



Workshop on Nonlinear Analysis and Control Theory in
Honor of Professor Enrique Zuazua for his 60th birthday

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Constrained control in reaction-diffusion equations

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Abstract

The classical control theory for parabolic equations does not take into account the fact that specific reaction-diffusion equations make physically sense only if the state is within $[0, 1]$, in case that the solution has to model a proportion. The talk will concern the techniques developed in [1, 2, 3, 4] in order to obtain control strategies satisfying the modelling constraints. Furthermore, it will be observed, under certain criteria, the lack of controllability due to the imposition of state constraints.

Joint work with:

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References

- [1] D PIGHIN, E ZUAZUA, *Controllability under positivity constraints of semilinear heat equations* Mathematical Control and Related Fields, 2018
- [2] C. POUCHOL, E. TRÉLAT, AND E. ZUAZUA,, *Phase portrait control for 1d monostable and bistable reaction-diffusion equations*, Nonlinearity 32 (2019), no. 3, 884-909.

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- [3] D RUIZ-BALET, E ZUAZUA, *Control under constraints for multi-dimensional reaction-diffusion monostable and bistable equations* Journal de Mathématiques Pures et Appliquées 143, 345-375
- [4] I MAZARI, D RUIZ-BALET, E ZUAZUA, *Constrained control of gene-flow models* arXiv preprint arXiv:2005.09236