Mathematical Congress of the Americas 2013

Poster Sessions

State Auditorium

August 8th, 2013

5007-00-278 **Isnaldo Isaac Barbosa*** (isnaldo.isaac@gmail.com), Rua José Marques Ribeiro, N 33., Trapiche da Barra, Maceió, ALAGOAS 57010730, Brazil. *Sharp Ill-Posedness Results for the Schrödinger-Debye and Benney System.*

We establish ill-posedness results for the Initial Value Problem (IVP) associated to the Schrödinger-Debye system in the one-dimensional case. This model appears in Nonlinear Optics and in [1] the authors obtained well-posedness results for this one in Sobolev's space $H^s \times H^k$, with s and k satisfying

$$\|k\| - 1/2 \leq s < \min\{k+1, 2k+1/2\} \quad \text{and} \quad k > -1/4.$$

Here we prove that the flow associated to the system is not C^2 at the origin for certain relations of the indices s and k. Particularly, we show that some of the local well-posedness results obtained in [1] are sharp. Similar results were obtained for the IVP associated to the Benney system, showing that the local theory developed in [2] is sharp.

This work is part of my Ph.D. Thesis under the guidance of Adán Corcho.

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(Received May 10, 2013)

5007-51-492 **Carlos Barrera-Rodriguez*** (barrera@cimat.mx), Prol. Mineral de Valenciana #4C, Col. Marfil, 36251 Guanajuato, Guanajuato, Mexico. *A collection of interpolating multicurve complexes of a surface S.* Preliminary report.

We introduce a new collection of simplicial complexes associated to a connected orientable compact surface $S = S_{g,n}$, called k-curve complexes and denoted by k-$\mathcal{C}(S)$. Each complex is realized by: vertices given by multicurves ($(k-1)$-simplices of the original curve complex of S) and edges given by a restricted nonfillingness property between vertices. We prove that for each k, $1 \leq k \leq 3g + n - 5$, the corresponding complex of this collection is connected and we study the coarse geometry of 1-$\mathcal{C}(S)$. In particular, we prove that 1-$\mathcal{C}(S)$ is hyperbolic. We also show a small application of these complexes to a Heegaard splitting of a manifold and a useful relation with the mapping class group of the surface S.
Keywords: curve complex, Teichmüller space, Heegaard splittings, pants complex, pseudo-Anosov map (Received May 14, 2013)

5007-60-515 **Airam Aseret Blancas*** (airam@cimat.mx), Jalisco S/N, Col. Valenciana, 36240 Guanajuato, Guanajuato, Mexico. *A population with neutral mutations conditioned to non-extinction.*

We are interested in the genealogical structure of alleles for a Galton-Watson branching process with neutral mutations, in the situation where the initial population is large and the mutation rate small. Assuming that the population is critical and that the reproduction distribution is in the domain of attraction of $\alpha-$stable law we prove, conditionally on non extinction, results similar to those obtained in [2]. Namely, we establish a functional convergence of a normalized branching processes towards a continuous state branching processes with immigration in discrete time. This work is part of my phD doctoral research elaborated under the direction of Víctor Rivero.

Keywords. Branching process; Neutral mutations; Q-processes; Regular variation; Stable distribution.

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(Received May 14, 2013)

5007-35-557 **Jesús Chaidez*** (chaidez_07@hotmail.com), Eje Central Lázaro Cárdenas Norte 152, San Bartolo Atepehuacan, 07730 Mexico D.F., Mexico, **Cristi Guevara** (crisdarley@gmail.com), Eje Central Lázaro Cárdenas Norte 152, San Bartolo Atepehuacan, Mexico D.F., Mexico, and **Jorge X. Velasco** (jx.velasco@gmail.com), Eje Central Lázaro Cárdenas Norte 152, San Bartolo Atepehuacan, Mexico D.F., Mexico. *Diffusion process on the Sierpinski gasket applied to oil industry.*

Oil reservoirs are classified as homogeneous or heterogeneous. The heterogenous might be natural fractured with fractal behavior, i.e., its flux, determined by well-testing and commonly described as diffusion process, is anomalous. To describe it, Chang-Yortsos(1990) considering fracture networks geometry and a probabilistic approach to fractals adapted a fractal diffusion equation.

In 1989, Kigami created a "Laplacian" for post-critical finite auto-similar fractals imitating the construction of the classical Laplacian in $[0, 1]$, and leading up to a development of the analogs of some of the classical partial differential equations.

Based on Kigami's approach and developing numerical simulations, our work shows a comparison between Chang-Yortsos model and the diffusion equation on the Sierpinski Gasket. (Received May 15, 2013)

MCA2013-PS02-06 **Norbil Cordova**, **Denise de Mattos**, **Edivaldo dos Santos**. *Degree of equivariant maps from a generalized manifold to a sphere.*

By a n-dimensional generalized manifold is meant a locally compact Hausdorff space whose local homology or cohomology (depending on this, the space is called homology or cohomology manifold) coincides with the local homology or cohomology of n-dimensional euclidean space [2]. Generalized manifolds show up naturally in topological problems in the theory of transformation groups [1]. We want show that every equivariant map $\varnothing : M \to S$ from a generalized manifold to a sphere of same dimension, where a finite group G acts freely over M and S, the degree of f is unique modulo $|G|$.
Key Words: Generalized G-manifolds, degree of equivariant maps, transfer homomorphism, equivariant maps, sheaf theory.

