

2019
CHAPTER

ICMC SUMMER MEETING ON DIFFERENTIAL EQUATIONS

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SESSIONS:

- ✓ Boundary Perturbations of Domains for PDEs and Applications
- ✓ Computational Dynamics in the Context of Data
- ✓ Dispersive Equations
- ✓ Elliptic Equations
- ✓ Evolution Equations and Applications
- ✓ Fluid Dynamics
- ✓ Linear Equations
- ✓ Nonlinear Dynamical Systems
- ✓ Ordinary/Functional Differential Equations
- ✓ Poster Session

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BOUNDARY PERTURBATIONS OF DOMAINS FOR PDES AND APPLICATIONS

Organizers: Marcone C. Pereira & Ricardo Parreira da Silva

Norm resolvent approximation of thin homogeneous tubes by heterogeneous ones

Alessandra A. Verri, Verri, César R. de Oliveira
Universidade Federal de São Carlos, Brazil

We study the operator $-\operatorname{div}(A(x)\nabla\psi(x))$ restricted to a waveguide $\Omega_\epsilon \subset \mathbb{R}^3$, with heterogeneous function $A(x)$ constant in the longitudinal direction. The purpose is to obtain an effective operator, in the norm resolvent sense, when the diameter of Ω_ϵ tends to zero with heterogeneity approaching a homogeneous situation (i.e., a constant function A). The effective operator presents a potential that, besides the traditional dependence on waveguide geometric properties, there is also a contribution from $A(x)$ which results, when combined with the curvature, for example, in the possibility of a repulsive interaction.

Joint work with César R. de Oliveira.

Continuity of attractors for C^1 perturbations of a smooth domain

Antônio L. Pereira
Universidade de São Paulo, Brazil

We consider a family of semilinear parabolic problems with nonlinear boundary conditions in a family of C^2 domains converging to a fixed domain in the C^1 -norm as a parameter ϵ goes to 0. Assuming suitable regularity and dissipative conditions for the nonlinearities, we show that the problem is well posed for $\epsilon > 0$ sufficiently small in a suitable scale of fractional spaces, the associated semigroup has a global attractor \mathcal{A}_ϵ and the family $\{\mathcal{A}_\epsilon\}$ is continuous at $\epsilon = 0$.

Recent advances in nonsmooth shape optimization

Antoine Laurain
Universidade de São Paulo, Brazil

We will see some recent results about distributed and boundary expressions of the Eulerian and Fréchet shape derivatives for several classes of nonsmooth domains such as open sets, Lipschitz domains, polygons and curvilinear polygons, semiconvex and convex domains. We will focus on the particular case of the Dirichlet energy, for which we compute first and second order distributed shape derivatives in tensor form. Depending on the type of nonsmooth domain, different boundary expressions can be derived from the distributed expressions. This requires a careful study of the regularity of the solution to the Dirichlet Laplacian in nonsmooth domains. These results are applied to obtain second order shape derivatives in matricial form for polygons.