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Département de Mathématiques
Laboratoire de Mathématiques Appliquées- LaMA

Actes de l'atelier scientifique

Deuxième Workshop sur les Equations aux Dérivées Partielles Non Linéaires et Applications WEDP'18
Sétif, 25, 26 Novembre 2018

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Première Partie

Résumés Des Conférenciers

(08 conférences)

Deuxième Workshop sur les Equations aux Dérivées Partielles
Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

Principe du maximum dans les équations différentielles

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Résumé :

Notre but est de donner une idée (sommaire) sur un outil très classique et très efficace utilisé dans la théorie des équations différentielles, ordinaires ou aux dérivées partielles. Il s'agit du (ou des) principe(s) du maximum. Ce principe possède plusieurs applications. Il nous permet, par exemple, d'obtenir des informations sur les solutions des équations et des inégalités différentielles sans connaissance explicite préalable de ces solutions.
Nous présenterons ce principe en particuliers pour

1. les inéquations différentielles du second ordre à une dimension,
2. le laplacien à une ou plusieurs dimensions,
3. l'opérateur de la chaleur à une dimension d'espace et
4. l'opérateur des ondes à une dimension d'espace.

Notre présentation ne fera appel qu'à des connaissances élémentaires d'analyse mathématique. Nous adaptons principalement dans cela les méthodes du livre de Protter et Weinberger [1].

Références

[1] M. Protter and H. Weinberger, *Maximum Principles in Differential Equations*, Prentice Hall, Englewood Cliffs, N.J., 1967 ; Springer-Verlag Inc., New York, 1984 and 1999.

Sur la dynamique globale en temps d'un écoulement de Bingham plan, soumis à une condition aux limites sous-différentielle

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Résumé : [Je présente l'étude de la dynamique globale dans le temps d'un écoulement de Bingham soumis à une condition aux limites sous-différentielle de type Tresca. D'abord je présente l'existence d'une solution globale unique dans le temps du problème considéré et l'existence de l'attracteur global associé. Je montre ensuite, que pour de petites forces motrices l'attracteur global est trivial et attire des ensembles liés en temps finis ou de manière exponentiellement rapide.Finalement, j'obtiens la propriété de semi-continuité supérieure de l'attracteur global par rapport à la limite de rendement lorsque ce dernier approche de zéro, liant ainsi les attracteurs globaux du modèle de Bingham d'un fluide à celui pour le modèle Navier-Stokes.]

On global in time dynamics of a planar Bingham flow subject to a subdifferential boundary condition

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Abstract :
In this paper we study the global in time dynamics of a planar Bingham flow subject to a subdifferential boundary condition of Tresca's type. First, we prove the existence of a unique global in time solution of the consid- ered problem and the existence of the global attractor. Then we show that for small driving forces the global attractor is trivial and attracts bounded sets in finite times or exponentially fast. In the end we prove the upper semicontinuity property of the global attractor with respect to the yield limit parameter when the latter approaches zero, thus relating the global attractors for the Bingham model of a fluid to that for the Navier-Stokes model.

Université Badji Mokhtar Annaba
Laboratoire de Mathématiques, Dynamique et Modélisation (LMDM)
Pr. A. DJELLIT

Espaces de Lebesgue-Sobolev à exposant variables

Résumé:

L'exposé porte sur les espaces de Lebesgue-Sobolev à exposant variables, notés $W^{k,p(x)}(\Omega)$. Nous allons voir que ces espaces jouissent globalement des mêmes propriétés que les espaces de Sobolev classiques; notamment l'inégalité de Hölder et certaines immersions restent vraies. Nous insisterons sur le fait que la topologie des espaces $L^{p(x)}(\Omega)$ est induite par une norme particulière dite norme du Luxemburg d'expression:

$$\|u\| = \inf\left\{\lambda > 0, \int_{\Omega}\left|\frac{u}{\lambda}\right|^{p(x)} dx \leq 1\right\}.$$

Comme application, nous avons choisi de présenter une étude sur la résolution d'un système elliptique non linéaire.

1- L. Diening, P. Harjulehto, P Hasto, M. Ruzicka, Lebesgue and Sobolev spaces with variable exponents, Spin Springer's 2010.

2- X. L. Fan, D. Zhao, On the $L^{p(x)}(\Omega)$ and $W^{k,p(x)}(\Omega)$, J. Math. Anal. Appl. 302 (2005).

3- A. Djellit, B. Abdelmalek, Existence of Solutions for an Elliptic p(x)-Khirchoof-type Systems in unbounded domain, Bol. Soc. Paran. Math. 3° Serie. Vol. 36 N:3 (2018).

Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

Global nonexistence results for a class of hyperbolic systems

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Abstract:

We present blow-up results to the non-autonomous nonlinear system of wave equations

$$u_{tt} - \Delta u = a(t,x)|v|^p, \quad v_{tt} - \Delta v = b(t,x)|u|^q, \ \ t > 0, \ x \in \mathbf{R}^N,$$

in any space dimension. We show that a curve $\tilde{F}(p,q) = 0$ depending on the space dimension N, on the exponents p, q and on the behavior of the functions $a(t,x)$ and $b(t,x)$ exists, such that all nontrivial solutions to the above system blow-up in a finite time whenever $\tilde{F}(p,q) > 0$. Our method of proof relies on some estimates developed by Galaktionov and Pohozaev for a single non-autonomous wave equation enabling us to obtain a system of ordinary differential inequalities from which the desired result is derived. Our result generalizes some important results such as the ones in Del Santo, Georgiev and Mitidieri (1996) and Galaktionov and Pohozaev (2003). The advantage here is that our result applies to a wide variety of problems.

Deuxième Workshop sur les Equations aux Dérivées Partielles

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[Approximate solutions of Fredholm integral equations of the second kind by projections]

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Abstract: [
In this work, we present a numerical methods to solve Fredholm integral equations of the second kind. On one hand, we give an important background for the classification of integral equations and we discuss the compactness of integral operators on Banach spaces. On the other hand, we introduce some computational methods for solving Fredhom integral equation. We compare the application of four methods to approach the solution of these equations.]
Keywords: Integral operators, integral equations, projection methods, convergence analysis.

AMS Classification: 45E05, 45J05.

Analysis and Numerical Study of a pollution problem

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Abstract

A system of partial differential equations that models the organic pollution in lakes or estuaries, is presented. This problem due to Streeter & Phelps is more precisely reduced to a reaction-diffusion problem, where the unknowns are the biochemical oxygen demand and the dissolved oxygen concentration. We start by proving that this problem is well posed. Then we propose finite element discretizations to demonstrate optimal a priori and a posteriori estimates of the error.

Keywords: EDPs, Mathematical Analysis, Stabilized Finite Elements.

Mathématiques et Application

Fatma Zohra Nouri
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Université Annaba

Résumé

On présente un système d'´equations aux dérivées partielles qui modélise la pollution organique dans des lacs ou des estuaires. Ce problème dû à Streeter & Phelps est plus précisement réduit à un problème de réaction-diffusion, où les inconnues sont la demande biochimique en oxygène et la concentration d'oxygène dissous. On commence par prouver que ce problème est bien posé. Puis nous proposons des discrétisations par éléments finis pour démontrer des estimations a priori et a posteriori optimales de l'erreur

Mots-clés: EDPs, Analyse Mathématique, Elements Finis Stabilisés.

Deuxième Partie

Posters

(68 posters)

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018.

Isométries infinitésimales

Saad Aggoun

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Abstract: Soit M une variété et $\sigma = [\omega]$ une structure de contact . L'algèbre de Lie $A([\omega])$ des automorphismes infinitésimaux de $\sigma = [\omega]$ est de dimension infinie.On désigne par $A(\omega)$ la sous-algèbre de dimension infinie de $A([\omega])$ engendrée par les autmorphismes infinitésimaux de ω.Dans cet article on va déterminer les algèbres de lie de dimensions finies $A([\omega], g)$ (resp $A(\omega, g)$) des automorphismes infinitésimaux de $\sigma = [\omega]$ (resp de $A(\omega)$) qui laissent invariante une certaine métrique g.

2000 Mathematics Subject Classification: 37J55; 53D10; 53D17; 53D35.
Mots clés : Formes de contact , Structures de contact ,Champ de Reeb , Crochet dePoisson , Automorphisme infinitésimal , Isométrie infinitésimale.

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Application d'un modèle exponentiel linéaire généralisé à des données biomédicales

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Abstract: Le modèle exponentiel linéaire généralisé (GLE) est une généralisation de la distribution exponentielle et de celle Rayleigh, La distribution GLE, utilisée pour décrire les phénomènes de fonction risque linéairement croissante. Grâce à sa flexibilité et ses interprétations physiques, cette distribution peut modéliser différentes durées de vie. Elle peut être appliquée dans différents domaines d'analyse de survie et particulièrement en biomédical. Dans notre travail, nous nous intéressons à la modélisation de données biomédicales issues d'un essai clinique qui a été mené pour évaluer l'efficacité d'une pommade antibiotique anesthésique. Celle-ci est utilisée pour soulager la douleur causée par des plaies superficielles de la peau. Après l'étude des caractéristiques du modèle, on construit pour celui-ci, un test d'ajustement du type du Chi-deux modifié pour vérifier si les observations peuvent être ajustées par ce modèle. On en déduit les différentes caractéristiques de la variable étudiée. Des simulations numériques, ont été menées pour conforter les résultats théoriques obtenus.
Keywords:
Distribution exponentielle linéaire généralisée, estimation du maximum de vraisemblance; type du Chi-deux modifié

1 Présentation du modèle

On dit qu'une variable aléatoire T suit la distribution exponentielle linéaire généralisée avec α le paramètre de forme et λ le paramètre d'échelle notée $GLE\,(\gamma)$, si sa fonction densité est

$$f(t;\gamma) = (\alpha + \lambda t)\exp\left(-\left[\alpha t + \frac{\lambda t^2}{2}\right]\right) \qquad t \geq 0$$

Où $\gamma = (\alpha, \lambda)^T$.
La fonction de distribution cumulative est:

$$F(t;\gamma) = 1 - \exp\left(-\left[\alpha t + \frac{\lambda t^2}{2}\right]\right)$$

