Central-upwind Schemes for Some Hyperbolic Conservation Laws with Nonlinear Terms

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Abstract: In this talk, we study solution behavior for two hyperbolic conservation laws with nonlinear force terms at large time via central-upwind schemes. The most advantage of central-typed scheme is simplicity because no approximate Riemann solver is needed. Central-upwind scheme employs this advantage with less numerical viscosity so that it can be applied to study solution behavior at large time.

We start with a brief introduction to the semi-discrete central-upwind scheme by Tadmor and Kurganov in 1998 and then use it to simulate an initial-boundary value problem of a 2x2 p-system with nonlinear force term. We confirm that the solution globally exists and converges to its corresponding diffusion wave, or the solution blows up at a finite time under suitable condition. For convergence case, convergence rates are calculated.

We then turn to study solution behavior of an initial-value problem of a 1D Euler-Poisson equation defined on bounded domain. With the help of an improved Kurganov-Tadmor scheme introduced by Kurganov, Noelle and Petrova in 2001, we demonstrate that the solution converges to its corresponding boundary value problem.

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