

On all-regime and well-balanced Lagrange-Projection schemes for compressible fluid systems

Thursday, August 30, 2018 2:30 PM (45 minutes)

It is the purpose of this talk to provide an overview on recent advances on the development of Lagrange Projection like numerical schemes for compressible fluids systems with source terms.

The key idea of the Lagrange-Projection strategy is to decouple the acoustic and transport phenomenon. When combined with a Suliciu like relaxation technique, the Lagrange-Projection strategy leads to efficient implicit-explicit discretisations on fixed unstructured grids, with CFL conditions driven by the (slow) material waves and not by the (fast) acoustic waves. The resulting scheme also satisfies a fully discrete entropy inequality. As we will see, the strategy is very well-suited to design efficient all-regime and well balanced numerical schemes. For the purpose of illustration, we will first consider the nearly incompressible limit of low Mach number flows and the diffusive limit of the gas dynamics equations with source terms, for which asymptotic-preserving schemes are proposed. We will also show that the strategy allows to design fully well-balanced schemes for the shallow water equations. By fully well-balanced, we mean here that the scheme is able to preserve stationary states with non-zero velocity.

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