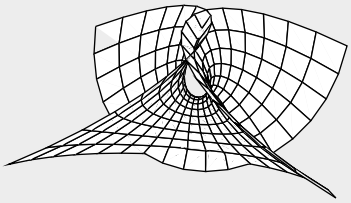

Oberseminar Mathematische Strömungsmechanik

Institut für Mathematik der Julius-Maximilians-Universität Würzburg

Gero Schnücke

Universität Jena

Split form ALE discontinuous Galerkin methods for the Euler equations

Abstract:

The construction of discontinuous Galerkin (DG) methods for the compressible Euler equations includes the approximation of non-linear flux terms in the volume integrals. The terms can lead to aliasing and stability issues, e.g. due to under-resolution of vortical dominated structures. The kinetic energy or entropy are elevated in smooth, but under-resolved parts of the solution which are affected by aliasing. It is known that the kinetic energy is not a conserved quantity for compressible flows, but for small Mach numbers minor deviations from a conserved evolution can be expected. In Gassner, Winters and Kopriva (2016) a framework to construct provable kinetic energy preserving (KEP) and entropy conserving (EC) DG methods to solve the Euler equations on conform static meshes has been introduced.

Real world applications, e.g. the simulation of turbulent flows around airfoils, require adaptive discretizations to reduce the computational costs and degrees of freedoms. The r-adaptive method involves the re-distribution of the mesh nodes in regions of rapid variation of the solution. In comparison with h-adaptive discretizations, where the mesh is refined and coarsened by changing the number of elements in the tessellation, the r-adaptive method has some advantages, e.g. no hanging nodes appear and the number of elements does not change. On the other hand a r-adaptive method can be only used when the effect of mesh movement is appropriately accounted for the discretization. This can be done by an Arbitrary Lagrangian-Eulerian (ALE) approach.

In this talk, the split form framework from Gassner, Winters and Kopriva (2016)] and the ALE framework are used to construct KEP and EC moving mesh DG methods for the Euler equations. Numerical experiments will be presented to validate the capabilities of these split form ALE DG methods.

This is joint work with Nico Krais, Thomas Bolemann and Gregor J. Gassner.

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

Monday, July 27 at 9:30 am

Zu diesem Vortrag sind Sie herzlich eingeladen.

gez. Christian Klingenberg