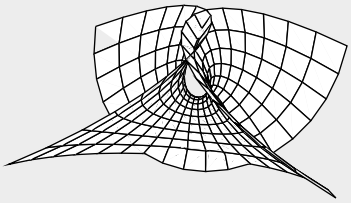

Oberseminar Mathematische Strömungsmechanik

Institut für Mathematik der Julius-Maximilians-Universität Würzburg

Structure preserving numerical methods for hyperbolic equations

Gregor Gassner

Universität zu Köln, Germany

Entropy-dissipation/stability and local linear stability

Abstract:

In recent years, a strong push to construct novel entropy-stable schemes based on the summation-by-parts property has occured in the high-order community. These schemes mimic the second law of thermodynamics, by incorporating the entropy contraction property of the continuous PDE into the discretisation. A key ingredient is summationby-parts, which mimics integration-by-parts and the definition/condition of Tadmor for entropy-conserving flux functions, which discretely mimics the chain-rule necessary for an entropy pair to contract the PDE. These novel methods gain more and more succes, as they offer great robustness for highly non-linear problems such as compressible turbulence. We will however report in this talk on recently observed stability issues of entropy-conservative/stable high order schemes. We investigate the local linear stability of the schemes when approximating non-linear conservation laws such as the simple Burgers equation and the compressible Euler equations. We demonstrate that local linear stability is not guaranteed, even when the scheme is (non-linearly) entropy stable, as parts of the high-order scheme might be anti-diffusive in relation to a central discretisation. We show in numerical tests that the lack of local linear stability might have a severe impact on the simulation, as exponential growth of spurious solution modes might occur leading to potential fatal crashes of the run.

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

Thursday, Nov. 19 at 9:30 am

Zu diesem Vortrag sind Sie herzlich eingeladen.

gez. Christian Klingenberg