Accurate and stable boundary conditions for high-order discretizations of hyperbolic PDEs

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In this talk, we provide a rigorous analysis of various boundary conditions applicable to Runge–Kutta methods for hyperbolic conservation laws. In particular, we focus on perturbed Runge–Kutta methods that use both upwind- and downwind-biased discretizations; such methods have been used until now only with periodic boundary conditions. Moreover, we examine the boundary conditions under which a perturbed Runge–Kutta method coupled with a TVD spatial discretization maintains the TVD property. Several examples in one- and two-dimensional hyperbolic problems exhibit the robustness of the boundary condition treatment and the high order of accuracy at the boundaries.