ICM 1998, Berlin, Aug. 18–27

Abstracts of Short Communications and Posters

Section:

15. Numerical Analysis and Scientific Computing

1991 MS Classification: 65,76,80,86
Fuhrmann, Jürgen, Langmach, Hartmut, Weierstrass Institute Berlin, Germany

Numerically Stable Finite Volume Discretizations for Nonlinear Parabolic Problems

We introduce a time-implicite Voronoi box based finite volume discretization for the initial-boundary value problem of a scalar nonlinear viscous conservation law in a one, two- or threedimensional domain. Using notations from the theory of explicit finite volume methods for hyperbolic problems and results from the Perron-Frobenius theory of nonnegative matrices, we establish various existence, stability and uniqueness results for the discrete problem.
The class of schemes introduced covers hyperbolic problems as well as degenerate diffusion problems, and a broad range of equations interesting from an application point of view.
To clarify our results, we provide numerical examples, and we show the practical relevance of our considerations with a groundwater flow example.