

Control of degenerate evolution equations in one space dimension

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Abstract: This talk aims to discuss analogies and differences in the study of controllability problems for evolution equations in one space dimension which exhibit boundary degeneracy. Given a function $a \in \mathcal{C}([0, 1]) \cap \mathcal{C}^1(]0, 1])$ such that $a(x) > 0$ for all $x \in]0, 1]$ and $a(0) = 0$, we are interested in the controllability properties of the parabolic operator

$$Pu(t, x) = u_t(t, x) - (a(x)u_x(t, x))_x \quad (t, x) \in]0, T[\times]0, 1[$$

as well as the hyperbolic one

$$Hu(t, x) = u_{tt}(t, x) - (a(x)u_x(t, x))_x \quad (t, x) \in]0, T[\times]0, 1[,$$

with suitable boundary conditions. The parabolic case will be considered first with both locally distributed and boundary controls. We shall present the main results obtained for this problem via Carleman estimates, mainly in collaboration with P. Martinez and J. Vancostenoble. Then, the controllability problem will be approached for operator H with boundary controls by the multiplier method, as was done in a recent work with F. Alabau-Boussouira and G. Leugering. In this case, boundary stabilization results will also be derived.