Universität Stuttgart

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Institut für Aerodynamik und Gasdynamik

Institut für Aerodynamik und Gasdynamik
Prof. Dr. Claus-Dieter Munz

Introduction to Discontinuous Galerkin methods

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Prof. Jochen Schütz, University of Hasselt

Seminar organised within the framework of DROPIT

July 8th and 9th, room 2.222 of Pfaffenwaldring 31

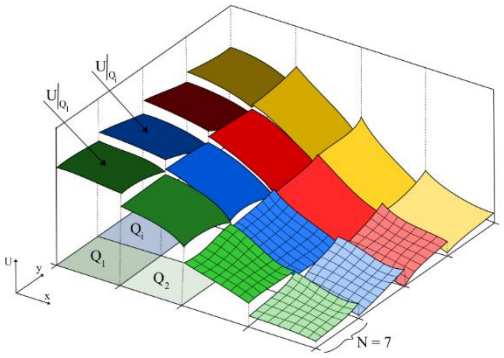
Abstract

In this seminar, we will give a brief introduction to Discontinuous Galerkin methods for conservation laws and their applications to challenging flow problems. First, we will highlight the advantages and challenges of high order schemes for smooth and non-smooth problems and give an overview of the current state of the art. Then, we will introduce the basics of polynomial function approximation through projection and interpolation and derive the DG formulation. We will discuss approximation properties and highlight some discretization choice as well as their effects on accuracy and efficiency. The lectures are accompanied by hands-on sessions, in which the basic building blocks will be implemented in a Matlab code and practical examples will be discussed. External experts in DG will present advanced aspects of DG and give on overview of the current state of research.

Tentative Schedule

Day 1:

- Introduction, High Order Schemes
- Polynomial Approximation, Interpolation, Projection, DG for hyperbolic systems
- The Discontinuous Galerkin Spectral Element methods
- Hands-on Session: DG operator in 1D



$$\frac{\partial}{\partial t}\int_E J\vec{U}\phi\, d\vec{\xi} + \oint_{\partial E}\left(\vec{\mathcal{F}}_n^{u*} - \vec{\mathcal{F}}_n^{v*}\right)\phi\, d\vec{s} - \int_E \vec{\mathcal{F}}(\vec{U},\vec{\nabla}_x\vec{U})\cdot\vec{\nabla}_\xi\phi\, d\vec{\xi} = 0$$

Day 2:

- Introduction to h-DG
- Special Topics: Parallelization, Meshing, Shock Capturing
- Extension to the Navier-Stokes equations

If you would like to participate, please send an email with your name and contact email to beck@iag.uni-stuttgart.de before **June 29th**. Also, please bring a notebook **with Matlab** installed on it for the hands-on session (student licence is ok!). If you do not have Matlab, please indicate this in the email so we can try to find an alternative!

- Hands-on Session: FLEXI

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