abstract. In this paper, two types of distributed control functions, vaccine and treatment have been applied to a spatiotemporal SIR model with no-flux boundary conditions. The spatiotemporal SIR epidemic model is formulated from existing SIR epidemic model by including a diffusion term in his different compartments to study the impact of spatial heterogeneity of disease transmission in dense regions. Our main objective to find the optimal control pair that minimizes the number of infected individuals, the corresponding vaccination and treatment costs. The existence of the positive solution for the state system and the existence of a distributed optimal control pair are proved. Techniques of optimal control are used to characterize optimal control pair in terms of state and adjoint functions. The optimality system is solved numerically; the numerical results show that the control effect is effective if the treatment and vaccine strategies are used simultaneously.

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