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Exponential BV stability for networks of scalar conservation laws

vendredi 4 décembre 2020 14:30 (30 minutes)

In this presentation, we will talk about networks of $d \in \mathbb{N}$ scalar conservation laws with positive characteristic velocities. The interaction takes place at the boundary, where a feedback operator acts. The open loop system is given below with H a square matrix given by the physics having a destabilizing effect:

\begin{equation}
\left\{
\begin{array}{lll}
R_t + [f(R)]_x &=& 0 \\
R(t,0) &=& HR(t,1) + u(t) \\
R(0,x) &=& R_0(x)
\end{array}
\right.
\end{equation}

To stabilize this system, we design a feedback control of the form $u(t) = KR(1,t)$ where K is a control gain to be designed. Such stabilization problem had been widely treated in the literature in various settings [2,3]. Nonetheless for the discretized version of the problem, it is far from being obvious that a control synthesized from the continuous theory stabilizes the discretized open-loop system.

In this talk, we focus on numerical aspects related to system (1). Using flux limiter schemes [1], we study the influence of the choice of the limiter on the BV exponential stability of numerical solutions.

[1] Sweby, P. K., High resolution schemes using flux limiters for hyperbolic conservation laws, SIAM Journal on Numerical Analysis, 1984.

[2] Bastin, G. and Coron, J.-M., Stability And Boundary Stabilization Of 1-D Hyperbolic Systems, Springer International Publishing, 2016.

[3] Coron, J.-M. and Ervedoza, S. and Ghoshal, S.S. and Glass, O. and Perrollaz, V., Dissipative boundary conditions for 2×2 hyperbolic systems of conservation laws for entropy solutions in BV, Journal of Differential Equations, 2017.

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