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5007-30-235 **Albert Clop Ponte** (albertcp@mat.uab.cat), Edifici C, Departament de Matematiques, Facultat de Ciencies, Bellaterra, Barcelona 08193, and **Victor Alberto Cruz Barriguete*** (victorcruz@mixteco.utm.mx), Carretera a acatlima Km. 2.5, Institute de Fisica y Matematicas, 69000 Huajuapan, Oaxaca, Mexico. *Weighted Estimates for Beltrami Equations,*

We obtain a priori estimates in $L^p(\omega)$ for the generalized Beltrami equation, provided that the coefficients are compactly supported $VMO(\mathbb{C})$ functions with the expected ellipticity condition, and weight $\omega \in A_p$. (Received May 08, 2013)

MCA2013-PS02-03 **Leandro Nery de Oliveira***. *Characterization of germs of irreducible plane curves with maximal torsion.*

This paper aims to summarize the main results obtained in Master's Thesis "Caracterização dos Germes de Curvas Planas Irredutíveis com Torção Maximal". Let $f \in \mathbb{C}[[X,Y]]$ a formal series convergent in a neighborhood of the origin $\mathbb{C}^2$ and irreducible, we define the equation $f(X,Y) = 0$ (also indicated as (f) or C) as the *germ* of an *analytic curve* or an *irreducible plane algebroid curve*. We can find a ring associated to f , namely, $\mathcal{O} = \frac{\mathbb{C}[[X,Y]]}{\langle f \rangle}$; where $\langle f \rangle$ is the ideal generated by f . Is possible to calculate $\mathcal{O}d\mathcal{O}$ defined as the $\mathcal{O}$-module of Kahler differentials and we can define the $\mathcal{O}$-submodule torsion $\mathcal{T}$ of $\mathcal{O}d\mathcal{O}$ as $\mathcal{T} = \{\omega \in \mathcal{O}d\mathcal{O} : \xi\omega = 0, \text{ for some } \xi \in \mathcal{M}\backslash\{0\}\}$, with $\mathcal{M}$ the maximal ideal of $\mathcal{O}$. A necessary and sufficient condition for a curve C to be quasi-homogeneous is when the length of the torsion submodule $\mathcal{T}$ of $\mathcal{O}d\mathcal{O}$ is maximum.

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MCA2013-PS02-05 **Maria Amelia de Pinho Barbosa Hohlenwerger***,PhD Student of ICMC-USP-Brazil.

WHEN IS THE REAL MILNOR FIBER A STANDARD BALL?

Given an analytic map germ $f : (\mathbb{R}^n, 0) \to (\mathbb{R}^p, 0)$, $n \geq p \geq 2$, with isolated singularity at origin, Milnor proposed to call the map f trivial, if the fiber (real Milnor's fiber) of its fibration is diffeomorphic to a (n, p)- dimensional ball. In this work we extend the characterization of trivial map germs started by Church and Lamotke. Our main result cover all cases when the Milnor fiber is a three dimensional manifold.

Join to T. O. Souza, D. De Mattos, R. Araújo dos Santos (advisor).

5007-65-45 **Alexandre Fioravante de Siqueira*** (siqueiraaf@gmail.com), Dep de Fis, Qui e Bio, Univ Estadual Paulista, Rua Roberto Simonsen, 305, Presidente Prudente, Sao Paulo 19060-900, Brazil, and **Flavio Camargo Cabrera**, **Aylton Pagamisse** and **Aldo Eloizo Job**. *Segmentation of images obtained by samples of natural rubber with gold nanoparticles: comparison between Multi-Otsu thresholding and a-trous Wavelets.*

This study aims to choose the best technique, between a-trous wavelet and Multi-Otsu method, to characterization and recognition of patterns formed by gold nanoparticles incorpored into natural rubber samples. Latex was collected from different rubber trees of RRIM 600 clones. The formation of AuNPs was achieved by direct reaction of the natural rubber membrane in a solution of gold chloride, where the synthesis was realized at 80C for periods of 6, 9, 15, 30, 60 and 120 minutes of immersion. The natural rubber membranes with gold nanoparticles were used in chemistry analysis and ultrasensitive detection by Raman spectroscopy, constructing flexible SERS and SERRS substrates, as well as in the study of influence of natural rubber/Au nanoparticle membranes on the physiology of Leishmania braziliensis protozoans. Both techniques were applied in images of natural rubber samples with gold nanoparticles, and the method that leads to better results was chosen to characterize the nanoparticles in the images. Natural rubber membranes were fabricated by casting latex stabilized with 2% of ammonium hydroxide on glass and annealing for 10 hours at 65° (Received April 02, 2013)

