Expositor:

Luis M. Villada

Centro de Investigación en Ingeniería Matemática (CI^{2}MA), UDEC

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Lagrangian-remap schemes for the multiclass Lighthill-Whitham-Richards traffic model

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Resumen

The multiclass Lighthill-Whitham-Richards (MCLWR) traffic model, which distinguishes N classes of drivers differing in preferential velocity, gives rise to a system of N strongly coupled, nonlinear first-order conservation laws for the local car densities as a function of distance and time.We propose a new class of anti-diffusive schemes by splitting the system of conservation laws into two different first-order quasilinear systems, the scheme is to combine the solution of the equations in a Lagrangian reference frame with an algorithm to remap the original mesh. The new schemes are addressed as Lagrangian-Remap (LR) schemes. One version of LR schemes incorporates recent anti-diffusive techniques for transport equations. The corresponding subclass of LR schemes are named Lagrangian-antidiffusive-remap(LAR) schemes. Alternatively, the remap step can be handled by a Glimm-like random sampling method, which gives rise to a statistically conservative Lagrangian-random sampling (L-RS) scheme that is less diffusive than other remap techniques. The LR schemes for the MCLWR model are supported by a partial analysis of the L-AR schemes for N = 1, which are total variation diminishing (TVD) under a suitable CFL condition and therefore converge to a weak solution, and numerical examples for both L-AR and L-RS subclasses of schemes..