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Riemann solution approximation based on zero diffusion-dispersion limit of Dafermos type

In the present work, a new numerical strategy is designed to approximate the Riemann solutions of systems of conservation laws. Here, the main difficulty comes from the definition of the discontinuous solutions. Indeed, the shock solutions are no longer selected by entropy criterion but they are defined as the zero limit of a diffusive-dispersive system. As a consequence, the solutions of interest may contain nonclassical shocks. In order to derive a suitable numerical approach, the Dafermos diffusion technique is here adopted. Then, the PDE initial value problem reformulates as an ODE boundary value problem. A fourth-order finite difference scheme is introduced to approximate the solution of the ODE boundary value problem under consideration. In this work, a particular attention is paid on the existence of the discrete solutions. Several numerical experiments illustrate the relevance of the derived numerical strategy.