5007-81-44 **Héctor Manuel Garduño Castañeda*** (neozt2k2000@hotmail.com), México City, Mexico, **Julio César García Corte** (jcgc@xanum.uam.mx), Mexico City, Mexico, and **Slavisa Djordjevic** (slavdj@fcfm.buap.mx), Puebla City, Mexico. *Brownian Motion as a Quantum Stochastic Process.*

Consider the Fock space H over the Hilbert space $h = L^2(\mathbb{R}_+)$. Using this space, we get a Quantum Probabilistic Space, where we have the notion of quantum stochastic adapted and martingale processes based on the, possibly unbounded, linear operators on H. In that sense, a process is a family of allowable linear operators, say $E = \{E(t) : t \geq 0\}$. A process is adapted if, for every time t, the operator $E(t)$ is an ampliation: $E(t) = E_t \bigotimes_a I$, where E_t is a linear operator acting on certain type of subespace on H.

The martingales are defined using properties of the Fock space. In this work, we present a way of view the canonical Brownian motion as a special case of a quantum martingale process via an isomorphism from H to the Hilbert space $L^2(\mathbb{W})$ and will present the Classic Ito's Formula as a particular case of the Quantic Ito's Formula.

Key words: Fock space; Exponential domain; Brownian motion; Ito's Formula; Quantum processes.

References: R.L. Hudson, An Introduction to Quantum Stochastic Calculus and some of its Applications, Quantum Probability Communications, Vol XI (pp.221-271). (Received April 01, 2013)

5007-92-269 **Paula A Gonzalez Parra*** (pagonzalez@uao.edu.co), Calle 25 # 115-85, Cali, Valle , Colombia, and **Martine Ceberio** and **Carlos Castillo-Chavez**. *Interior Point Methods For a Multi-Group Discrete Time Influenza Model.*

We formulated a discrete susceptible-infected-treated-recovered (SITR) model. We evaluated the potential effect of control measures, such as social distancing and antiviral treatment in the context of a single influenza outbreak. The potential effect of antiviral treatment was evaluated by considering both unlimited and limited supply. The role of heterogeneity in the population was considered. The total population was divided into subgroups according to activity or susceptibility levels. The goal was to determine how treatment doses should be distributed and how social distancing should be implemented in each group in order to reduce the final epidemic size. The optimal control problem was solved by using the primal-dual interior-point method. This approach allowed the inclusion of constraints more efficiently. We found that the use of single and dual strategies (social distancing and antiviral treatment) resulted in reductions in the cumulative number of infected individuals. In the case of limited resources, our results showed that in order to control the epidemic, most of the resources must be utilized at the beginning of the epidemic until all the resources exhausted. (Received May 10, 2013)

5007-53-384 **Oscar Guajardo*** (oscar@matcuer.unam.mx). *A classical approach to smooth supermanifolds.* Preliminary report.

We'll characterise smooth supermanifolds as smooth superalgebra bundles over a smooth manifold and prove the equivalence between this approach and the usual approach via ringed spaces. In this approach, morphisms of supermanifolds are differential operators along smooth maps between the underlying manifolds.

With this approach we begin a study of differential-geometric concepts in the $\mathbb{Z}_2$-graded setting, including the de Rham cohomology groups and the curvature of superconnections. (Received May 13, 2013)

5007-17-456 **Ma Isabel Hernández*** (isabellie@gmail.com). *Classification of Lie Superalgebras supported over* $\mathfrak{gl}_n(\mathbb{C})$.

An important problem in mathematics is to classify algebraic structures. It is also well known that the classification problem of Lie superalgebras is very difficult and so far to be solved. In this work, we classify finite-dimensional complex Lie superalgebras having as even part the reductive Lie algebra $\mathfrak{gl}_n(\mathbb{C})$ without another extra condition. (Received May 14, 2013)

5007-91-469 **Vyacheslav V. Kalashnikov*** (kalash@itesm.mx), Ave. Eugenio Garza Sada 2501 Sur, 64849 Monterrey, Nuevo Leon, Mexico, and **Vladimir A. Bulavsky**, **Nataliya I. Kalashnykova** and **Mario A. Ovando-Montantes**. *Consistent Conjectural Variations Equilibrium and Structure of Demand in a Mixed Oligopoly Model.*

We study a model of mixed oligopoly with conjectured variations equilibrium (CVE) with a not necessarily continuous demand function, which is the principal novelty from our previous papers. The agents' conjectures concern the price variations depending upon their production output increase or decrease. We establish the existence and uniqueness results for the conjectured variations equilibrium (called an exterior equilibrium) for any set of feasible conjectures. To introduce the notion of an interior equilibrium, we develop a consistency criterion for the conjectures (referred to as influence coefficients) and prove the existence theorem for the interior equilibrium (understood as a CVE with consistent conjectures, or CCVE). On the base of our results related to the case of non-differentiable demand functions, we also investigate the behavior of the consistent conjectures depending upon a parameter representing the demand function derivative with respect to the market price. The latter results allow us to analyze the behavior of groups of consumers with different consumption abilities. The proposed techniques are important because they permit one to develop a qualitative description of the dependence of the market price on the active demand component. (Received May 14, 2013)

