Some ideas on the numerical approximation of null-controls for the heat equation

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Abstract

This talk is devoted to the numerical approximation of controls for the heat equation. In a first part, we recall that the approximation of the null-control of minimal L^2 norm is severally ill-posed, exhibiting high oscillations near the controllability time which are difficult to capture. The drawback of some standard well-posed perturbations (Tychonov regularization, quasi-irreversibility method, ...) is discussed. In a second part, we introduce in the L^2 norm some specific weights with permits to solve directly the optimality conditions of the corresponding cost with a mixed finite element strategy (part in collaboration with E. Fernández-Cara). In a third part, we briefly mention the transmutation method which express controls for the heat equation in term of controls for a wave equation (part in collaboration with E. Zuazua).