WORKING GROUPS PDE

DATE: TUESDAY, APRIL 24, STARTING FROM 15:30 [1]

On the controllability of coupled scalar parabolic equations

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In this conference we will discuss some results on the null controllability of coupled scalar parabolic equations. We will discuss several problems related with the fact that the coupling matrix in the principal part of the operator is not the identity. In one hand we will see the difficulties arising in the boundary controllability of two one dimensional equations when the coupling matrix is diagonal but not a constant times the identity, and on the other hand, we will discuss some results when trying to control with a distributed control and acting, possibly, on each equation but when the coupling matrix in the principal part is not diagonalizable. That is, in the second part of the talk we deal with the controllability properties of some nondiagonalizable parabolic systems.

Let $\Omega \subset \mathbb{R}^N$ be a non-empty regular and bounded domain, let us fix $T > 0$ and let us set $Q := \Omega \times (0,T)$ and $\Sigma := \partial\Omega \times (0,T)$. We will consider the null controllability properties of the linear system

$$\begin{cases} y_t - A\Delta y = M(x,t)y + Bv1_\omega & \text{in } Q \\ y = 0 & \text{on } \Sigma \\ y(x,0) = y_0(x) & \text{in } \Omega \end{cases} \tag{1}$$

where $\omega \subset \Omega$ is a (small) open subdomain,

$$A \in \mathcal{L}(\mathbb{R}^n;\mathbb{R}^n),\ M \in L^\infty(Q;\mathcal{L}(\mathbb{R}^n;\mathbb{R}^n)),\ B \in \mathcal{L}(\mathbb{R}^m;\mathbb{R}^n) \text{ and } y_0 \in L^2(\Omega)^n.$$

with A a non diagonalizable matrix.

Numerical control of the discrete monopole problem

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This talk deals with an discrete phase transition model: the monopole prob- lem. We propose a numerical method to solve the control problem. The proposed method allows us to control any given initial state $(R_1(0), \ldots, R_M(0)) \in \mathbb{R}^M$ to reach a final state $(R_f, \ldots, R_f) \in \mathbb{R}^M$ at any time $T > 0$.

[1] The presentation will last about 30 minutes + further questions and discussions