5007-68-567 **Adriana Lara*** (adriana@esfm.ipn.mx), Departamento de Matemáticas, Edificio 9, Unidad Profesional ALM IPN, del. GAM., 07738 D.F., Mexico. *Gradient-based Local Searchers for Evolutionary Algorithms in Solving Multi-objective Optimisation Problems.*

Computer Algorithms in multi-objective optimisation attempt to compute a set of trade-off solutions of the multi-obljective problem (MOP). In this work, three original gradient-based methods, for solving MOPs, are designed and presented in order to be combined with Multi-objective Evolutionary Algorithms (MOEAs). They have different performances and different computational costs, in order to be used accordingly with the MOP features. Several difficulties arise when combining these two techniques. First, since we have to simultaneously minimise several functions, the gradients of the different objective functions are in conflict and must be efficiently combined. Second, the cost of performing a gradient-based descent is computationally very high. Then, it is necessary to find a compromise between the computing cost and the benefits of the local search procedure. Third, the balance of resources between the evolutionary heuristic and the (gradient-based) local search has a major impact on the overall efficiency of the hybrid MOEA. Theoretical and numerical results are presented in this work in order to show the efficiency of the proposed methods. (Received May 15, 2013)

MCA2013-PS02-07 **Northon Canevari Leme Penteado**, Advisor: **Oziride Manzoli Neto**. *Representing homotopy classes by well-behaved functions.*

Let $T^2 = S^1 x S^1$ be the torus where $S^1 = \{x \epsilon \mathbb{R}^2; |x| = 1\}$ is the circle. In this work we are interested in describing certain special type of elements in each homotopy class of the set $[T^2; S^1] = \{[f]; f : T^2 \to S^1 \text{ is continuos }\}$. Given a homotopy class $[f] \epsilon [T^2; S^1]$, we construct a representant g of this homotopy class using lifting of maps and the respectively universal recovering $\mathbb{R}^2$ and $\mathbb{R}$ of T^2 and S^1 respectively. The representant g has good properties and is geometrically well-behaved.
Key Words: Homotopy, lifting, ...

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5007-35-275 **Diana Assaely León Velasco*** (assaely86@gmail.com), iztapalapa, distrito f, Mexico. *Study of the Controllability for parabolic Partial Differential Equations.*

In recent years important progresses have been done in the context of numerical approximation of controllability problems for pde's. it is by now well known that,often, numerical approximation schemes that are stable for solving initial-boundary value problems, develop instabilities when applied to controllability problems, due to the presence of high frequency numerical solutions.

The goal of this work is introduce some elements and numerical examples in 1-D of the theory of distributed and pointwise control for linear diffusion equations. We consider a system whose state is given by the solution y to a pde, and which contains control functions v. The state equation is written as

$$\frac{\partial y}{\partial t} + \mathcal{A}(v) = \mathcal{B}v \tag{1}$$

where y is a scalar valued function, $\mathcal{A}$ is a partial differential operator, and $\mathcal{B}$ maps the "space of controls" into the "state space". v can be either applied inside the domain $\Omega \subset \mathbf{R}^d$ where (1) is considered.

The control theory is a complementary tool to solve the problems of dynamic optimization, using the calculus variational theory and the optimality principle (Received May 13, 2013)

5007-65-169 **Jorge Lopez*** (loppital1@hotmail.com) and **L. Hector Juarez**. *GC con precondicionamiento para ajuste de campos de velocidad en 2D.* Preliminary report.

Se mostrarán los resultados obtenidos al aplicar el método de gradiente conjugado precondicionado para el ajuste U de un campo U^I de velocidad, donde básicamente se resuelve un problema de punto silla para el multiplicador asociado L, y el campo ajustado U, donde U^I es un campo inicial que no satisface conservación de masa, mientras que ésta es una condición que si cumple U. Es necesario resolver subproblemas elípticos para funciones tipo velocidad y con datos tipo presión, lo cual se hace utilizando elemento finito en mallas mixtas. Key words: Elípticos, Elemento Finito, Matrices Definidas Positivas, Cholesky, Métodos Variacionales, Campos de Velocidad, Aguas someras. (Received May 04, 2013)

5007-60-351 **Ekaterina T. Kolkovska** and **Ehyter M. Martín González*** (8ermartin@cimat.mx). *Ruin probabilities and the time to ruin of a perturbed two-sided risk process.*

