Departament de Matemàtica Aplicada I

INTAS project 00-221

INTAS Open Call 2000, Project 00-221

Field:

Mathematics, Telecommunication and Information

Keyword:

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Chaotic motion and stability in conservative and near-conservative systems

The dynamical systems commonly found in the nature display at the same time zones with regular motion and zones with chaotic motion. The location of such different kinds of behavior, as well as the transition between them and its dependence on parameters leads to the description and full understanding of the structure of the phase space of the dynamical system.

Main Objectives:

1. To investigate the structure of the phase space for dynamical systems close to integrable Hamiltonian systems.
2. To develop and compare variational and geometrical methods for the detection of chaotic motion and diffusion in Hamiltonian systems and symplectic maps.
3. To detect analytically and numerically the exponentially small phenomena in Hamiltonian systems and symplectic maps.
4. To provide constructive tools and higher order methods for the detection of integrability and non-integrability of Hamiltonian systems.
5. To study homoclinic orbits and homoclinic bifurcations for conservative and non-conservative systems.
6. To investigate the existence of invariant objects in infinite dimensional Hamiltonian systems.
7. To study the non-analyticity and Gevrey regularity of centre-like invariant manifolds.

Research Teams

- The **UPC** (Universitat Politècnica de Catalunya) team is specialized in:
  - Galois group approach to integrability problems.
  - Various aspects of the perturbation theory, in particular convergence of normalizing transformations.
  - Dynamics under quasi-periodic perturbations.

- Splitting of separatrices for flows and diffeomorphisms.
- Dynamical systems methods in the problems of celestial mechanics.
- Symbolic and numeric computation.

Scientists involved:

1. Amadeu Delshams, Departament de Matemàtica Aplicada I
2. Pere Gutiérrez, Departament de Matemàtica Aplicada I
3. Josep Masdemont, Departament de Matemàtica Aplicada I
4. Juan José Morales-Ruiz, Departament de Matemàtica Aplicada II
5. Rafael Ramírez-Ros, Departament de Matemàtica Aplicada I
6. Tere M. Seara, Departament de Matemàtica Aplicada I
7. Jordi Villanueva, Departament de Matemàtica Aplicada I
8. Pau Martín, Departament de Matemàtica Aplicada IV
9. J. Tomás Lázaro, Departament de Matemàtica Aplicada I

- The **UM** (Università de Milano) team is specialized in:
  - KAM theory.
  - Constructive methods in classical perturbation theory.
  - Exponential stability.
  - Symbolic computation.
  - Dynamical system methods for partial differential equations.
  - Dynamics of infinite lattices.

  Scientists involved:

  1. Dario Bambusi, Dipartimento di Matematica
  2. Antonio Giorgilli, Dipartimento di Matematica e Applicazioni, Università di Milano Bicocca
  3. Luigi Galgani, Dipartimento di Matematica
  4. Andrea Carati, Dipartimento di Matematica
  5. Simone Paleari, Dipartimento di Matematica
  6. Massimo Bertini, Dipartimento di Matematica

- The **UW** (University of Warwick) team is specialised in:
  - Destruction of invariant tori
  - Anti-integrable limits
  - Dynamics of lattice systems
  - Surfaces of locally minimal flux

  Scientists involved:

  1. Robert S. MacKay, Mathematics Institute
  2. Claude Baesens, Mathematics Institute
  3. G. James, Mathematics Institute
  4. Anna Litvak-Hinenzon, Mathematics Institute
  5. Yi-Chiuan Chen, Department of Applied Mathematics & Theoretical Physics, University of Cambridge
  6. João Lopes Dias, Department of Applied Mathematics & Theoretical Physics, University of Cambridge
  7. Piers Walton, Department of Applied Mathematics & Theoretical Physics, University of Cambridge
  8. Vesna Kadelburg, Department of Applied Mathematics & Theoretical Physics, University of Cambridge
  9. Nuno Catarino, Mathematics Institute

- The **UB** (Universitat de Barcelona) team is specialized in:
  - Various aspects of the perturbation theory, in particular convergence of normalizing transformations.
  - Splitting of separatrices for flows and diffeomorphisms.
  - Complex dynamics of some classical maps.
  - Dynamical systems methods in the problems of celestial mechanics.