Considérons $X_1, X_2, ...X_n$, un échantillon aléatoire de la loi exponentielle Linéaire généralisée $GLE(\alpha, \lambda)$,
La fonction de log-vraisemblance du modèle s'écrit:

$$\begin{aligned} L(t,\gamma) &= \sum_{i=1}^{n} \ln f(t;\gamma) \\ &= n\ln\alpha + n\ln\lambda + (\alpha-1)\sum_{i=1}^{n}\ln\left(1-e^{-\lambda t_i}\right) - \lambda\sum_{i=1}^{n} t_i \end{aligned}$$

et dès lors que la log-vraisemblance est dérivable, l'estimateur du maximum de vraisemblance annule le vecteur des scores :

$$\frac{\partial L}{\partial \alpha} = \frac{n}{\alpha} + \sum_{i=1}^{n} \ln(1-e^{-\lambda t_i}) = 0$$

$$\frac{\partial L}{\partial \lambda} = \frac{n}{\lambda} + (\alpha-1)\sum_{i=1}^{n}\frac{t_i e^{-\lambda t_i}}{1-e^{-\lambda t_i}} - \sum_{i=1}^{n} t_i = 0$$

on obtient l'estimateur du maximum de vraisemblance de α en fonction de λ

$$\hat{\alpha}(\lambda) = -\frac{n}{\sum_{i=1}^{n}\ln(1-e^{-\lambda t_i})}$$

et λ peut être obtenu en tant que solution de l'équation non linéaire:

$$f(\lambda) = \frac{n}{\lambda} - (\frac{n}{\sum_{i=1}^{n}\ln(1-e^{-\lambda t_i})} + 1)\sum_{i=1}^{n}\frac{t_i e^{-\lambda t_i}}{1-e^{-\lambda t_i}} - \sum_{i=1}^{n} t_i$$

Par conséquent, on peut obtenir $\hat{\lambda}$ comme solution de l'équation non linéaire de la forme $g(\lambda) = \lambda$, où

$$g(\lambda) = n\left[\frac{n}{\sum_{i=1}^{n}\ln(1-e^{-\lambda t_i})}\sum_{i=1}^{n}\frac{t_i e^{-\lambda t_i}}{1-e^{-\lambda t_i}} + \sum_{i=1}^{n}\frac{t_i}{1-e^{-\lambda t_i}}\right]^{-1}$$

Comme $\hat{\lambda}$ est une solution de point fixe de l'équation non linéaire , par conséquent, il peut être obtenu en utilisant un schéma itératif comme suit:

$$g(\lambda_j) = \lambda_{j+1}$$

où $\hat{\lambda}$ est la $j-ième$ itération de λ. La procédure d'itération doit être arrêtée lorsque $|\lambda_j - \lambda_{j+1}|$ est suffisamment petit. Une fois que nous obtenons $\hat{\lambda}$,
Une fois qu'on trouve la valeur de $\hat{\lambda}$, nous pouvons utiliser l'équation pour trouver la valeur de $\hat{\alpha}$.

2 Test d'adéquation pour une distribution exponentielle généralisée

Considérons le problème de tester l'hypothèse H_0selon laquelle la distribution de $X = (X_1, X_2, ...X_n)^T$ vérifie:

$$H_0 = P(X_i \leq x) = F(x, \alpha, \lambda)$$

où $F(x, \gamma)$ est la fonction de distribution de la loi exponentielle linaire généralisée .
Nous adaptons la statistique de Nikulin-Rao-Robson ([Rao-Robson 1974], [Nikulin 1973], [Drost 1988]) définie par:

$$Y_n^2(\hat{\gamma}_n) = X_n^2(\hat{\gamma}_n) + \frac{1}{n} l^T(\hat{\gamma}_n) [I_n(\hat{\gamma}_n) - J(\hat{\gamma}_n)]^{-1} l(\hat{\gamma}_n)$$

Où $\hat{\gamma}_n$ est l'estimateur du maximum de vraisemblance du paramètre γ, $\hat{\gamma}_n = (\hat{\alpha}, \hat{\lambda})$

Sous H_0, la statistique Y_n^2 suit pour n assez grand, la distribution chi-deuχ^2_{r-1}à $(r-1)$ degrés de liberté[Greenwood and Nikulin 1996] au seuil ϵ. Si on choisit la valeur critique

$$C\epsilon = \chi^2_{r-1,1-\epsilon}$$

L'hypothèse H_0 est acceptée si $Y_n^2 \leq C\epsilon$. Dans le cas contraire, H_0 est rejetée.
Nous calculons d'abord la matrice d'information des données groupées $J(\hat{\gamma}_n)$ et celle des données non groupées I_n. Nous avons ensuite, élaboré un logiciel de calcul qui nous a permis de calculer tous les éléments de la statistique de test $Y_n^2(\hat{\gamma}_n)$.

3 Application la distribution GLE

Le tableau 1 donne les données d'un essai clinique qui a été menée pour évaluer l'efficacité d'une pommade antibiotique anesthésique pour soulager la douleur causée par des plaies superficielles de la peau. En raison de sa flexibilité pour modéliser une variété de données cliniques, la distribution a été utilisée comme un modèle provisoire de la répartition des patients (Dallas R. Wingo (1983)).
0.828-0.881-1.138-0.554-0.653-0.698-0.566-0.665-0.917-0.529-0.786-1.110-0.866-1.037-0.788-0.879-0.829-0.683-0.899-1.050

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2.Al-Khedhairi, A., (2008), Parameters estimation for a linear exponential distribution based on grouped data, International Mathematical Forum, 3, NÂ°33, 1643-1654.
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[Controllability of Fractional Semilinear Differential Systems in Banach Spaces]

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Abstract: [This paper is mainly concerned with the existence of mild solutions for fractional semilinear evolution equations with conditions of order $0 < \alpha < 1$ in Banach spaces E. We obtain sufficient conditions for the controllability results by using semigroup theory and the nonlinear alternative of Leray-Schauder type.]

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Iterative Multistep Reproducing Kernel Hilbert Space Method for Solving Fractional Oscillators

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Abstract: Reproducing kernel theory has important application in numerical analysis, differential equations, integral equations and integro-differential equations. In this study, we present an algorithm of the multistep reproducing kernel Hilbert space method (RKHS) to obtain approximate solutions for linear and nonlinear oscillator fractional differential equations. The fractional derivative is described in the Caputo sense. The method will increase the intervals of convergence for the series solution. Two numerical examples are used to illustrate the preciseness and effectiveness of the proposed method.

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[**Analysis of a frictional problem for thermo-piezo-viscoelastic materials**]

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Abstract: [We consider a mathematical model which describes the quasis-static process of contact between a piezoelectric body and a thermally-electrically conductive foundation. The behavior of the material is modeled with a thermo-electro-viscoelastic constitutive law. The contact is frictional and is modeled with normal compliance and memory term, Coulomb's law of dry friction, and the regularized electrical with thermal conductivity conditions. We present the classical formulation of the problem, list the assumptions on the data and derive a variational formulation of the model. Then we prove the unique weak solvability of the problem. The proof is based on arguments of evolutionary quasivariational inequalities, classical result of nonlinear first order evolution inequalities.]

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[VARIATIONAL ANALYSIS OF A DYNAMIC ELECTROVISCOELASTIC PROBLEM WITH FRICTION]

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Abstract. A dynamic contact problem is studied. The material behavior is modelled with piezoelectric effects for electro-visco-elastic constitutive law. The body may come into contact with a rigide obstacle. Contact is described with the Signorini condition, a version of Coulomb's law of dry friction, and a regularized electrical conductivity condition.We derive a variational formulation of the problem, then, under a smallness assumption on the coefficient of friction, we prove an existence and uniqueness result of a weak solution for the model. The proof is based on arguments of evolutionary variational inequalities and fixed points of operators.
Keywords: Piezoelectric, Frictional contact, Visco-Elastic, Fixed point, Dynamic process, Coulomb's friction law, Variational inequality.

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Existence results for a two point boundary value problem of nonlinear fractional differential equations with nonlocal conditions

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Abstract: This work is concerned with the existence results for a two point BVP of nonlinear fractional differential equations

$$\begin{cases} {}^{c}\mathcal{D}_{0^+}^{q} u(t) = f\big(t, u(t), {}^{c}\mathcal{D}_{0^+}^{\alpha} u(t)\big), \quad t \in I = [0,1], \\ u(0) = 0,\ u'(0) = 0,\ {}^{c}\mathcal{D}_{0^+}^{\beta} u(1) = 0,\ {}^{c}\mathcal{D}_{0^+}^{\sigma} u(1) = g(u(1)), \end{cases}$$

where $0 < \alpha \leq 1 < \beta \leq 2 < \sigma \leq 3 < q \leq 4$, ${}^{c}\mathcal{D}_{0^+}^{q}, {}^{c}\mathcal{D}_{0^+}^{\alpha}, {}^{c}\mathcal{D}_{0^+}^{\sigma}, {}^{c}\mathcal{D}_{0^+}^{\beta}$ are the Caputo fractional derivatives. By means of the Banach fixed-point theorem, Krasnosel'skii's-Guo fixed point theorem and the Schauder fixed-point theorem, we get some existence results about the boundary value problems of fractional differential equations. As applications, some examples are presented to illustrate the main results.

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Existence and Uniqueness Results of Solutions to Nonlinear Degenerate Parabolic Equation

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Abstract: Many problems and models in physics, chemistry, biology and economics are modeled by partial differential equations (PDEs). In this work, we shall give an example of a class of renowned equations, which allow to describe the diffusion phenomena; that is, a parabolic PDE and known as "nonlinear diffusion equation not in divergence form", and is written as:

$$\frac{\partial u}{\partial t} = u^m \frac{\partial^2 u}{\partial x^2},\ m \in (0,1) \cup (1,\infty), \tag{1}$$

where $u = u(x,t)$ is a nonnegative scalar function of space variables $x \in \mathbb{R}$, and time $t > 0$. We investigate the problem of existence and uniqueness of positive solutions of the degenerate parabolic PDE (1) under the generalized self-similar form which is:

$$u(x,t) = c(t)\, f\left(\frac{x}{a(t)}\right),\ x \in \mathbb{R},\ t > 0.$$

The functions $a(t)$ and $c(t)$ depend on time t and the "basic profile" $f > 0$, are not known in advance and are to be identified.

By applying the properties of Banach's fixed point theorems, we establish several results on the existence and uniqueness of the general form of self-similar solutions of this equation.

Also we have found new solutions; the behavior of these solutions depends on some parameters (that satisfy some conditions), which make their existence global or local in a time T, and we generalized the families of self-similar solutions of the porous medium equation, which is formed by the Barenblatt solutions.

References:

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[EDP et cycles limites]

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Abstract: [Dans ce travail, on va donner un critère pour étudier l'existence et le non existence d'un cycle limite. L'outil de base pour cette étude est l'utilisation d'une EDP non linéaire. On va donner des exemples d'illustration pour cette méthode, on donne un système différentiel qui n'admet pas de cycle limite, et un oscillateur qui admet un cycle limite algébrique. Finalement, on donne un système différentiel qui admet un cycle limite non algébrique.]

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The centers and their cyclicity for a class of polynomial differential systems

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Abstract: We classify the global phase portraits in the Poincaré disc of a class of polynomial differential systems which are symmetric with respect to y-axis of coordinates. Moreover using the averaging theory up to third order, we study the cyclicity of the center located at the origin of coordinates, i.e. how many limit cycles can bifurcate from the origin of coordinates of the previous differential system when we perturb it inside the class of all polynomial differential systems of the same degree.