Let $\{Y(t), t \geq 0\}$ be the two-sided classical risk process defined by $Y(t) = u + ct + \sum_{i=1}^{N_1(t)} Y_{1i} - \sum_{j=1}^{N_2(t)} Y_{2j}$, where u and c are positive constants representing, respectively, initial capital and prime per time unit, and for $i = 1, 2$, Y_{i1} and Y_{i2} are sequences of independent and identically distributed random variables with a common distribution function $F_i(x)$ such that $F_i(0) = 0$. In addition, $N_i(t)$ are independent homogeneous Poisson processes. We consider the perturbed risk process $X(t) = Y(t) - \eta W_\alpha(t)$ for $\eta \geq 0$, where $W_\alpha(t)$ is an independent α-stable process without negative jumps, $\alpha \in (1, 2)$. We also assume that F_1 corresponds to either a mixture of exponential distributions, or an Erlang distribution. By approximating the α-stable process in path space, we obtain the Laplace transform of the Gerber-Shiu function of $X(t)$ in the case when the deterministic penalty function is identically 1. We also obtain asymptotic expressions for the expected Gerber-Shiu penalty function. These results extend previous work of Gerber and Shiu; Tsai and Willmot; Furrer; Albrecher, Gerber and Yang; Labbe, Sendov and Sendova. (Received May 13, 2013)

MCA2013-PS02-04 **L.M.A. Luis Romeo Martínez Jiménez***, **Dr. Hugo Rodríguez Ordóñez**. *Topological complexity of configuration spaces for robot motion planning.*

$TC(X)$ is a number which measures discontinuity of the process of motion planning in the configuration space X. Michael Farber gives an upper and lower bound for $TC(X)$ in terms of the dimension of the configuration space X, and also, he computes the topological complexity of motion planning for a number of configuration spaces: spheres, two-dimensional surfaces, products of spheres. In practical terms, we could see these configuration spaces like a robot arm which only rotates (sphere), like an arm with two articulations (product of spheres) or like an intersection of two arms (two-dimensional surfaces). We ofer theorical foundations of some bounds for TC and their applications to some configuration spaces of robots.

AMS subject classifications: 68T40, 55M30, 55R80.

Keywords: Ljusternik-Schnirelman category of a space; Discriminantal varieties,configuration spaces; robots.

5007-37-153 **Alejandro Mario Meson*** (meson@iflysib.unlp.edu.ar), 59 nro 789, La Plata, B. Aires, Argentina, and **Fernando Vericat**, 59 nro 789, La Plata, B. Aires, Argentina. *On the topological entropy of the irregular part of the V-statistics multifractal spectra.*

We study the irregular part of the multifractal decomposition of $V-$statistics of order$-r$. Let us consider a topological dynamical system (X, f), with X a compact metric space and f a continuous map. Let $X^r = X \times ... \times X$ be the product of $r-$copies of X with $r \geq 1$, if $\Phi : X^r \to \mathbf{R}$ is a continuous map, then let

$$V_\Phi(n, x) = \frac{1}{n^r} \sum_{1 \leq i_1, ..., i_r \leq n} \Phi\left(f^{i_1}(x), ..., f^{i_r}(x)\right).$$

These averages are called the *$V-$statistics of order r with kernel* Φ. The multifractal spectra of $V-$statistics are specified by the decomposition sets

$$E_\Phi(\alpha) = \left\{x : \lim_{n \to \infty} V_\Phi(n, x) = \alpha\right\}.$$

The *irregular part* E_Φ^∞ of the spectrum is the set of points x for which $\lim_{n \to \infty} V_\Phi(n, x)$ does not exist. We prove that the irregular part E_Φ^∞ has the same entropy than the whole space. (Received May 03, 2013)

5007-60-293 **Harold A. Moreno-Franco***, CIMAT, Guanajuato, Gto, Mexico. *Existence of the Value Function for Controlled Two-Dimensional Lévy Processes.*

The main purpose of this work is to establish the existence, and study the regularity, of a solution to a Hamilton-Jacobi-Bellman (HJB) equation arising in the minimization of an infinite horizon singular stochastic control problem, where the state process is a controlled two-dimensional Lévy process. In our model the controlled process is allowed to be a general two-dimensional Lévy process, in particular to have jumps. This makes that the HJB equation has an integral term coming from the jumps of the controlled process, and which is naturally related to the integral term of its infinitesimal generator. This is a joint with D. Hernandez and V. Rivero. (Received May 11, 2013)

5007-51-112 **Ana Claudia Nabarro*** (anaclana@icmc.usp.br) and **Amani Saloom**. *Geometry in the Minkowski space.*

In A.C. Nabarro and F. Tari, Families of curve congruences on Lorentzian surfaces and pencils of quadratic forms. Proc. Roy. Soc. Edinburgh Sect. 141A, 2011, we de fine and study the families of conjugate and reflected curve congruences associated to a self-adjoint operator A on a smooth and oriented surface M endowed with a Lorentzian metric. These families parametrise parts of the pencils of forms that link, respectively, the equation of the A-asymptotic curves and that of the A-principal curves, and the equationof the A-characteristic curves and that of the A-principal curves. (There is a crucial difference with the Riemmanian case due to the existence of light-like curves.) In this joint work with A. Saloom, we study the generic local singularities in the members of the families of conjugate and reflected curve congruences and describe how these bifurcate within the families. (Received April 29, 2013)

