

Exact Controllability through Flatness Method in Space of Analytic Functions

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This talk addresses the local controllability result for a general class of 1D partial differential equations on the interval $(0, 1)$. The PDEs we consider take the form

$$\partial_t^N y = \zeta_M \partial_x^M y + f(x, y, \partial_x y, \dots, \partial_x^{M-1} y)$$

where $1 \leq N < M$, $\zeta_M \in \mathbb{C}^*$, and f some linear or nonlinear term of lower order. The local controllability result between analytic function states and analytic boundary data satisfies some compatibility conditions. The proof is performed by studying a nonlinear Cauchy problem in the spatial variable with data in some spaces of Gevrey functions and investigating the relationship between the jet of space derivatives and the jet of time derivatives. Some examples are presented, such as the (good and bad) Boussinesq equation and the Korteweg-de Vries equation.

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