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[GLOBAL DYNAMICS OF AN SVIR MODEL : VERY GENERAL NON LINEAR INCIDENCE, BOTH AGES VACCINATION AND INFECTION.]

[Soufiane BENTOUT]

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Abstract: [In this paper, we study an SVIR infection and vaccination ages model with a general class of nonlinear incidence rates. We show the uniform persistence of the solutions. We demonstrate the global asymptotic stability of the free-equilibrium if the basic reproduction numberR0 is smaller than one. In the end, we demonstrate the global stability of the endemic equilibrium when the basic reproduction number R0 is greater than 1:.]

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[Explicit non-algebraic limit cycles of a family of cubic polynomial systems, using Abel equations.]

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

$$\begin{aligned} x' &= x\left(1-ab\left(mx^2+my^2+nx+ny\right)\right)+(2my+n)\left((by+cx)^2+x^2\right) \\ y' &= y\left(1-ab\left(mx^2+my^2+nx+ny\right)\right)-(2mx+n)\left((by+cx)^2+x^2\right) \end{aligned} \quad (1)$$

where a, b, c, n and m are real constants We prove that these systems are Liouville integrable. Moreover, we determine sufficient conditions for a polynomial differential system to possess an explicit non-algebraic limit cycles. Concrete examples exhibiting the applicability of our result are introduced.

1 Main result

Theorem 1 *Consider polynomial differential system* (**??**). *Then the following statements hold.*
(1) System (**??**) *is Darboux integrable with the Liouvillian first integral*

$$H(x,y)=\exp\left(-\int_0^{\arctan\frac{y}{x}}F(s)\,ds\right)K(x,y)-\int_0^{\arctan\frac{y}{x}}G(s)\exp\left(-\int_0^{s}F(w)\,dw\right)ds$$

where

$$K(x,y)=m\left(x^2+y^2\right)+n\left(x+y\right),$$
$$F(\theta)=\frac{2ab}{\cos 2\theta-b^2\cos 2\theta+c^2\cos 2\theta+b^2+c^2+2bc\sin 2\theta+1},$$
$$G(\theta)=\frac{-2}{\cos 2\theta-b^2\cos 2\theta+c^2\cos 2\theta+b^2+c^2+2bc\sin 2\theta+1}$$

*(2) If $m > 0, n \geq 0$, $ab > 0$ then system (**??**) has an explicit non algebraic limit cycles limit cycle, given in polar coordinates $(r;\theta)$ by*

$$r = -\frac{1}{2m}\left(g(\theta) - \sqrt{(g(\theta))^2 + 4m\rho(\theta, r_*)}\right)$$

where

$$\begin{aligned}
&\rho(\theta, r_*) = h(\theta)\left(mr_*^2 + nr_* + f(\theta)\right), \\
&g(\theta) = n(\cos\theta + \sin\theta), \\
&f(\theta) = \textstyle\int_0^\theta G(s)\exp\left(-\int_0^s F(w)\,dw\right)ds, \\
&h(\theta) = \exp\left(\textstyle\int_0^\theta F(s)\,ds\right)
\end{aligned}$$

and

$$r_* = \frac{-1}{2}\left(\frac{n}{m} - \sqrt{\frac{n^2}{m^2} - \frac{4h(2\pi)f(2\pi)}{m(h(2\pi)-1)}}\right).$$

Moreover, this limit cycle is a unstable hyperbolic limit cycle.

]

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[**Existence of multiple positive solutions of nonlinear Hadamard fractional differential equations with integral boundary conditions**]

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Abstract: [In this paper, we study the existence of positive solutions for Hadamard fractional differential equations with integral conditions. We employ Avery-Peterson fixed-point theorem and properties of Green's function to show the existence of positive solutions of our problem. At the same time, we present an example to illustrate our main result.]

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Solvability for a coupled system of partial differential equations with nonlocal conditions

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Abstract: In the present work, we consider a boundary value problem for a system of coupled partial differential equations subject to nonlocal types integral conditions.We are interested in finding a solution to the mentioned system. To this end, we reduce the system to an equivalent abstract generalized Cauchy problem. Then the existence and uniqueness of a solution to the last problem is proved using the theory of semigroups with singulatities in L_p $(1 \leq p < \infty)$ spaces. Note that a similar problem was treated in the case of local boundary conditions in [1].

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[Sur un système non linéaire d'EDP en convection libre]

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Abstract:
Dans l'étude des phènoménes de convection libre crées par une plaque chauffée et plangée dans un milieu poreux saturé d'un feluide, on est amené à considérer un système d'EDP dans $\mathbb{R}^+ \times \mathbb{R}^+$, qui nous amène à étudier dans $\mathbb{R}^+ \times \mathbb{R}^+$ le (nouveau) système d'EDP:

$$\Delta u = K.\nabla T \quad Dans \quad \Omega \tag{1}$$
$$\lambda\Delta T = \nabla T.(\nabla\Psi)^{\perp} \quad Dans \quad \Omega \tag{2}$$
$$\tag{3}$$

Avec les conditions sur le bords de Ω, pour Ψ

$$\Psi = 0 sur \Gamma_1 \quad et \quad \frac{\partial\Psi}{\partial v} = 0 \quad sur \quad \Gamma_2 \tag{4}$$

et pour T

$$T = T_0 \quad sur \quad \Gamma. \tag{5}$$

où $K = (k_1, k_2) \in L^\infty(\Omega) \times L^\infty(\Omega)$ et $(\nabla\Psi)^\perp = (\partial_y\Psi, \partial_x\Psi)$ et Ω un domaine borné de $\mathbb{R}^2$ avec une frontière suffisamment régulière Γ et Γ_1, Γ_2 sont deux parties de Γ tel que: $mes\Gamma_1 \neq 0, \overline{\Gamma_1} \cup \overline{\Gamma_2} = \Gamma, \Gamma_1 \cap \Gamma_2 = \emptyset$. Dans ce exposer on va voir que le système (1)-(5) admet une unique solution faible.

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[Uniform decay of memory type thermoviscoelastic with a nonlinear source]

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Abstract: In this paper, we are concerned with the energy decay rate of the following thermoviscoelastic problem

$$\begin{cases} u_{tt} - k_0 \triangle u(t) - (\mu+\lambda)\nabla(divu) + \int_0^t g(t-s)\Delta u(s)\,ds + bu_t + \beta\nabla\theta = u|u|^{p-2}, & \\ & \text{in } \Omega\times(0,\infty) \\ c\theta_t - \triangle\theta + \beta divu_t = 0, & \text{in } \Omega\times(0,\infty) \\ k_0\dfrac{\partial u}{\partial\nu} + (\mu+\lambda)\,divu.\nu - \int_0^t g(t-s)(\nabla u(s)).\nu\,ds + h(u_t) = 0, & \text{on } \Gamma_1\times(0,\infty) \\ u(x,0)=u_0,\ u_t(x,0)=u_1,\ \theta(x,0)=\theta_0, & x\in\Omega \\ u=0, & \text{in } \Gamma_0\times(0,\infty) \\ \theta=0, & \text{on } \Gamma\times(0,\infty), \end{cases}$$

where $k_0, \beta, c, \mu, \lambda,\ b$ are positive constants, where μ, λ are lame moduli, $p > 2$ and Ω is a bounded domain in $\mathbb{R}^n$ $(n \geq 1)$ with a smooth boundary Γ, such that $\{\Gamma_0 \cup \Gamma_1\}$ is a partition of Γ, with meas $(\Gamma_1) > 0$, ν is the outward normal to Γ, $u = u(x,t) \in \mathbb{R}^n$ is the displacement vector, and $\theta = \theta(x,t)$ is the difference temperature. The relaxation function g is a positive and uniformly decaying function, h is a function satisfying some conditions, under appropriate assumptions imposed on relaxation function and with certain initial data, we establish the general decay rate of the solution energy, which the usual exponential and polynomial decay are only special cases.

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An efficient primal-dual interior point methods for linear programming based on a new parameterized kernel function with an exponential barrier term

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Abstract: The kernel functions play an important role in the amelioration of the computational complexity of algorithms. In this paper, we propose a primal-dual interior point methods to solve the problems of linear programming LP. This method is based on a new Newton's direction class and a new proximity measure introduced by a new kernel function. Our function is on the one hand parameterized by a positif real, on the other hand it has an exponential barrier term and it gives the best known iteration bounds for large-update primal-dual interior-point algorithms. The obtained complexity result for small-update methods is the same as that for large-update methods. This result is the first to reach this goal. This study is followed by numerical implementation of this algorithm on problems of LP.

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Boundary problems for thermo-elastic and thermo-elasto-viscoplastic bodies

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Abstract: We consider two boundary problems, the first is for an elastic body with heat exchange, the second is for an elasto-viscoplastic body with heat exchange. The contact is frictional and bilateral.For each one we establish a variational formulation for the model and we prove the existence of a unique weak solution to the problem. The proof is based on a classical existence and uniquness result on parabolic in´equalities, differentiel equations and fixed point argument.

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On a class of Kolmogorov systems

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Abstract: Many mathematical models in biology science and population dynamics, frequently involve the systems of ordinary differential equations having the form

$$x' = \frac{dx}{dt} = x(t)\, F(x(t), y(t)) \text{ and } y' = \frac{dy}{dt} = y(t)\, G(x(t), y(t)), \tag{1}$$

where F , G are two functions in the variables x and y, $x(t)$ and $y(t)$ represent the population density of two species at time t, and $F(x, y)$, $G(x, y)$ are the capita growth rate of each specie, usually, such systems are called Kolmogorov systems. System (1) is integrable on an open set Ω of $\mathbb{R}^2$ if there exists a non constant C^1 function $H : \Omega \to \mathbb{R}$, called a first integral of the system on Ω , which is constant on the trajectories of the system (1) contained in Ω, i.e. if

$$\frac{dH(x, y)}{dt} = \frac{\partial H(x, y)}{\partial x} xF(x, y) + \frac{\partial H(x, y)}{\partial y} yG(x, y) \equiv 0 \text{ in the points of } \Omega.$$

In this work we introduce an explicit expression of invariant algebraic curves, then we proved that these systems are integrable and introduced an explicit expression of a first integral.