- Symbolic and numeric computation. Arbitrary precision computations.
- Dynamics of dissipative diffeomorphisms.

Scientists involved:

1. Carles Simó, Departament de Matemàtica Aplicada i Anàlisi
2. Gerard Gómez, Departament de Matemàtica Aplicada i Anàlisi
3. Àngel Jorba, Departament de Matemàtica Aplicada i Anàlisi
4. Joaquim Font, Departament de Matemàtica Aplicada i Anàlisi
5. Ernest Fontich, Departament de Matemàtica Aplicada i Anàlisi
6. J. Carles Tatjer, Departament de Matemàtica Aplicada i Anàlisi
7. Àlex Haro, Departament de Matemàtica Aplicada i Anàlisi
8. Claudia Valls, Departament de Matemàtica Aplicada i Anàlisi

- The **MSU** (Moscow State University) team is specialized in:
  - Theory of integrability and non-integrability.
  - Global variational methods in Hamiltonian systems.
  - Various aspects of the perturbation theory for Hamiltonian systems.
  - Averaging in fast-slow systems.
  - Splitting of separatrices for flows and diffeomorphisms.

  Scientists involved:

  1. Valery V. Kozlov, Department of mechanics and mathematics
  2. Sergey V. Bolotin, Department of mechanics and mathematics
  3. Dmitry V. Treschev, Department of mechanics and mathematics
  4. Yuri N. Fedorov, Department of mechanics and mathematics
  5. Vladimir V. Ten, Department of mechanics and mathematics
  6. Sergey Polikarpov, Department of mechanics and mathematics
  7. Oleg E. Zubelevich, Department of mechanics and mathematics

- The **SPSU** (St.Petersburg State University) team is specialized in:
  - Splitting of separatrices of symplectic maps and Hamiltonian systems.
  - Problems of exponentially small quantities in perturbation theory.
  - Homoclinic phenomena in the complex domain.
  - Problems of the positivity of the metric entropy for APM.

  Scientists involved:

  1. Nikolai Svanidze, Physics Department
  2. Alexei V. Ivanov, Physics Department
  3. Vadim L. Chernov, Physics Department
  4. Natalia V. Petrova, Physics Department
  5. Evgenii V. Volkov, Physics Department
  6. Valerii E. Valeev, Physics Department
  7. Vassili G. Gelfreich, Physics Department and Mathematics Institute, University of Warwick

- The **MSRI** (Moscow Space Research Institute) team is specialized in:
  - Theory of adiabatic invariance.
  - Modern averaging methods.
  - KAM theory.

  Scientists involved:

  1. Anatoly I. Neishtadt, Department of Space Geophysics
  2. Alexei A. Vasiliev, Department of Space Geophysics
  3. Nikolai N. Nekhoroshev, Department of mechanics and mathematics, Moscow State University
  4. Vladislav V. Sidorenko, Keldysh Institute for Applied Mathematics
  5. Dmitry L. Vainshtein, Department of Space Geophysics
  6. Alexandr P. Itin, Department of Space Geophysics

- The **RIAMC** (Research Institute for Applied Math. and Cybernetics) team is specialized in:
  - Homoclinic phenomena in Hamiltonian and dissipative systems.
  - Theory of integrability and non-integrability Hamiltonian systems.
  - Bifurcation methods in Hamiltonian and dissipative systems.
  - Dynamical system methods for partial differential equations.
  - Methods of theory of dynamical systems in the slow-fast Hamiltonian systems.

  Scientists involved:

  1. Lev M. Lerman, Department of Differential Equations
  2. Leonid P. Shilnikov, Department of Differential Equations
  3. Sergei V. Gonchenko, Department of Differential Equations
  4. Mikhail V. Shashkov, Department of Differential Equations
  5. Oleg V. Stenkin, Department of Differential Equations
  6. Oksana Yu. Koltsova, Department of Differential Equations
  7. Vladimir S. Gonchenko, Department of Differential Equations

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