5007-86-268 **Teresa Pérez-Muñoz*** (teresap@imp.mx), Eje Central Lázaro Cárdenas 152, Gustavo A. Madero., 07730 México, DF, Mexico, **Eliseo Hernandez-Martinez** (elijazfan@yahoo.com), Eje Central Lázaro Cárdenas 152, Gustavo A. Madero, 07730 México, DF, Mexico, and **Jorge X. Velasco-Hernández** (velascoj@imp.mx), Eje Central Lázaro Cárdenas 152, Gustavo A. Madero, 07730 México, DF, Mexico. *Study on Identification of Oil, Gas and Water Zones in Geological Logging: A Wavelet Coherence Approach.*

To reduce the operating costs in new wells and of working over existing wells, it is imperative to know the location of oil, gas and water horizons in the wellbore. For many years the predictions of oil, gas or water in the wells by geophysical logs have differed considerably from the results obtained when the zones were tested. Nowadays, due to the great advances in logging techniques supported with additional tools such as seismic, the prediction about the structure and transport routes have been improved. However, these techniques are costly and depend on the interpreter's experience. In this work, we analyze different well-logs by mean of wavelet coherence analysis to identify oil, gas and water zones. The proposed metodology is based on the normalization of the well-logs allowing quantify the fluctuations of the signals at the same scales. The presence of gas, oil or water zones is identified when the wavelet coherence shows significative constrasts in the trends of two different logs of the same well. Results indicate that the interpretation of the coherence analysis is a valuable technique to identify common features in well logs, such as, spatial distributions of the different types of sand and posible oil transport routes. All results were corroborated by geologists. (Received May 10, 2013)

5007-46-103 **Reyna María Pérez Tiscareño*** (reyna@ut.ee), Institute of Mathematics, University of Tartu, 2 J. Liivi Str. room 221, 50409 Tartu, Estonia, and **Mati Abel**. *Locally pseudoconvex inductive limit of topological algebras.*

Topological algebras are one of subfields of the modern functional analysis. The study of topological algebras started in 1938, when S. Mazur gave the description of normed division algebras and I.M. Gelfand the description of Banach fields. In the end of 40s the study of locally convex algebras and in the beginning of 60s the study of locally bounded algebras started. Theory of these classes of topological algebras has been today comparatively well built up, but the theory of more general classes of topological algebras, as locally pseudoconvex algebras, locally m-pseudoconvex algebras, Gelfand-Mazur algebras, Fréchet algebras (with or without any kind of convexities) and others, is in creation.

The aim of this poster is to present some properties of the locally pseudoconvex inductive limit of topological algebras.

∗ This research is supported by the European Social Fund(Mobilitas grant No. MJD247). (Received April 29, 2013)

MCA2013-PS02-08 **Raquel Ribeiro**, *On various types of shadowing for geometric Lorenz flows.*

The shadowing property is a dynamical property that plays a key role in the study of the stability of the dynamics, and it is found in hyperbolic dynamics.

The geometric Lorenz model is an important example in the theory of dynamical systems, it was inspired by the equations found by Lorenz related to a model of fluid convection [6]. It is know the hyperbolic dynamical systems possess the shadowing property. However, these Lorenz systems are not hyperbolic, since they have singularities approximated by regular orbits. It is natural then to ask if these Lorenz systems have the shadowing property. Komuro [5] showed that geometric Lorenz attractor do not satisfy the shadowing property. So, we could ask if these systems have some shadowing-type properties which are more easy to check.

As a kind of generalization of the shadowing property, Blank [2] introduced the notion of the average shadowing property in the study of chaotic dynamical systems. In the other hand, Eirola et al [3] posed the notion of the limit-shadowing property, and Rongbao Gu [4] introduced the notion of the asymptotic average shadowing property for flows. Thus, following Komuro, a natural question is to decide if the Lorenz systems has some of these weaker shadowing properties. The answer to this question is negative. We show in this work that the geometric Lorenz attractor do not satisfy any of the properties typeshadowing mentioned above.

This work was done together with Alexander Arbieto and Jo ao Eduardo Reis, [1].

Key Words: Average Shadowing, Asymptotic Average Shadowing, Limit Shadowing, Geometrical Lorenz flows.

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5007-35-568 **José Luiz Boldrini** and **Bianca Morelli Rodolfo Calsavara***
(biancamrcalsavara@gmail.com), R. Pedro Zaccaria, 1300, Limeira, SP 13484-350, Brazil, and
Enrique Fernández-Cara. *Optimal control problems for a phase change model.*

In this work are treated some optimal control problems for a phase field model for solidification involving different kinds of restriction. This model describes phase change of metallic alloys, i.e, it allows two different kinds of crystallization; each of them is described by its own phase field function. To represent this model it is used a system of coupled non linear parabolic equations. In this system the first equation is for the temperature and the second and third equations are for the phase-field functions.