2010 Mathematics Subject Classification. 34C05, 34C07
Key words : EDP, Kolmogorov System, First Integral.

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Existence des solutions positive d'un problème aux limites

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Abstract: Dans ce travail on va étudier l'existence des solutions positive du problème aux limites avec le système de *lamé* suivant : Soit Ω un domaine borne dans IR^N de frontière $\partial\Omega$ tel que $\partial\Omega = \overline{\Gamma} \cup \overline{\Sigma}$ avec $\dim \Gamma = \dim \Sigma = N-1$, $mes\Sigma > 0$, $mes\Gamma > 0$ et $\Gamma \cap \Sigma = \Phi$;

$$(p) \begin{cases} Trouver\ u \in W_{\Gamma}^{1,p}(\Omega)\ \ solution\ de : \\ -\mu\Delta_p u - (\mu+\alpha)\nabla(Divu) = \lambda |u|^{q-2} u + u \quad dans\ \Omega \\ u = 0 \quad sur\Gamma \\ \dfrac{\partial u}{\partial \nu} = 0 \quad sur\Sigma \end{cases}$$

μ, λ et α sont des constantes réels. Dans le cas ou $\mu = 1$ et $(\mu+\alpha) = 0$ le problème à été traiter par C.O.Alves et A. El Hamidi $c.f$ [1]. On a démontrer l'existence de deux solutions positive du problème (p) avec l'utilisation des suites minimisantes et l'espace de *Nahari manifold* N_{I_λ},tel que $N_{I_\lambda} = \left\{ v \in W_{\Gamma}^{1,p}(\Omega), / I'_\lambda(v)(v) = 0 \right\}$ ou I_λ est la fonction d'*Euler* associe au problème (p) .

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[*On the solution of the optimal thinning and rotation problem in Forestry Management*]

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Abstract: [**Study of the Dynamical system of a optimal control problem:**
On the solution of the optimal thinning and rotation problem in Forestry Management.
The aim of this study is to use in a step by step manner the Dynamics programming methode to obtain a rigorous solution of the optimal control problem considered in "W. Clark and John D. De Pree". In fact; the partial solution descibed by authors is not obtained by a general procedure but also "justified" in a rigorous theoretical settibg of a suitable concepts and results.
The optimal control problem in W. Clark and John D. De Pree in a rather vague formulation is stated as follows:
Problem: Given $\delta, T > 0$ and $T > t_0 \geq 0$, find:

$$\sup_{u(.)} C\left(s, y; u\left(.\right)\right) .. \left(\forall\right) \left(s, y\right) \in E_0$$
$$C\left(s, y; u\left(.\right)\right) := x\left(T\right).K\left(T\right).e^{-\delta T} + \int_{t_0}^{T} e^{-\delta t} R\left(t\right) u\left(t\right) dt$$

Subject to:

$$\begin{gathered} x' = g\left(t\right).h\left(x\right) - u\left(t\right), x\left(t_0\right) = x_0, t \in [t_0, T] \\ u\left(t\right) \in U\left(t, x\right) := [0, +\infty)..a.p.t([t_0, T]) \\ \left(t, x\left(t\right)\right) \in E_0 := [t_0, T) \times \mathbb{R}_+^*, \left(T, x\left(T\right)\right) \in E_1 := \{T\} \times \mathbb{R}_+^* \\ g\left(t\right), h\left(x\right) \geqslant 0, g'\left(t\right) < 0 \ \left(\forall\right) t \in [t_0, T], x \succ 0 \\ K\left(T\right) \succ R\left(T\right). \end{gathered}$$

In a study of this problem we are to consider the particular case known in the literature under the name Kilkki-vaisanen model which described by:

$$g\left(t\right) = a.t^{-b}, h\left(x\right) = x.e^{-cx}, a, b, c \geq 0$$

In fact, the study in original paper concerns the "study in the "local behavior" of trajectories of a non smooth (in aur case stratified) hamiltonan system, around points situated on certain types of discontinuity surfaces.
Besides the fact that the Hamiltonian system it is not rigorously defined on the discountinuity surfaces, one may note also that in this approach there are neither clear criteria for choosing the "optimal trajectories" nor suitable "verification theorems" proving the optimality of the chosen trajectories, since the use of the theory of viscosity solutions it is not quite justifiedin this case (the fact that the value function is a viscosity solution it is proved only for fixed time-interval non-autonomous).]

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Théorèmes des Inéquations d'évolutions et ses applications

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Abstract: La modélisation mathématiques de plusieurs problèmes mécaniques conduits aux inégalités d'évolutions d'ordre un ou deux dans le cas de processus quasistatique ou dynamique. Nous considérons un problème thermodynamique d'un corps élasto-visco-plastique de contact sans frottement avec compliance normale. Nous écrivons le problème mécanique et nous précisons des hypothèses adéquates sur les données afin d'obtenir la formulation variationnelle. Ensuite nous établissons notre résultat d'existence et d'unicité de la solution faible. La démonstration est basée sur un théorème d'existence et d'unicité de la solution des équations d'évolutions du premier ordre linéaires et non linéaires suivis d'un argument de point fixe. Ainsi nous montrons la dépendance continue de la solution par rapport aux données.

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[Elliptic operators with unbounded diffusion, drift and potential terms]

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Abstract: [We prove that the realization A_p in $L^p(\mathbb{R}^N)$, $1 < p < \infty$, of the elliptic operator $A = (1+|x|^\alpha)\Delta + b|x|^{\alpha-1}\frac{x}{|x|}\cdot\nabla - c|x|^\beta$ with domain $D(A_p) = \{u \in W^{2,p}(\mathbb{R}^N) \mid Au \in L^p(\mathbb{R}^N)\}$ generates a strongly continuous analytic semigroup $T(\cdot)$ provided that $\alpha > 2$, $\beta > \alpha - 2$ and any constants $b \in \mathbb{R}$ and $c > 0$. Moreover we show that $T(\cdot)$ is consistent, immediately compact and ultracontractive.
Joint work with F. Gregorio, A. Rhandi and C. Tacelli.]

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Etude variationnelle d'un problème pseudoplastique

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Abstract: In this paper, we are interested to study the problem of the flow of a pseudoplastic fluid, whose the viscosity decreases as the stress increases, with mixed boundary conditions and the friction law of subdifferential type. In the rst step, we formulate the mechanical problem then we give the variational problem which consists of a variational inequality for the velocity eld. We prove the existence of a weak solution as well as results of a continuous dependence. Finally, we describe a number concrete friction conditions.

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[An integrable quintic and planar polynomial differential system with two explicit non-algebraic limit cycles]

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Abstract: [We introduce a three parameters quintic planar differential system and after adequate regular transformations, we show that it is equivalent to a Riccati equation. This equation is shown to be integrable. Then via the Poincaré return-map, we show that the system admits exactly two non-algebraic limit cycles. Moreover, these limit cycles are given in an explicit way. As far as we know, this result has no analogeous in the litterature.
2010 Mathematics Subject Classification: 34C29, 34C25.
Key Words: Non-algebraic limit cycle; Invariant curve; Poincaré return-map; First integral; Riccati equation.]

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ANALYSIS OF QUASISTATIC VISCOELASTIC-VISCOPLASTIC PIEZOELECTRIC CONTACT PROBLEM WITH FRICTION AND ADHESION

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Abstract:

Ce travail est consacré à l'étude d'un problème de contact avec frottement et a adhésion entre un corps de loi constitutive électro-viscoélastique-viscoplastique et une fondation rigide. Les conditions aux limites de contact sont modélisées par *une loi non locale de frottement avec adhésion* .

Nous présentons tout d'abord le problème physique. De là, nous dérivons une formulation faible en termes de déplacements et de potentiel électrique. Pour cette formulation, nous donnons un résultat d'existence et d'unicité de la solution dite faible, dont la démonstration est basée sur des techniques des inéquations variationnelles elliptiques et de point fixe.

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Application des équations aux dérivées partielles en médecine pour des données censurées

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Abstract: Dans ce travail, nous nous proposons une application des EDP en médecine pour un modèle à risques de défaillance concurrents, introduit par Bertholon et qui peut décrire aussi bien les pannes accidentelles que les pannes dues au vieillissement; particulièrement pour des paramètres inconnus. Si de plus, les données sont censurées, ce qui est le cas dans les études d'analyse de survie et de fiabilité.
Pour calculer les estimateurs de maximum de vraisemblance des paramètres inconnus, et vu la complexité des équations, Bertholon a utilisé l'algorithme EM en considérant le modèle comme un modèle à données manquantes.On peut aussi utiliser les méthodes numériques telles que la méthode de Newton-Raphson, le logiciel BB, pour résoudre le système d'équations et déduire les estimateurs du maximum de vraisemblance des paramètres.
Une importante application à des données réelles ont été réalisées pour montrer la maniabilité du méthode proposé pour un modèle très important des risques concurrents.
Mots clés
Algorithme EM, Maximum de vraisemblance, Modèle à risques de concurrents, Méthode de Newton-Raphson.
Références

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Existence and uniqueness of weak solutions for a class of an antiplane contact problem with friction: Case elentro-elastic material

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Abstract: Purpose: In this work, we describe the classical formulation for the antiplane problem and we give the corresponding variational formulation which is given by a system coupling an evolutionary variational equality for the displacement field and a time-dependent variational equation for the electric potential field. Then we prove the existence of a unique weak solution to the model.

Key-Words: Antiplane problem; electro-elastic law; weak solution; variational inequality.

Subject 'Authors Classification): 74M10, 74F15, 74G25, 49J40.

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Existence and uniqueness of solutions for BVP of nonlinear fractional differential equations

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Abstract: In this work,we study the existence and uniqueness of solutions for fractional differential equations involving the Caputo fractional derivative. Our results are based on standard tools of fixed point theory (Banach fixed point theorem, Schefer's fixed point theorem, Krasnoselskii's fixed point theorem).

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[Système de files d'attente M/G/1 avec rappels et priorité, orbite FCFS]

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Résumé : [On considère un système de file d'attente avec rappels et un seul serveur où les clients primaires arrivent dans le système selon un processus de Poisson de taux $\lambda > 0$: À l'arrivée d'un client si le serveur est libre, il entre immédiatement en service, sinon il décide d'entrer en orbite avec une probabilité p ou de rejoindre la file d'attente (d'une capacité infinie) avec une probabilité (1- p) : On suppose que seulement le client en tête de l'orbite est autorisé à accéder au serveur.
A cet effet, la chaîne de Markov induite est décrite, la condition d'ergodicité est établie à l'aide du critère de Foster et de la condition de Kaplan, la distribution stationnaire de l'état du système est obtenue en appliquant la méthode des variables supplémentaires ainsi que les mesures de performance sont déduites. Enfin, le comportement asymptotique du nombre de clients en orbite et celui dans le système a été étudié.

A cet effet, les lois de probabilité du nombre de clients en orbite dans le cas d'un régime chargé et dans le cas d'un taux de rappels faible ont été établies. Enfin, le comportement asymptotique du nombre de clients dans le système a été étudié. Nos investigations théoriques sont appuyées par des illustrations numériques.]

