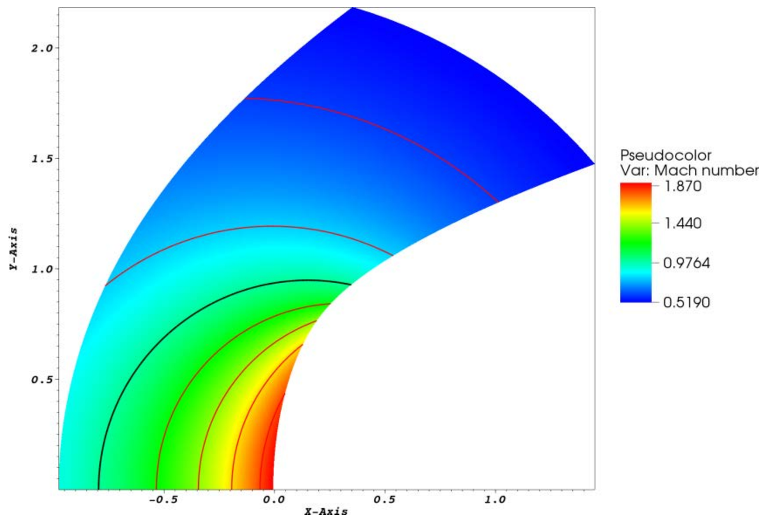
GRADUATE SCHOOL
computational engineering

TECHNISCHE UNIVERSITÄT DARMSTADT

Subject: High-order accurate simulation of the collapse of cavitation bubbles using Discontinuous Galerkin Method for compressible multi-phase flows

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



Description:

The Discontinuous Galerkin Method (DGM) is a highly accurate numerical technique (essentially, a merging of the Finite Element with the Finite Volume Method) 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 department 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.

This project is concerned with the application of the BoSSS solver to the simulation of the collapse of cavitation bubbles. Cavitation is undesirable in the majority of applications, but can still be observed in many elementary technical devices. The direct numerical simulation of this phenomenon including a vast number of bubbles and compressibility effects is extremely difficult. Understanding the collapse of isolated cavitation bubbles is a key ingredient for the enhancement of models describing the flow behavior and potential side effects such as cavitation damage.

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.

Supervisors: M. Oberlack, Fluid Dynamics, Department of Mechanical Engineering