Adrian Sandu

Multirate integration methods for PDEs

Computer Science Department
Virginia Tech
Blacksburg
VA 24061
sandu@cs.vt.edu
Emil Constantinescu

Conservative high resolutionmethods with explicit time discretization have gained widespread popularity for numerically solving conservation laws. Stability requirements limit the temporal step size, with the upper bound being determined by the ratio of the temporal and spatial meshes and the magnitude of the wave speed. The timestep for the entire domain is restricted by the finest (spatial)mesh resolution or by the highest wave velocity, and is typically (much) smaller than necessary to accurately represent other variables in the computational domain. Implicit, unconditionally stable timestepping algorithms allow large global timesteps; however, this approach requires the solution of large (non)linear systems of equations.

We discuss new multirate methods for the solution of conservation laws.In multirate time integrationmethods, the timestep can vary across the spatial domain and has to satisfy the CFL condition only locally, resulting in substantiallymore efficient overall computations. We discuss the construction of multirate methods that are conservative and preserve the linear and nonlinear stability.