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Asymptotic behavior of the solution of linear elasticity problem in a thin domain with nonlinear source and dissipative terms

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Abstract: In this paper we study the asymptotic behavior of linear elasticity problem with nonlinear source and dissipative terms in a three-dimensional thin domain Ω^{ε}. When the thickness ε of the domain tends towards zero, we proved that the solution of the three-dimensional problem with nonlinear friction of Tresca type, converges to a limit characterized by a two-dimensional problem with the limit of Tresca free boundary conditions. We also obtain the specific Reynolds limit equation.

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Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

EXISTENCE AND UNIQUENESS OF SOLUTION FOR A NONLINEAR FRACTIONAL ELLIPTIC SYSTEM

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Abstract: Fractional differential equations (FDEs) are for many researchers the generalization of partial differential equations (PDEs). More exactly, they are the limit cases of the PDEs because of their non-local property.
This work is devoted to the study of the existence and uniqueness of a weak solutions for the nonlinear fractional elliptic system

$$\begin{cases} -\Delta^s u(x) = f(x, u(x), v(x)) & \text{in} \quad \Omega, \\ -\Delta^s v(x) = g(x, u(x), v(x)) & \text{in} \quad \Omega, \\ u = v = 0 & \text{on} \quad \mathbb{R}^n \setminus \Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^n$ be a bounded open set with Lipschitz boundary, $s \in (0, 1)$ and $f, g : \Omega \times \mathbb{R} \times \mathbb{R}^n \to \mathbb{R}$ two continuous functions satisfying the Caratheodory conditions and verifying also the growth restriction. We assume that f and g are Lipschitz continuous functions with respect to the second variable. In this work we give an application of the Banach and the Schauder fixed point theorems to prove the existence of a weak solution to our system.
As far as we know, this result is new and represent a fractional version of a classical theorem obtained working with Laplacian equations.

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[A DYNAMIC BILATERAL CONTACT PROBLEM FOR PIEZOELECTRIC MATERIALS WITH TRESCAS FRICTION]

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Abstract: [We consider a dynamic contact problem between two electro-viscoelastic bodies with damage. The contact is bilateral and is modeled with Trescas friction law. The damage of the materials caused by elastic deformations. We derive a variational formulation for the model which is in the form of a system involving the displacement field, the electric potential field, and the damage field. Then we provide the existence of a unique weak solution to the model. The proofs are based on the classical result of nonlinear first order evolution inequalities, the equations with monotone operators and the fixed point arguments.]

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

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

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Abstract: [This paper deals with the solvability of a higher dimension mixed non local problem for a Boussinesq equation non linear. Galerkinís method was the main used tool for proving the solvability of the given non local problem.]

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On the decay rates of Von Kármán System with Second Sound

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Abstract: The study of dynamic nonlinear elasticity systems described by von Kármán's equations, one of the fundamental model of mathematical physics. Their importance stems from the fact that many physical phenomena related to the theory of oscillation are described by dynamic elastic models. The propagation of waves, oscillations and vibrations of membranes, plates and shells, are governed by nonlinear elastic systems involving wave and plate equations or combination thereof. Unlike other basic models, such as: the Euler-Bernoulli model, the Rayleigh model or the Timoshenko model, the full von Kármán's model is appropriate when taking into account transversal displacements as well as longitudinal displacements for vibrating slender bodies with large deflection.

In our work, we consider a one-dimensional full von Kármán system coupled to a heat equation modeling an expected effect of dissipation by the heat conduction governed by the law of Cattaneo.

We prove the existence and uniqueness of solution using the semigroup theory for that we prove that the operator $\mathbb{A}$ is dissipative, we point out that it is not difficult to prove that 0 in the resolvent of $\mathbb{A}$. Therefore, from the Lumer–Phillips theorem we conclude that $\mathbb{A}$ is the generator of a strongly continuous semigroup. For the stability result, an idea is to construct a Lyapunov functional equivalent to the energy of the problem. A careful choice of multipliers and the sequence of estimates in the energy method will give the result.

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Numerical solution of general Volterra nth-order integro-differential equations via Variational iteration method

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Abstract: In this paper, we extend the applications of the variational iteration method (VIM) to find approximate solutions for the general nth-order integro-differential equations. The variational iteration method which proposed, is effectively and easily used to solve some classes of linear and nonlinear Volterra integro-differential equations. Finally, some numerical examples with exact solution are given.
keyword: Volterra's Integro-Differential Equation, equations, Integro-differential equations, Variational iteration method (VIM), RHFs.
AMS: 65R20, 33D45, 45D05, 45F05

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Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18),
25 et 26 Novembre 2018

[Solvability of a supercritical free surface flow problem under gravity-capillarity]

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Abstract: [Dans ce travail, nous nous sommes intéressées à l'étude d'un écoulement bidimensionnel à frontière libre, stationnaire et irrotationnel, d'un fluide parfait et incompressible, perturbé par un obstacle placé au fond d'un canal. L'accélération de la pesanteur ainsi que les effets de tension superficielle sont pris en considération. Dans ce problème, il y a une double non linéarité: la présence d'une frontière libre, sur laquelle est posée une condition non linéaire, qui est la condition dynamique d'équilibre des pressions, appelée condition de Bernoulli. Nous adimensionnons le problème puis nous le linéarisons en considérant un obstacle de faible hauteur. Le problème linéaire obtenu est défini dans le rectangle $\Omega = \mathbb{R}\times]0\,,\,1[$; La forme bilinéaire de la formulation variationnelle associée au problème linéaire est non coercive sur $H^1(\Omega)$, nous déterminons alors des propriétés a priori de la solution, qui vont nous permettre de construire un sous espace de $H^1(\Omega)$ où la coercivité de la forme bilinéaire est rétablie.]

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[Nonlinear internal stabilization of the wave equation with a nonlinear delay term in the internal feedback]

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Abstract: [It is well known that certain infinite-dimensional second-order systems are not robust with respect to arbitrarily small time delays in the damping (Datko et al (1986), Datko (1988)). Xu et al (2006) established sufficient conditions ensuring the stability of the one dimensional wave equation with a constant time delay term in the boundary feedback controller using spectral methods. This result have been extended to the multidimensional wave equation with a delay term in the boundary or internal feedbacks by Nicaise and Pignotti (2006). A similar result was obtained by Nicaise and Rebiai (2011) for the Schrödinger equation with a delay term in the boundary or internal feedbacks.
Our aim in this paper is to study the stability problem for the multidimensional wave equation with a delay term in the nonlinear internal damping. In absence of delay, this problem has been considered by several authors, see for example Liu and Zuazua (1999).]

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

Theoreme de Floquet et ses applications

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Abstract: Les équations diffrentielles linaires à coefficients périodiques apparaissent notamment dans la linéarisation autour de solutions périodiques d'équations non-linéaires, et jouent un rôle important dans la stabilité de ces solutions périodiques. En dimension finie elles se ramènent dans une certaine mesure aux équations à coefficients constants, via la théorie de Floquet.

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

Positive solutions of qualitative boundary value problem of fractional differential equation

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Abstract: We consider a class of singular fractional order functional differential equations with delay. Using fixed point theorem on cones, sufficient conditions are established for the existence of positive solutions for the qualitative boundary value problem. Is to interpret we give examples to clear up the main results. In this work, we study the existence of positive solutions to the following problems: Multi-point non-linear limit value problem with delay.

$$\begin{cases} D_{0+}^{\alpha}u(t) + r(t)f(u_t) = 0 & 0 < t < 1, \\ u(t) = \phi(t) & -\tau \leq t \ \leq 0 \\ u(0) = u^{'}(0) = 0 & u'(1) = \beta u(\eta) \quad 0 \leq \eta \leq 1, \quad 0 \leq \beta \leq \frac{1}{\eta^{\alpha-2}}. \end{cases} \tag{1}$$

where D_{0+}^{α} is the Riemann-Liouville operator of order $2 < \alpha \leq 3$ and $\phi(t) \in C([-\tau, 0], [0, +\infty))$, $\phi(0) = 0, u_t(\theta) = u(t + \theta), t \in [0, 1], \theta \in [-\tau, 0]$ and τ is the dely$(0 \leq \tau < \frac{1}{2})$fixed.

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[Asymptotic behaviour of nonlinear wave equations in a noncylindrical domain becoming unbounded]

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Abstract: [We study the asymptotic behaviour for the solution of nonlinear wave equations in a noncylindrical domain, becoming unbounded in some directions, as the time t goes to infinity. If the limit of the source term is independent of these directions and t, the wave converges to the solution of an elliptic problem defined on a lower dimensional domain. The rate of convergence depends on the limit behaviour of the source term and on the coefficient of the nonlinear term.]

Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

A contact problem between electro-thermo-elastic bodies with damage, adhesion

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Abstract: We study of a friction contact problem between two thermoelastic piezoelectric bodies with damage, adhesion and normal compliance. The evolution of the damage is described by an inclusion of parabolic type. The contact is modelled with a version of normal compliance condition and the associated Coulomb's law of friction in which the adhesion of contact surfaces is taken into account. We establish a variational formulation for the model and we prove the existence of a unique weak solution to the problem.

1 Introduction

Situations of contact between deformable bodies are very common in the industry and everyday life. Contact of braking pads with wheels, tires with roads, pistons with skirts or the complex metal forming processes are just a few examples. The constitutive laws with internal variables has been used in various publications in order to model the effect of internal variables in the behavior of real bodies like metal and rocks polymers. Some of the internal state variables considered by many authors are the spatial display of dislocation, the work-hardening of materials, the absolute temperature and the damage field. See for examples [1, 5, 6, 7] for the case of adhesion field or the damage field which is denoted in this paper by α^ℓ. The damage is an extremely important topic in engineering, since it affects directly the useful life of the designed structure or component. There exists a very large engineering literature on it. Models taking into account the influence of the internal damage of the material on the contact process have been investigated mathematically. General novel models for damage were derived in [3] from the virtual power principle. The new idea of [4] was the introduction of the *damage function* $\alpha^\ell = \alpha^\ell(x,t)$, which is the ratio between the elastic moduli of the damage and damage-free materials. In an isotropic and homogeneous elastic material, let E_Y^ℓ be the Young modulus of the original material and E_{eff}^ℓ be the current modulus, then the damage function is defined by

$$\alpha^\ell = \alpha^\ell(x,t) = \frac{E_{eff}^\ell}{E_Y^\ell}.$$

Clearly, it follows from this definition that the damage function α^ℓ is restricted to have values between zero and one. When $\alpha^\ell = 1$, there is no damage in the material, when $\alpha^\ell = 0$, the material is completely damaged, when $0 < \alpha^\ell < 1$ there is partial damage and the system has a reduced load carrying capacity. Contact problems with damage have been investigated in [3]. In this paper the inclusion used for the evolution of the damage field is

$$\dot{\alpha}^\ell - \kappa^\ell \Delta \alpha^\ell + \partial \psi_{K^\ell}(\alpha^\ell) \ni \phi^\ell\big(\boldsymbol{\sigma}^\ell - \mathcal{A}^\ell \boldsymbol{\varepsilon}(\dot{\boldsymbol{u}}^\ell), \boldsymbol{\varepsilon}(\boldsymbol{u}^\ell), \theta^\ell(s), \alpha^\ell\big), \tag{1}$$

where K^ℓ denotes the set of admissible damage functions defined by

$$K^\ell = \{\xi \in H^1(\Omega^\ell);\ 0 \le \xi \le 1, \text{ a.e. in } \Omega^\ell\}, \tag{2}$$

κ^ℓ is a positive coefficient, $\partial \psi_{K^\ell}$ represents the subdifferential of the indicator function of the set K^ℓ and ϕ^ℓ is a given constitutive function which describes the sources of the damage in the system.

