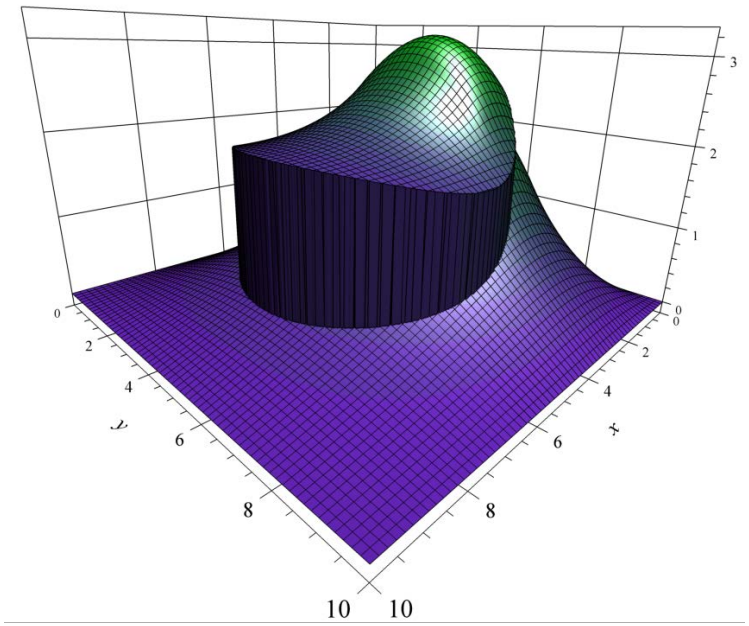
GRADUATE SCHOOL
computational engineering

TECHNISCHE UNIVERSITÄT DARMSTADT

Subject: Simulation of the droplet combustion and impact on a solid surface using high-order accurate Discontinuous Galerkin Method for multi-phase incompressible flows

Research Focus/ Cross-sectional Area: Multi-phase flows (R6)



Description:

The Discontinuous Galerkin Method (DGM) is a highly accurate numerical technique for the solution of partial differential equations. Two key features are the use of arbitrary high order approximations of the local solution and the excellent parallelizability due to its strong locality in space. The DGM is the basis for the highly object-oriented framework *BoSSS* (*Bo*unded *S*upport *S*pectral *S*olver), which is under active development at the Chair of Fluid Dynamics. Using DGM, it is generally capable of solving a broad variety of partial differential equations relevant for different applications such as single- and multi-phase fluid flows.

The main objective of this project is to numerically investigate the combustion of a single fuel droplet and the impact of the combusing droplet on a solid surface. For this purpose, the DG library BoSSS is employed to accurately compute the two-phase incompossible flows with non-material deformable interface and the transport processes of chemical species. The droplet combustion is simulated by an interface tracking method combined with the extended DG (cut-cell) method and non-smooth basis functions. The fluid-solid heat exchange during the impact and spreading of the droplet on the solid surface will also be investigated.

Requirements:

Applicants have a strong interest in both numerical simulation and mathematical modelling of flow problems. Advanced knowledge in numerical methods and in mathematical analysis is a key pre-requisite.

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