Here the main interest is to obtain the existence of a minimum and the optimality conditions for a cost functional involving the solution and the non homogeneity of the phase field model. Besides, some of optimal control problems has different restrictions for the control function or for the state functions or both of them. To obtain the existence of a minimum for the cost functional it is used minimizing sequences and to obtain the optimality conditions to the control problems it is used the Dubovitskii-Milyutin formalism. (Received May 15, 2013)

5007-51-93 **C. Rubio-Montiel*** (christian@matem.unam.mx) and **Gy. Kiss** (kissgy@cs.elte.hu). *On m-factorizations of complete multigraphs and designs.*

The complete multigraph λK_v has v vertices and λ edges joining each pair of vertices. An m-factor of the complete multigraph λK_v is a set of pairwise vertex-disjoint m-regular subgraphs, such that these subgraphs induce a partition of the vertices. An m-factorization of λK_v is a set of pairwise edge-disjoint m-factors such that these m-factors induce a partition of the edges. If the m-factors are pairwise distinct, then it is called *simple*. Furthermore, an m-factorization of λK_v is decomposable if there exist positive integers λ_1 and λ_2 such that $\lambda_1 + \lambda_2 = \lambda$ and λK_v is the union of the m-factorizations $\lambda_1 K_v$ and $\lambda_2 K_v$, otherwise it is called *indecomposable*.

This poster will present simple and indecomposable m-factorizations of λK_v arising from designs for different values of m, λ and v. (Received April 26, 2013)

MCA2013-PS02-01 **Andrea de Jesus Sacramento***, PhD student of ICMC-USP-Brazil, joint work with A. C. Nabarro. *Focal set of curves in the Minkowski Space*

In this work we study the geometry of curves in the Minkowski Space. The tangent vector, the normal or binormal vectors can be lightlike. These are isolated points and the Serret-Frenet formulas are not defined in these points. By other side, the contact of the curves with planes and pseudo-spheres are defined. Therefore we utilize the family of distance squared functions to define the focal surface of a curve in the Minkowski 3-Space.We also consider curves in the de Sitter spaces in the Minkowski 3-Space and in the Minkowski 4-Space.

5007-18-266 **Carlos Segovia*** (csegovia@mathi.uni-heidelberg.de), Im Neuenheimer Feld 288, 69120 Heidelberg, Baden Wurt, Germany. *Unexpected relations of cobordism categories with another subjects in mathematics.*

For this poster we introduce the G-cobordism category in dimension 1+1 with G a finite group. This let us to define an invariant associated to every finite group which for groups of the form $\mathbb{Z}_p^n$ this has a nice description with p a prime number. For example for $p = 2$ this number follows the sequence $2, 5, 15, 51, 187, 715, ...$ which writes as $(2^n + 1)(2^{n-1} + 1)/3$. To my knowledge, this number represents the dimension of the universal embedding of the symplectic dual polar space, or is the number of isomorphism classes of regular four folding coverings of a graph with respect to the identity automorphism, or the density of a language L_c with $c = 4$. We present the way to pass from one side to another of the last three options and the invariant given by the cobordism category. Finally, we present some work we have in the analogous part for every prime number. (Received May 10, 2013)

MCA2013-PS02-09 **Yuri D. Sobral**, **Nicolas Taberlet**, **Vincent Grenard**, **Francisco R.Cunha**, *A Study of Fluidisation Via a Hydrid Method.*

In this work, we study instabilities in uidised beds using a hybrid method in which the motion of the particles is solved explicitly, using a molecular dynamics technique, and the fluid flow is solved using the standard averaged balance equations, in an intermediate length scale, by standard finite difference methods. This approach is much cheaper computationally than solving the actual flow and its interaction with the particles, and does not need the standard closure equations necessary for a continuum description of the particles. Instead, it needs a connecting link between the two different length scales. This is achieved, in our case, via the drag force that the fluid exerts on the particles. We will present details of the formulation and of the numerical implementation of this approach. Some rheological results, concerning continuum properties of the ensemble of fluidised particles, as well as a description of the instabilities observed in this flow, will be discussed.

Key Words: fluidised beds, instabilities, molecular dynamics, two-phase flow.

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5007-86-171 **Anibal Sosa*** (uasosa@icesi.edu.co), **Aaron Velasco** and **Lennox Thompson**. *Constrained optimization framework for geophysical inversion of seismic data.*

Many experimental techniques in geophysics advance the understanding of Earth processes by studying Earth velocity structure. We present a novel approach based on constrained optimization, to expand a one dimensional (1-D) joint inversion least-squares algorithm to characterize Earth's structure. We use multiple geophysical data sets with different sensitivity and resolution domains to produce 1-D velocity models.

Our non-standard approach poses the inversion problem as in nonlinear programming that we solve by means of primal-dual interior point methods. To address some of the numerical issues inherently related to these inversion problems, we use inequality constraints to introduce physical bounds over the parameters. Our synthetic and real data tests show that the addition of this type of constraints, can be considered as a robust alternative to introduce a priori information. Furthermore, we present a framework that produces 3-D velocity models by using a kriging interpolation scheme to combine independent 1-D velocity models. Our smoothly varying 3-D results compared to those obtained by other techniques facilitate their interpretation. Finally, we discuss advantages/disadvantages of our approach, compare our findings with previous work and explore further research areas (Received May 04, 2013)

5007-76-63 **Pablo Ulises Suarez*** (psuarez@desu.edu), 1200 N Dupont Hwy, Dover, DE 19709. *A Numerical Study of the axisymmetric Taylor-Couette Problem using the Galerkin Characteristics Method.* Preliminary report.

