SEMINARIO DE OPERADORES Y FÍSICA–MATEMÁTICA

Organizers: Dr. Ricardo Weder y Dr. Rafael del Río

- **ON JACOBI MATRICES WITH RANDOM DECAYING PERTURBATIONS I: RELATIVE DECAY**
- **ON JACOBI MATRICES WITH RANDOM DECAYING PERTURBATIONS II: SPECTRAL STABILITY**

Dr. Jonathan Breuer
California Institute of Technology–CALTECH

20 y 22 de noviembre de 2007.

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EL COMPORTAMIENTO ESPECTRAL DEL MODELO DE ANDERSON CON POTENCIAL COMPLEJO

Dra. Carmen Martínez Adame
Departamento de Matemáticas, Facultad de Ciencias, UNAM

Resumen

Consideramos el operador no auto–adjunto asociado al modelo de Anderson con un potencial complejo en una dimensión y utilizamos el rango numérico de segundo orden para determinar casi completamente el espectro del operador. También encontramos cotas para el tamaño de posibles hoyos que pueden existir en el espectro del operador.

15 de noviembre de 2007.

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STABILITY OF AN INVERSE EIGENVALUE PROBLEM

Dr. Marton Kiss
Budapest University of Technology and Economics

Abstract

We investigate the stability of the inverse eigenvalue problem discussed on the previous week. If the associated exponential system form a Riesz basis, various stability results can be stated. Some of them can be considered as a generalisation of the Hausdorff–Young inequality.

4 de octubre de 2007.

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AN INVERSE EIGENVALUE PROBLEM FOR SCHRÖDINGER OPERATORS

Dr. Marton Kiss
Budapest University of Technology and Economics

Abstract

We investigate the problem whether a system of eigenvalues from different spectra determines the potential of the Schrödinger operator on a finite interval. For example, the knowledge of two sets of eigenvalues corresponding to two different boundary conditions determines the potential. We present an equivalent condition due to Horváth, in connection with the completeness of an associated exponential system, which generalizes all known result.

27 de septiembre de 2007.

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AMBARZUMIAN TYPE THEOREMS

Dr. Marton Kiss
Budapest University of Technology and Economics

20 de septiembre de 2007.

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EIGENVALUE RATIOS OF ONE–DIMENSIONAL OPERATORS

Dr. Marton Kiss
Budapest University of Technology and Economics

7 de septiembre de 2007.

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NEWS FROM TRANSFER MATRIX METHODS

Dr. Hermann Schulz–Baldes
Erlangen University

Abstract

A rotation number calculation for Jacobi matrices with matrix entries is presented. This allows to derive a formula for the density of states in the case of a random Jacobi matrix with matrix entries. In order to evaluate the appearing Birkhoff sums perturbatively with a good control of the error terms, a certain Fokker–Planck operator on the symmetric space of Lagrangian planes is used. The latter result follows from a general perturbative analysis of random Lie group actions on compact Riemannian manifolds.

6 de septiembre de 2007.

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ENTRELAZAMIENTO CUÁNTICO EN SUBSISTEMAS BIPARTITOS EN CADENAS DE ESPINES ½ CON INTERACCIONES DE LARGO ALCANCE

Dr. Omar Osenda
Universidad Nacional de Córdoba

Resumen

Se considera el entrelazamiento cuántico en subsistemas de dos espines en un anillo de *N* espines ½ interactuando con un Hamiltoniano

$$H = \sum_{1 \le j < k \le N} \left(\frac{1}{r_{j,k}} \right)^{\alpha} \sigma_j \cdot \sigma_k ,$$

donde $(\hbar/2)\sigma_j$ es el operador vectorial de espín para el *j*–ésimo espín, $r_{j,k}$ es la longitud de la cuerda entre los sitios *j* y *k*.

El caso $\alpha = 2$ corresponde al modelo de Haldane y Shastry. El entrelazamiento de subsistemas bipartitos distingue $\alpha = 2$ de $\alpha \neq 2$. Para $\alpha = 2$ no hay entrelazamiento bipartito más allá de primeros vecinos para todos los autoestados. Para $\alpha \neq 2$ se puede obtener entrelazamiento a cualquier distancia para autoestados de energía suficientemente alta dentro de un intervalo de valores de α que depende de la energía.

5 de septiembre de 2007.