The aim of this paper is to study the quasistatic evolution of damage in thermo-electroelastic materials. For this, we use an thermo-electroelastic constitutive law with long-term memory and damage given by

$$\boldsymbol{\sigma}^\ell = \mathcal{A}^\ell\big(\boldsymbol{\varepsilon}(\boldsymbol{u}^\ell), \theta^\ell, \alpha^\ell\big) + \int_0^t \mathcal{Q}^\ell\big(t-s, \varepsilon(\boldsymbol{u}^\ell(s)), \theta^\ell(s), \alpha^\ell(s)\big)\, ds - (\mathcal{E}^\ell)^* E^\ell(\varphi^\ell), \tag{3}$$

where $\boldsymbol{u}^\ell$ the displacement field, $\boldsymbol{\sigma}^\ell$ and $\boldsymbol{\varepsilon}(\boldsymbol{u}^\ell)$ represent the stress and the linearized strain tensor, respectively, θ^ℓ represents the absolute temperature and α^ℓ represents the damage field. Here $\mathcal{Q}^\ell$ is the relaxation operator, and $\mathcal{A}^\ell$ represents the thermo-elasticity operator with damage. $E(\varphi^\ell) = -\nabla \varphi^\ell$ is the electric field, $\mathcal{E}^\ell$ represents the third order piezoelectric tensor, $(\mathcal{E}^\ell)^*$ is its transposition.

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Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[Kernel function based interior-point methods for horizontal linear complementarity problems]

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Abstract: [It is well known that each kernel function defines an interior-point algorithm.In our work we propose new class of kernel function with trigonometric barrier term for $P*(\kappa)$-horizontal linear complementarity problems(HLCP). New search directions and proximity measures are defined by these kernel functions. We obtain so far the best known complexity results for large- and small-update methods.]

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Boundedness of non regular pseudodifferential operators on variable Besov spaces

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Abstract: We study the boundedness of non regular pseudodifferential operators, with symbols belonging to certain vector-valued Besov space, on Besov spaces with variable smoothness and integrabilty. These symbols include the classical Hörmander classes.

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[Mise en évidence Numérique de l'instabilité Rayleigh Bénard]

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Abstract: [L'instabilité de Rayleigh bénard dans les fluides non newtoniens (fluide à seuil et rhéofluidifiant) sera étudiée par méthode numérique en 2D. Le point de départ de l'analyse sont les équations de Navier-Stokes incompressible et l'équation d'énergie thermique sur laquelle L'approximation de Boussinesq est appliquée. L'utilisation de l'analyse de stabilité linéaire est une condition pour la stabilité est obtenue en fonction d'un paramètre non dimensionnelle, appelé le nombre de Rayleigh, pour un nombre d'onde donné k. Les résultats numérique seront comparés a nos résultats expérimentaux approuvés précédemment.]

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[Diferential system and Limit Cycles]

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Abstract: [We consider two-dimensional polynomial di erential system, we show that the system admits invariant algebraic curves and we provide su cient conditions for the existence of algebraic limit cycles. Concrete examples exhibiting the applicability of our result are introduced.]

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Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[Existence of Solutions for Nonlinear Elliptic (p(x)-q(x))-Laplacian Systems]

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Abstract: [In this paper, we are concerned with the existence of nontrivial weak solutions for nonlinear elliptic systems of the form:

$$\begin{cases} -\Delta_{p(x)}u - \Delta_{q(x)}u = h(x,u) - f_1(x,u,v) & \text{in } \Omega \\ -\Delta_{p(x)}v - \Delta_{q(x)}v = g(x,v) \ - f_2(x,u,v) & \text{in } \Omega \\ u = v = 0 & \text{on } \partial\Omega \end{cases} \qquad (P)$$

where Ω is bounded domain $\mathbb{R}^N$ $(N \geq 3)$, $p(x)$ et $q(x)$ are continuous functions with $1 < p(x), q(x) < \infty$, far all $x \in \overline{\Omega}$, $h, g \in C^1\left(\overline{\Omega} \times \mathbb{R}\right)$, and $f_1, f_2 \in C^1\left(\overline{\Omega} \times \mathbb{R}^2\right)$ are Caratheodory functions.
We define the operators $L, F, G : Z = W_0^{1,p(x)}(\Omega) \times W_0^{1,q(x)}(\Omega) \to Z^*$, by

$$\langle L(u,v),(\varphi,\psi)\rangle = \int_\Omega |\nabla u|^{p(x)-2} \nabla u \nabla \varphi dx + \int_\Omega |\nabla u|^{q(x)-2} \nabla u \nabla \varphi dx +$$

$$\int_\Omega |\nabla v|^{p(x)-2} \nabla v \nabla \psi dx + \int_\Omega |\nabla v|^{q(x)-2} \nabla v \nabla \psi dx,$$

$$\langle F(u,v),(\varphi,\psi)\rangle = \int_\Omega f_1(x,u,v)\varphi dx + \int_\Omega f_2(x,u,v)\psi dx,$$

$$\langle K(u,v),(\varphi,\psi)\rangle = \int_\Omega h(x,u)\ \varphi dx + \int_\Omega g(x,v)\ \psi dx, \text{ pour tout } (\varphi,\psi) \in Z.$$

put

$$T(u,v) := (L - K + F)(u,v), \quad \forall (u,v) \in Z.$$

Note that if $T(u,v) = 0$ then (u,v) is a weak solution for the system (P). A topological approach consisting to specify some mixed and monotonic growth conditions on nonlinearities is used. otherwise, we used the Leray-Lions theorem for the operator T in order to prove the existence results.]

Université Ferhat Abbas de Sétif 1
Laboratoire de Mathématiques Fondamentales et Numériques

Modification de l'Algorithme de Karmarkar pour la Programmation Non Linéaire (PNL)

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Résumé: Depuis les années 80, le monde de l'optimisation continue a connu une vraie concurrence entre les chercheurs dans ce domaine, et ce grâce à l'apparition de L'algorithme de Karmarkar comme un vrai concurrent de la méthode du simplexe pour la résolution des programmes linéaires. Mais malheureusement peu de tentatives de l'extension de ce dernier à la programmation non linéaire, notre travail présente une extension de l'algorithme de Karmakar pour la programmation quadratique convexe basé essentiellement sur les travaux de Ye-Tse et élargie au cas où la fonction objectif est inconnue .

Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[Variational analysis of quasistatic viscoplastic contact problems with friction]

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Abstract: [The aim of this paper is the study of a quasistatic problem of the contact with normal compliance and Coulomb Friction taking into consideration a thermic effect. Here, we consider non linear constitutive law for thermo-viscoelastic materials with longue memory. For this problem, we find its variational formulation followed by results of existence and uniqueness of weak solutions.
Key words: Thermo-viscoelastic, longue memory, Coulomb friction, quasistatic process, monotone operator, weak solution, fixed point.]

Deuxième Workshop sur les Equations aux Dérivées Partielles

Non Linéaires et Applications (WEDP18), 25 et 26 Novembre 2018

[**Asymptotic study of a frictionless contact problem between** two elastic bodies]

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Abstract: [We consider a mathematical model which describes the bilateral, frictionless contact between two elastic bodies. We will establish a variational formulation for the problem and prove the existence and uniqueness of the weak solution. We then study the asymptotic behavior when one dimension of the domain tends to zero. In which case, the uniqueness result of the solution for the limit problem are also proved. The travil of this paper is to study the asymptotic behavior of a boundary value problem in a three dimensional thin domain with non linear friction of Tresca type. The novelty here consist in the fact that we study the contact between two bodies and we assume that on the common part of the boundary there is no separation between the bodies during the process, that is, the contact is bilateral. The use of the small change of variable z posed in the domain transforms the initial problem into a new problem posed on a fixed domain independent of the parameter. We prove some estimates on the displacement independent of the small parameter domain,The passage to the limit problem by the asymptotic analysis, permits us to obtain all the properties of our original problem.]

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[Approximate Solution of High-Order Integro-Differential Equations using Radial Basis Functions]

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Abstract: The present work is motivated by the desire to apply radial basis functions to find numerical solutions to nonlinear high-order Volterra integro-differential equations of the form

$$u^{(m)}(x) = g(x) + \int_0^x K(x,t)\,\psi(u(t))\,dt, \quad 0 < x < b, \tag{1}$$

with the boundary conditions

$$u^{(j)}(0) = \alpha_j, \quad j = 0, 1, ..., r-1, \tag{2}$$
$$u^{(j)}(b) = \beta_j, \quad j = r, r+1, ..., m-1. \tag{3}$$

where $u^{(m)}(x)$ indicates the m-th order derivative of $u(x)$, the kernel $K(x,t)$ and $g(x)$ are given functions, $\psi(u(t))$ is a nonlinear function. $u(x)$ and $g(x)$ are assumed real and as many times differentiable as required for x $\in [0,b]$ and α_j, $0 \leq j \leq (r-1)$ and β_j, $r \leq j \leq (m-1)$ are real finite constants. This method is based on interpolating by radial basis functions, using Legendre-Gauss-Lobatto nodes and weights. The proposed method reduces the main problem to a nonlinear system of algebraic equations that can be solved by iterative methods. The present method is tested on some examples and the results are satisfactory.

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On the Brusselator system

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Abstract: In this work, We are going to prove that the Brusselator system has a solution of Canard type near the origin.
Let us consider the Brusselator system

$$\begin{cases} \epsilon x^{'} & = & a\left(1+x\right)^{2}y+ax^{2}+(a-1)x \\ y^{'} & = & -x(1+x)-y(1+x)^{2} \end{cases} \qquad (1)$$

Where:
ϵ is a small parameter (infinitesimal in the nonstandard analysis's context).
a is a strictly positive parameter.

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[Asymptotic behavior of a dynamic problem with dissipative term between two elastic bodies]

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Abstract: [In this work we study the asymptotic analysis of a linear elasticity system with dissipative term in a dynamic regine between two elastic bodies in a three dimensional thin domains Ω^{ε}.We will establish a variational formulation for the problem and discuss the existence of weak solution.We then study the asymptotic behavior when one dimension of the domain tends to zero.The uniqueness result of the solution for the limit problem are also proved.]

