Poster

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Shadowing Properties on Hilbert Spaces

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It is known that Morse-Smale dynamical systems defined on a compact manifold (without border) have the Lipschitz Shadowing property. We will show that some of this properties (Shadowing, Holder-Shadowing, Lipschitz Shadowing) also holds for Morse-Smale semigroups defined on infinite dimensional Hilbert spaces, that is, the Lispchitz Shadowing property holds on the global attractor $\mathcal{A}$ and the Hölder Shadowing property holds on a neighborhood of $\mathcal{A}$. This results can be applied to estimate the Hausdorff semidistance of global attractors.

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Non-autonomous semilinear parabolic equations with nonlinear Neumann boundary conditions and time-varying domains

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Let $\Omega \subset \mathbb{R}^n$, $n \geq 2$, be a nonempty bounded open set with C^2 boundary $\partial\Omega$. We consider the function $r : \mathbb{R} \times \overline{\Omega} \to \mathbb{R}^n$ such that $r \in C^1(\mathbb{R} \times \overline{\Omega}, \mathbb{R}^n)$ and $r(t, \cdot) : \overline{\Omega} \to \overline{\Omega}_t$ is a C^2-diffeomorphism, for all $t \in \mathbb{R}$, with $\Omega_t = r(t, \Omega)$. We define

$$Q_\tau = \bigcup_{t \in (\tau, +\infty)} \{t\} \times \Omega_t \quad \text{and} \quad \Sigma_\tau = \bigcup_{t \in (\tau, +\infty)} \{t\} \times \partial\Omega_t, \quad \text{for all } \tau \in \mathbb{R}.$$

We are interested in studying the following non-autonomous semilinear parabolic problem with nonlinear Neumann boundary conditions

$$\begin{cases} \dfrac{\partial u}{\partial t}(t,x) - \Delta u(t,x) + \beta u(t,x) = f(t,u), & (t,x) \in Q_\tau \\ \dfrac{\partial u}{\partial n_t}(t,x) = g(t,u), & (t,x) \in \Sigma_\tau \\ u(\tau, x) = u_\tau(x), & x \in \Omega_\tau \end{cases} \tag{13}$$

where $\beta > 0$, $n_t(x)$ is the unit outward normal vector at $x \in \partial\Omega_t$, $u_\tau : \Omega_\tau \to \mathbb{R}$ and $f, g : \mathbb{R}^2 \to \mathbb{R}$ are nonlinear functions satisfying certain conditions.

Initially, we apply a coordinate transformation technique of [2] to rewrite the original problem (13) as an auxiliary non-autonomous problem on the fixed domain Ω. So we show the existence and uniqueness of solutions to this problem and then we prove the existence of pullback attractors. Therefore, this work extends the results obtained in [1] to the case of nonlinear Neumann boundary conditions.

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Global solutions by logistic law on two-dimensional Keller-Segel-Navier-Stokes of potential type

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The present work deals with a Keller-Segel-Navier-Stokes system with potential consumption and production, under homogeneous boundary conditions of Neumann type for both the cell density, n, an attracting chemical signal c and an repulsive chemical signal v and of Dirichlet type for the velocity field u, over a bounded two-dimensional domain. In this work we investigate the effect of a generalized logistic law of degradation type and global solutions for the system

$$\begin{cases} n_t + u \cdot \nabla n - \Delta n = -\chi \nabla \cdot (n \nabla c) + \xi \nabla \cdot (n \nabla v) + kn - \mu n^\beta \\ c_t + u \cdot \nabla c - \Delta c = -n^s c, \\ v_t + u \cdot \nabla v - \Delta v = n^r - v, \\ u_t + u \cdot \nabla u - \Delta u = -\nabla P - n \nabla \Phi, \\ \nabla \cdot u = 0, \\ \partial_v n = \partial_v c = \partial_v v = u = 0, \quad n(0) = n_0, \quad c(0) = c_0, \quad v(0) = v_0, \quad u(0) = u_0. \end{cases} \tag{14}$$

Restraints on the degradation rate and support capacity for global solutions of the system are dependent on the rate of production and consumption, and this relationship is explored. Overall we extend the already existing existence results for the case $s = r = 1$.

Joint work with Gabriela Planas (Universidade Estadual de Campinas) and Francisco Guillén-Gonzalez (Universidad de Sevilla)

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