Chair for Computation in Engineering
Prof. Dr.rer.nat. Ernst Rank
Arcisstraße 21, D-80290 München

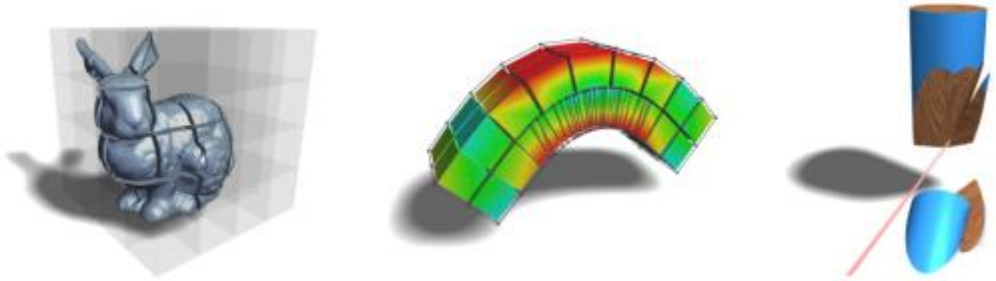
Software Lab:

Literature: ★★★★☆
Mathematics: ★★★☆☆
Programming: ★★★★★

Implementation of a Discontinuous Galerkin Method in MATLAB

Setting

Discontinuous Galerkin Methods have experienced a huge growth in interest in the last decades. Since they employ purely discontinuous shape functions, h- and p-refinement can be performed simply and efficiently. Furthermore they lead to block-diagonal mass matrices, which simplifies parallelization for hyperbolic problems.



http://graphics.ethz.ch/research/physics_animation_fabrication/simulation/dgfem.php

Task

The rough schedule might look the following:

- Learn about the background of DG methods using the provided literature
- Choose one formulation suitable for the wave equation
- Implement a simple 2D DG Code for hyperbolic problems in MATLAB
- Derive an appropriate benchmark test case for the wave equation
- Compare the different formulations

Supervisors

Tino Bog, Simulation in Applied Mechanics Group, tino.bog@tum.de
Nils Zander, Simulation in Applied Mechanics Group, nils.zander@tum.de

References

[1] D.N. Arnold, F. Brezzi, B. Cockburn and L.D. Marini, Unified analysis of discontinuous Galerkin methods for elliptic problems, SIAM J. Numer. Anal. 39(5):1749-1779, 2002.
[2] B. Cockburn, G. E. Karniadakis and C.-W. Shu (eds.), Discontinuous Galerkin methods. Theory, computation and applications, Lecture Notes in Computational Science and Engineering, 11. Springer-Verlag, Berlin, 2000.