

Minimal time control for parabolic-type equations

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We present a time optimal control problem for evolution equations in Hilbert spaces, with applications to parabolic-type equations. The time optimal control problem resides in searching for a constrained internal control able to drive the trajectory of the solution from an initial state to a given target set in the shortest time, while controlling over the complete timespan. Actually we focus on the maximum principle for the time optimal controls and in particular for those having the dimension smaller than that of the state system. Also, we discuss about the minimal time sliding mode control. The theoretical results are developed in an abstract framework and the proofs and the characterization of the controls provided by the first order necessary conditions of optimality rely on a set of hypotheses meant to cover a large class of applications. Among them, we refer to control problems governed by parabolic equations with potential and drift terms, porous media equation or reaction-diffusion systems with linear and nonlinear perturbations describing real world processes.

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