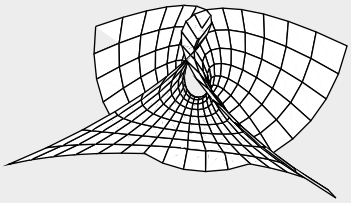

Oberseminar Mathematische Strömungsmechanik

Institut für Mathematik der Julius-Maximilians-Universität Würzburg

Hyperbolic equations - structure preserving methods & other topics

Viktor Linders

Lund University, Sweden

Conservative iterative methods for conservation laws

Abstract:

When pursuing the modelling of compressible viscous flows, turbulence, boundary layers or shocks, this present particularly challenging problems. Conservation laws and their discretizations serve as a stepping stone towards numerically capturing these phenomena. Often, the resulting initial value problem is stiff and has very high dimensions, which necessitates the use of implicit time integration and iterative methods to obtain approximate numerical solutions. Theory and practical experience suggests that the ability to discretely mimic the conservative properties of the conservation law is central to ensuring a robust and convergent scheme. Yet, while spatial discretizations and time integration methods often are designed upon this principle, iterative methods typically are not.

In this talk we explore some well known families of iterative methods in the context of global and local conservation. Many commonly used methods are able to preserve the global conservation of an underlying implicit scheme. However, there are exceptions such as the Jacobi and Gauss-Seidel iterations. Further, local conservation is preserved by pseudo-time iterations as well as Newton's method, under certain restrictions on the space-time discretization. We present an extension of the Lax-Wendroff theorem that incorporates pseudo-time iterations and show that the resulting method in general is inconsistent, unless special care is taken in the choice of pseudo-time steps. A simple trick is shown to solve this issue and numerical experiments indicate that faster convergence can be expected if the trick is applied.

via Zoom video conference (request the Zoom link from klingen@mathematik.uni-wuerzburg.de)

Friday, Sept. 24 at 3 pm CET

Zu diesem Vortrag sind Sie herzlich eingeladen.

gez. Christian Klingenberg