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[A new approximate solutions for analytical perturbation method in nonlinear differential equations]

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Abstract: [The question discussed in this study concerns one of the most helpful of all approximation methods, namely the expansion of a solution of a differential equation in a series in powers of a small parameter.We used the Lindstedt-Poincaré perturbation method to construct a solution closer to uniformly valid asymptotic expansions for periodic solutions of second order nonlinear nonlinear differential equations.]

AMS subject classification: 76M45, 41A60, 35B10.
Keywords: Perturbations, Asymptotic approximations, Lindstedt method, Periodic solutions.

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[ANALYSIS OF A FRICTIONAL CONTACT PROBLEM WITH DAMAGE AND WEAR]

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Abstract: [We study a quasistatic problem describing the contact with friction and wear between an electroviscoelasltic body with long memory and damage and a moving foundation. The wear of the contact surface due to friction is taken into account and is described by the dierential Archard condition. The contact is modeled with normal compliance and the associated law of dry friction. We present a variational formulation of the problem and establish, under a smallness assumption on the data, an existence and uniqueness of the weak solution. The proof is based on arguments of parabolic evolutionary inequations, elliptic variational inequalities and Banach xed point.]

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EXPONENTIAL STABILITY OF THE HEAT EQUATION WITH BOUNDARY TIME-VARYING DELAYS

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Abstract: In this paper, we consider the heat equation with a time-varying delays term in the boundary condition in a bounded domain of $\mathbb{R}^n$, the boundary Γ is a class C^2 such that $\Gamma = \Gamma_D \cup \Gamma_N$, with $\overline{\Gamma_D} \cap \overline{\Gamma_N} = \emptyset$, $\Gamma_D \neq \emptyset$ and $\Gamma_N \neq \emptyset$. Well-posedness of the problems is analysed by using semigroup theory. The exponential stability of the problem is proved. This paper extend in n-dimensional the results of the heat equation obtained in [1].
Keywords: Heat equation, delay feedbacks, stabilization, Lyapunov method.

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Life Span of Blowing-up Solutions to Cauchy Problem For the Time-Space Fractional Diffusion Equation

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Abstract: We study the blow-up, and global existence of solutions to the following time–space fractional diffusion problem

$$\begin{cases} {}_0^C D_t^\alpha u(x,t) + (-\Delta)^{\beta/2} u(x,t) = {}_0I_t^\gamma \left(|u|^{p-1}u\right)(x,t), \quad x \in \mathbb{R}^N,\ t > 0, \\ u(x,0) = u_0(x) \in C_0(\mathbb{R}^N), \end{cases}$$

where $0 < \alpha < 1-\gamma$, $0 < \gamma < 1$, $0 < \beta \leq 2$, $p > 1$, ${}_0I_t^\gamma$ denotes the left Riemann-Liouville fractional integral of order γ, ${}_0^C D_t^\alpha$ is the Caputo fractional derivative of order α and $(-\Delta)^{\beta/2}$ stands for the fractional Laplacian operator of order $\beta/2$. We show that if $p < 1 + \beta(\alpha+\gamma)/\alpha N$, then every nonnegative solution blows up in finite time, and if $p \geq 1 + \beta(\alpha+\gamma)/\alpha N$ and $\|u_0\|_{L^{q_c}(\mathbb{R}^N)}$ is sufficiently small, where $q_c = \alpha N(p-1)/\beta(\alpha+\gamma)$, then the problem has global solutions. Finally, we give an upper bound estimate of the life span of blowing-up solutions.

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[QUASISTATIC THERMO-VISCOELASTIC FRICTIONAL ANTIPLANE CONTACT PROBLEM WITH LONG-TERM MEMORY]

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Abstract: [We study a mechanical problem modeling the antiplane shear deforma-tion of a cylinder in frictional contact with a rigid foundation.
The material is assumed to be thermo-viscoelastic with long-term mem-ory, the process is quasistatic, and the friction is modeled with Trescaís law.
The mechanical model is described as a coupled system of a variational elliptic equality for the displacements and a di§erential heat equation for the temperature. We present a variational formulation of the problem and establish the existence and uniqueness of weak solution in using general results on evolution equations with monotone operators and Öxed point arguments.

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[Le modèle Thixotrope et le modélisation physique]

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Abstract: Ce travail est consacré aux notions physiques utiles à la compréhension de ce travail et à la présentation des équations du modèle physique à résoudre. Nous nous intéressons tout d'abord à la modélisation des écoulements en microfuidique, constitués de deux phases. De fait, nous abordons les notions d'écoulements laminaires, les concepts d'interface et de tension superficielle, puis les propriétés de mouillage qui jouent un rôle majeur à cette échelle. Dans un second temps, la modélisation de la ligne triple est abordée. Ce travai est l'objet de nombreux travaux de recherche puisqu'il met en jeu des difficultés liées au couplage entres les équations de Stokes ou Navier-Stokes et d'une condition d'interface mobile le long d'une paroi solide. Après l'état de l'art des différentes modèles existants pour traiter le déplacement de la ligne triple, le modéle de Cox est détaillé.
Dans ce travail, les deux fluides considérés sont respectivement newtonien et viscoélastique. Finalement, nous définissons le modèle Thixotrope.

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Groups whose proper subgroups have minimax conjugacy classes

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1 Abstract

Let G be a group and let $\mathcal{X}$ be a class of groups. We say that G has $\mathcal{X}$ conjugacy classes or that it is an $\mathcal{X}C$-group, if $G/C_G(x^G)$ belongs to $\mathcal{X}$ for every $x \in G$. Taking $\mathcal{X}$ to be the class $\mathcal{F}$, $\check{C}$, $\mathcal{P}$, $\mathcal{PF}$, $\mathcal{M}$ and $\mathcal{M}_r$, we obtain the (more or less familiar) classes FC, CC, PC, $(PF)C$, MC and M_rC respectively. Also if $m \in \mathbb{N}^* \cup \{\infty\}$, then the subgroup G_m generated by all elements of G of order m is called the m-layer of G. We say that G is an $\mathcal{X}L$-group, if all its layers belong to $\mathcal{X}$. Among classes $\mathcal{X}L$ which have been studied, one can cite the classes FL, CL, $(PF)L$ and AL which we obtain when we take for $\mathcal{X}$ the classes $\mathcal{F}$, $\check{C}$, $\mathcal{PF}$ and $\mathcal{A}$ respectively. Finally we say that G is minimal non-$\mathcal{X}$-group if it is not an $\mathcal{X}$-group while all its proper subgroups belong to $\mathcal{X}$. Many papers have been published on minimal non-$\mathcal{X}$-groups, for various classes $\mathcal{X}$ (for minimal non-$\mathcal{X}C$-groups see [1], [2], [3], and [4]). Minimal non-$\mathcal{X}L$-groups have been also studied in [5], where $\mathcal{X}$ is the class of groups finite or Chernikov. In this note we consider a class $\mathcal{X}$ contained in the class of soluble-by-finite minimax groups and we study minimal non-MC (resp., non-$(PF)L$ and non-$(PF)L \cup (\mathcal{PF})\mathcal{A}$)-groups and we also study groups of infinite rank whose proper subgroups of infinite rank are $\mathcal{X}L \cup \mathcal{X}\mathcal{A}$. We also study groups with few non-$(PF)L \cup (\mathcal{PF})\mathcal{A}$ subgroups.

2 Main results

Theorem 1. *Let G be a group having a non-trivial finite or abelian image. Then G is a MC-group if, and only if, each proper subgroup of G is a MC-group.*

Theorem 2.[6] *(i) If G is a minimal non-$(PF)L$-group, then it is a minimal non-$((PF)L \cup (\mathcal{PF})\mathcal{A})$-group.*

(ii) If G is a minimal non-$((PF)L \cup (\mathcal{PF})\mathcal{A})$-group, then it is a minimal non-$(PF)C$-group.

Theorem 3.[6] *(i) G is a locally graded minimal non-$(PF)L$-group if, and only if, G is a non-perfect minimal non-FC-group.*

(ii) G is a locally graded minimal non-$((PF)L \cup (\mathcal{PF})\mathcal{A})$*-group if, and only if, G is a non-perfect minimal non-*FC*-group.*

Theorem 4.[6] *Let* $\mathcal{X}$ *be one of the following classes of groups:*

(i) The theoretical union of the class of CL*-groups and that of Chernikov-by-abelian groups;*

(ii) The class of CL*-groups;*

(iii) The theoretical union of the class of FL*-groups and that of finite-by-abelian groups;*

(iv) The class of FL*-groups;*

(v) The theoretical union of the class of FL*-groups and that of (polycyclic-by-finite)-by-abelian groups.*

If G is a locally (soluble-by-finite) group of infinite rank which has no simple factor group of infinite rank, then G is an $\mathcal{X}$*-group if, and only if, all proper subgroups of G of infinite rank are* $\mathcal{X}$*-groups.*

Theorem 5.[6] *(i) A locally graded group satisfying the minimal condition on non-*$(PF)L$ *subgroups is either* $(PF)L$*-group or Chernikov.*

(ii) A locally graded group satisfying the minimal condition on non-$((PF)L \cup (\mathcal{PF})\mathcal{A})$ *subgroups is either* $((PF)L \cup (\mathcal{PF})\mathcal{A})$*-group or Chernikov.*

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[SENTINELLE FAIBLE POUR LES SYSTÈMES DISTRIBUÉS À TERMES DE POLLUTION DANS LA FRONTIÈRE]

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Abstract: [La notion des sentinelles a été introduite dans l'étude des problèmes données incomplètes par J.L.Lions [10]. Ces sentinelles sont construites à partir de l'existence de la contrôlabilit exacte du système adjoint. Dans ce travail, nous avons introduit les sentinelles faibles pour étudier l'estimation de la pollution des systèmes distribués données manquantes sont dans les conditions initiales, et que la pollution apparaît au bord.]