The Taylor–Couette problem consists of a viscous fluid confined in a gap between two concentric rotating cylinders. When the angular velocity of the inner cylinder is increased above a certain threshold, the flow becomes unstable and a secondary steady state characterized by axisymmetric toroidal vortices emerge. The governing equations are the axisymmetric Navier Stokes equations. A Galerkin Characteristics Method is used to solve these equations and reproduce the vortices. To advance in time we discretize the convective term using the Method of Characteristics. To discretize in space we use a Galerkin Method with Taylor-Hood elements. The method can be implemented in a straightforward by using *FreeFEM++*. The numerical results agree accurately with linear stability theory and with previous numerical studies. (Received April 18, 2013)

MCA2013-PS02-02 **Juliana Roberta Theodoro de Lima***, PhD Student of ICMC-USP-Brazil, join work with Denise de Mattos (advisor). *Link-Homotopy Braid Groups on Surfaces.*

In this work , we talk about string links and generalized string links on an orientable surface M of genus $g \geq 1$ (different of the sphere). We define the Link- Homotopy Generalized String Link Group on M and find a presentation for it.

5007-32-59 **João Nivaldo Tomazella*** (jntomazella@hotmail.com), Universidade Federal de São Carlos, Departamento de Matemática, Rodovia Washington Luís, km 235 - SP-310, São Carlos, SP 13565-905, Brazil, and **Juan José Nuño Ballesteros** and **Bruna Oréfice Okamoto**. *Positive degree deformations of weighted homogeneous singularities.* Preliminary report.

We consider a weighted homogeneous germ of complex analytic variety $(X,0) \subset (\mathbb{C}^n,0)$ and a consistent function germ $f : (\mathbb{C}^n,0) \to (\mathbb{C},0)$. We want to derive necessary and sufficient conditions for some deformations to have positive degree (i.e., for any additional term in the deformation, the filtration is not smaller) in terms of an adapted version of the relative Milnor number. We study the cases where $(X,0)$ is an isolated surface singularity and the invariant is the Bruce-Roberts number of f with respect to $(X,0)$, and where $(X,0)$ is an isolated complete intersection or a curve singularity and the invariant is the Milnor number of the function restricted to $(X,0)$. In the last part we give some formulas for the invariants in terms of the weights and the degrees of the polynomials. (Received April 16, 2013)

5007-62-57 **Vera Lucia D. Tomazella*** (vera@ufscar.br), Rodovia Washington Luís, km 235 - SP-310, São Carlos, 13565-905, Brazil, and **Saralees Nadarajha** and **Jhon Frank Bernedo Gonzales**.

Estimation of parameters in Laplace and log-Laplace distributions with grouped data.

In the modelling of lifetime data, usually the reponse variable is given by the survival time or the time to ocurrence of an event of interest for an individual. In many applications, we could have right or left censored data and the presence of one or more covariates. Another common situation is given when all data is interval-censored, that is, the exact survival times are unknown and we only know the interval where a death or failure of an individual have occurred. Zhou, Mi and Guo (2007) considered maximum likelihood estimation of logistic and log-logistic distributions for interval censored data. Here, a similar treatment is provided for Laplace and log-Laplace distributions. Simulations and real data applications show that the latter distributions can be more efficient in spite of being simpler. (Received April 15, 2013)

5007-37-274 **André Vanderlinde da Silva*** (andre_vanderlinde@hotmail.com) and **Pedro Antonio Santoro Salomao** (psalomao@gmail.com). *On the Existence of Closed Reeb Orbit on the Non-degenerate Tight 3-Sphere.* Preliminary report.

Let λ be a non-degenerate tight contact form on S^3. Given a simply covered unknotted closed Reeb orbit $P = (x, T)$ satisfying $\mu_{CZ}(P) \leqslant 1$ and $sl(P) = -1$, we are able to proof the existence of a $P' = (x', T')$ closed Reeb orbit not linked to P and satisfying $\mu_{CZ}(P') = 2$. Following P. Salomão and U. Hryniewicz, the proof is based on the theory of pseudoholomorphic curves in symplectizations introduced by H. Hofer. From a Bishop Family of disks with boundary on a suitable disk $\mathcal{D}$ spanning P, we obtain, by using disk-filling methods, a finite-energy punctured pseudoholomorphic disk $\tilde{u}_0 : \mathbb{D} \setminus \Gamma_0 \to \mathbb{R} \times S^3$ with boundary on $\mathcal{D}$. The curve $\tilde{u}_0$ satisfies $\int_{\mathbb{D}\setminus\Gamma_0} u_0^* d\lambda > 0$ which allow us to find a closed Reeb orbit P' which is asymptotic limit of an embedded finite-energy plane. The existence of P' follows from properties of bubbling-off tree of finite-energy spheres, Carleman Similarity Principle and positivity and stability of pseudoholomorphic immersions. (Received May 14, 2013)