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GEOMETRIC MECHANICS OF VORTICITY FIELDS AND NEUTRALLY BUOYANT RIGID BODIES

Dr. Banavara N. Shashikanth
Department of Mechanical Engineering, New Mexico State University

Abstract

The talk will focus on the dynamics of vorticity fields and vortical structures interacting with neutrally buoyant rigid bodies in ideal flows of Newtonian fluids examined in the framework of geometric mechanics. Beginning with a brief review of the ideas set forth by Arnold (’66), Marsden and Weinstein (’83), Morrison (’82) (among others) on how vorticity fields in unbounded domains can be viewed as generalized momenta, dual to the generalized velocities–– the divergence–free velocity fields–– and the Euler equations as symmetry reduced equations, I will then talk about ongoing attempts to extend this framework to the case where there is a moving neutrally buoyant rigid body in the flow. Apart from scientific curiosity, the motivations come from locomotion problems in nature and engineering such as fish swimming, design of small autonomous underwater/aerial vehicles etcetera, where the dynamic interaction of coherent vortical structures with the neutrally buoyant body is considered important for the efficient momentum transfer to and maneuverability of the moving body. Hamiltonian formulation for special configurations where the vorticity field is modeled as discrete structures, such as point vortices, vortex rings, will be discussed in detail. For a simple circular body geometry in the plane, some results on bifurcations and control of the system will also be presented. Finally, in an attempt to connect to real flows, a movie on experiments done by my colleague James Allen with a neutrally buoyant sphere and a vortex ring in a water channel will be shown.

17 de mayo de 2007.

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THE FRACTAL DIMENSION OF THE SPECTRUM OF THE FIBONACCI OPERATOR

Dr. David Damanik
Rice University, Houston, Texas

Abstract

The Fibonacci operator is the most prominent model of a one–dimensional quasicrystal and it has been studied since the early 1980's by both physicists and mathematicians. It is known that its spectrum is a Cantor set of zero Lebesgue measure. In this talk we discuss the dimension of this set. We present upper and lower bounds that give a precise answer in the large coupling limit. We also present consequences of these bounds for the spreading in space of a solution to the time–dependent Schrödinger equation with Fibonacci potential. This is joint work with Mark Embree, Anton Gorodetski, and Serguei Tcheremchantsev.

8 de mayo de 2007.

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RENORMALIZATION OF CERTAIN EXPONENTIAL SUMS AND MATRIX COCYCLES II (Joint work with A. Fedotov)

Dr. Frédéric Klopp
LAGA, Institut Galilée, Université Paris

Abstract

The talk is devoted to a simple renormalization formula for Gaussian exponential sums. We apply it to study the behavior of these sums; we obtain new results on the curlicues seen on graphs of such sums and well as recover some known results on their growth. If time allows, we will discuss an analogue of this formula for certain cocycles and some consequences regarding the Lyapunov exponent for such cocycles.

17 de abril de 2007.

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EL RANGO NUMÉRICO Y ALGUNAS GENERALIZACIONES

Dr. Rubén A. Martínez Avendaño
Centro de Investigación en Matemáticas, Universidad Autónoma del Estado de Hidalgo

Resumen

El rango numérico de un operador se define como el rango de la forma cuadrática asociada al operador, restringida a la esfera unitaria. En esta plática hablaremos acerca de algunas propiedades interesantes del rango numérico y sobre una generalización de este concepto.

19 de abril de 2007.

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RENORMALIZATION OF CERTAIN EXPONENTIAL SUMS AND MATRIX COCYCLES (Joint work with A. Fedotov)

Dr. Frédéric Klopp
LAGA, Institut Galilée, Université Paris

Abstract

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12 y 17 de abril de 2007.

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PERTURBACIONES DE RANGO UNO EN TEORÍA ANALÍTICA DE MUESTREO

Dr. Luis O. Silva
Universidad Nacional Autónoma de México

Resumen

La teoría analítica de muestreo se ocupa de la reconstrucción de funciones a partir del conocimiento de sus valores en un conjunto discreto de puntos. En esta plática se derivan fórmulas ortogonales de muestreo y sus correspondientes fórmulas de interpolación de Lagrange a partir de una familia de perturbaciones acotadas de rango uno de cierto operador autoadjunto con espectro discreto y simple. Los resultados que se presentan en esta plática se obtuvieron en colaboración con el Dr. J. Toloza.

6 de marzo de 2007.

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RENORMALIZATION OF CERTAIN EXPONENTIAL SUMS AND MATRIX COCYCLES

Dr. Frédéric Klopp
LAGA, Institut Galilée, Université Paris
(Joint work with A. Fedotov)

Abstract

The talk is devoted to a simple renormalization formula for Gaussian exponential sums. We apply it to study the behavior of these sums; we obtain new results on the curlicues seen on graphs of such sums as well as recover some known results on their growth. If time allows, we will discuss an analogue of this formula for certain cocycles and some consequences regarding the Lyapunov exponent for such cocycles.

22 y 27 de febrero de 2007.