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[Comportement Asymptotique d'un fluide de Herschel-Bulkley dans un domaine mince avec frottement de Tresca]

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Abstract: Le but de ce travail, est l'étude de comportement asymptotique de l'écoulement stationnaire du fluide incompressible viscoplastique de Herschel-Bulkley dans un domaine mince, dont la viscosité ne dépend pas de la température.
La loi de comportement de Herchel-Boulklet et donnée par

$$\sigma_{ij}^{\varepsilon} = -p^{\varepsilon}\delta_{ij} + \alpha^{\varepsilon}\frac{d_{ij}\left(u^{\varepsilon}\right)}{\left|D\left(u^{\varepsilon}\right)\right|} + 2\mu\left|D\left(u^{\varepsilon}\right)\right|^{r-2} d_{ij}\left(u^{\varepsilon}\right),$$

où le paramètre r, $1 < r < 2$, est l'exposant de la loi de puissance du matériau. Lorsque $r = 2$, on retrouve les fluides de Bingham, et lorsque $r = 2$ et $\alpha^{\varepsilon} = 0$, on retrouve le modèle de Navier-Stokes (fluide newtonien) . Les conditions aux limites utilisées sont les conditions de Dirichlet homogènes sur une partie de la frontière et les conditions de Tresca sur l'autre partie. En cherchant des estimations à priori sur la vitesse et la pression et en passe à la limite pour cela en utilisant les inégalités de Poincaré, Young, Hölder, Korn, et le lemme de Minty, on obtient l'équation de Reynolds faible sous la forme:

$$\int_{\omega}\left[\frac{h^3}{12}\nabla p^* + \tilde{F} + \mu\int_0^h\int_0^y A^*\left(x,\zeta\right)\frac{\partial u^*\left(x,\xi\right)}{\partial\xi}d\xi dy + \hat{\alpha}\int_0^h\int_0^y\left|\frac{\partial u^*}{\partial z}\right|\left(x,\xi\right)d\xi dy\right.$$

$$\left. - \frac{h\mu}{2}\int_0^h A^*\left(x,\zeta\right)\frac{\partial u^*\left(x,\xi\right)}{\partial\xi}d\xi - \frac{\hat{\alpha}h}{2}\int_0^h\left|\frac{\partial u^*}{\partial z}\right|\left(x,\xi\right)d\xi\right].\nabla\varphi\left(x\right)dx = 0, \quad \forall\varphi\in W^{1,p}\left(\omega\right).$$

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[Identification of the pollution term by the average approximate Sentinel]

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Abstract: Let Ω be a bounded domain in R^n, with smooth boundary and ω be an open non-empty subset of Ω. Denote by $Q = \Omega \times [0, T]$ the space time cylinder where the equation holds; $\sum = \Gamma \times]0, T[$ for the lateral boundary and $\Sigma_0 \subset \Sigma$. Let $y(x, t, \lambda, \tau, \theta) = y_\theta(\lambda, \tau)$ be the unique solution of the problem

$$\begin{cases} \dfrac{\partial y}{\partial t}(x,t) + \operatorname{div}(a(x,\theta)\nabla y(x,t) = \zeta + \lambda\widehat{\zeta} & \text{in } Q, \\ y(x,0) = \ y^0 & \text{in } \Omega, \\ y = g + \tau\widehat{g} & \text{in}\Sigma_0, \\ y = 0 & \text{in}\Sigma/\Sigma_0, \end{cases}$$

Where the diffusivity coefficients $a(x, \theta)$ taken to simplify the study $a(x, \theta) = \sigma(\theta)\alpha(x)$; and are assumed to be bounded above and below by positive constants, and to depend on the uncertainty parameter $\theta \in (0, 1)$ in a continuous manner. However, the dynamics of the state is governed by a parametrized operator $A(\theta) = \operatorname{div}(a(\theta)\nabla y)$. We assume that $y^0 \in L^2(\Omega)$, ζ and g are given. And, the terms $\lambda\widehat{\zeta}$ and $\tau\widehat{g}$ are unknown function with λ, τ are a small real parameters.
We aim to choosing a control that would perform optimally in an averaged sense, i. e. rather than controlling specific realizations of the adjoint state, the average is controlled. This allows to building a control independent of the parameter and define the average approximate sentinel to obtain a good estamation of the source term which called pollution term independly of the boundary condition called missing data. We denote by

$$y(x, t, \lambda, \tau, \theta) = y_{obs}, \forall x \in O \times (0; T)\,. \tag{3}$$

an observation which is a measure of the concentration of the pollution taken at the interval time $(0, T)$ and on a non empty open subset $O \subset \Omega$ called observatory.

Let h be some function in $L^2(O \times (0;T))$, for any control function $u \in L^2(\omega)$, we introduce the functional $S_\theta(\lambda,\tau)$ as follows:

$$S_\theta(\lambda,\tau) = \int_0^T \int_O hy_\theta(x,t,\lambda,\tau)dxdt + \int_0^T \int_\omega uy_\theta(x,t,\lambda,\tau)dxdt. \quad (4)$$

and we define the following functional:

$$S(\lambda,\tau) = \int_0^1 \int_0^T \int_O (h\chi_{_O} y_\theta(x,t,\lambda,\tau) + u\chi_{_\omega} y_\theta(x,t,\lambda,\tau))dxdtd\theta. \quad (5)$$

where $\chi_{_O}$ and χ_ω are the characteristic functions for the open sets O and ω respectively. First, we prove the existence of such average approximate sentinels by solving a problem of approximate average controllability introduced by Zuazua. [17] , [18] , [19] . Secondly, we give information for the polution term by the average obsevation.

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Complexity analysis and numerical implementation of large-update interior-point methods for SDLCP based on a new parametric barrier kernel function

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Abstract: In our research, we deal with the complexity analysis and the numerical implementation of primal-dual interior-point methods for monotone semidefinite linear complementarity problems based on a new parametric kernel function. The proposed kernel function is neither a self-regular and nor the usual logarithmic barrier function. By means of the feature of the parametric kernel function, we study the complexity analysis of primal-dual IPMs and derive the currently best known iteration bound for the large-update algorithm, namely, $O(\sqrt{n}\log n \log \frac{n}{\epsilon})$ which is as good as the linear and the semidefinite optimization analogue. Finally, we report some numerical results to show the practical performance of the proposed algorithm with different parameters.

Kernel functions play an important role in defining new search directions for interior-point algorithms for solving monotone linear complementarity problems, for this reason we have studied primal-dual interior point algorithms for solving SDLCP.

The proposed kernel function is defined as follows:

$$\psi(t) = \frac{t^2-1}{2} + \frac{q^{\frac{1}{t}-1}-1}{q\log q} - \frac{(q-1)}{q}(t-1),\ \ t>0, \tag{1}$$

where $q > 1$ is the barrier parameter.

Recall that the semidefinite linear. complementarity problem (SDLCP), is the problem of finding a pair matrices $(X, Y) \in \mathbb{S}^n \times \mathbb{S}^n$ such that

$$X, Y \in \mathbb{S}^n_+,\ \ Y = \mathcal{L}(X) + Q,\ \ X \bullet Y = 0, \tag{2}$$

such that $\mathcal{L} : \mathbb{S}^n \to \mathbb{S}^n$ is a given linear transformation, $Q \in \mathbb{S}^n$ is a symmetric matrix and $X \bullet Y$ denotes the trace of the (matrix) product XY.

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Deuxième Workshop sur les Equations aux Dérivées Partielles

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On the Existence of Solutions for some Nonlocal Elliptic Problems

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Abstract: We consider bounded cylindrical domain

$$\Omega = \omega_1 \times \omega_2,\ \omega_1 \subset \mathbb{R}^{n_1} \text{ and } \omega_2 \subset \mathbb{R}^{n_2},$$

where n_1 and n_2 are positive integers. Let $a > 0$, $\lambda \in \mathbb{R}$, and consider the following nonlocal problem

$$\begin{cases} -\Delta_{X_2} u + \lambda l\left(u\right) + a\left|l\left(u\right)\right|^{p-1} l\left(u\right) = 0. & \text{in } \Omega, \\ u\left(X_1, .\right) = 0 & \text{on } \omega_2 \quad \text{for a.e. } X_1 \in \omega_1 \end{cases} \qquad (P_0)$$

where Δ_{X_2} denotes the (partial) Laplacian on ω_2.
Using a singular perturbation method, we establish the existence of solutions for (P_0) as the limits of some subsequence of the solution of a problem with a perturbed Laplacian, i.e.

$$\begin{cases} -\varepsilon^2 \Delta_{X_1} u - \Delta_{X_2} u + \lambda l\left(u\right) + a\left|l\left(u\right)\right|^{p-1} l\left(u\right) = 0 & \text{in } \Omega,\ \varepsilon > 0, \\ u = 0, & \text{on } \Omega. \end{cases} \qquad (P_\varepsilon)$$

Keywords and phrases: Anisotropic singular perturbations, Nonlocal elliptic problems, Critical points.

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A stability result of a Timoshenko system in thermoelasticity of second sound with a Time-varing delay term in the internal feedback

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Abstract: In this paper we consider a one-dimensional linear thermoelastic system of Timoshenko type with a Time-varing delay term in the feedback. The heat conduction is given by Cattaneo's law. Under an appropriate assumption between the weight of the delay and the weight of the damping, we prove a well posedness result . Furthermore, an exponential stability result will be shown without the usual assumption on the wave speeds. To achieve our goals, we make use of the semigroup method and the energy method.

The aim of this paper is to investigate the effect of Time-varing delay on the behavior of the solution to the following system:

$$\begin{cases} \rho_1\varphi_{tt}(x,t) - K(\varphi_x+\psi)_x(x,t) + \mu_1\varphi_t(x,t) + \mu_2\varphi_t(x,t-\tau(t)) = 0, \\ \rho_2\psi_{tt}(x,t) - b\psi_{xx}(x,t) + K(\varphi_x+\psi)(x,t) + \gamma\theta_x(x,t) = 0, \\ \rho_3\theta_t(x,t) + \kappa q_x(x,t) + \gamma\psi_{tx}(x,t) = 0, \\ \tau_0 q_t(x,t) + \delta q(x,t) + \kappa\theta_x(x,t) = 0, \end{cases}$$

where $t \in (0,\infty)$ denotes the time variable and $x \in (0,1)$ is the space variable, the functions φ and ψ are respectively, the transverse displacement of the solid elastic material and the rotation angle, the function θ is the temperature difference, $q = q(t,x) \in \mathbb{R}$ is the heat flux, and ρ_1, ρ_2, ρ_3, γ, τ_0, δ, κ, μ_1, μ_2 and K are positive constants.

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Adaptative numerical approach via operational matrix and collocation method for solving Fredholm-Volterra stochastic integral equations

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Abstract: In this work, we give a new iterative method for solving stochastic nonlinear Fredholm-Volterra integral equations, based on Block-pulse functions and operational matrix of integration. Using this approach a nonlinear Volterra Fredholm integral equation can be reduced to a nonlinear system of algebraic equations, which can be solved by iterative method. Error estimate and convergence analysis of the proposed method have been proved. Finally, illustrative examples are included to demonstrate the validity and applicability of the technique.

Key-Words: Stochastic Fredholm-Volterra integral equation; Brownian motion; Approximate solution; Best approximation; Block-pulse functions; Collocation method.

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[The nonlinear elasticity system in Sobolev spaces with variable exponent]

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Abstract: [We study the existence and uniqueness of solutions for the nonlinear elasticity system with laws of general behavior, in which the density of the volumetric forces depends on the displacement. Our approach relies on the variable exponent theory of generalized Lebesgue-Sobolev spaces, combined with the methods of monotony, more precisely, the Leray-Lions method.]