Control of 1-D hyperbolic systems

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Abstract

This talk deals with the control of systems modeled by hyperbolic systems in one space dimension. These systems appear in various real life applications (navigable rivers and irrigation channels, heat exchangers, plug flow chemical reactors, gas pipe lines, chromatography,...). On these systems we study the controllability and the stabilization problems. For the controllability, we recall and sketch proofs of results by Tatsien Li and his school. We also study the case of a water tank control system, a case where the linearized control system is not controllable: the controllability is obtained thanks to the nonlinearities. For the stabilization, we show how to construct explicit stabilizing feedback laws. We present specific feedback laws which have been implemented for the regulation of the rivers La Sambre and La Meuse (in collaboration with B. d'Andréa-Novel, G. Bastin and L. Moens). We show the importance of the choice of functional spaces for the stabilization issue: different functional spaces lead to different conditions on the feedback laws for the exponential stability even in the regular case (in collaboration with H.-M. Nguyen).