Aerodynamisches Institut und Lehrstuhl für Strömungslehre | RWTH AACHEN UNIVERSITY

Bachelor/Master Thesis

Conservative interface tracking methods for multiphase flows

In this thesis, an existing flow solver has to be extended to improve the accuracy for multiphase simulations.

In the context of electric discharge machining (EDM) the multiphase transport phenomena during the machining process are investigated. One key aspect is the dynamic of the liquid-gaseous dielectric fluid in the gap between tool and workpiece. The knowledge of the exact behaviour of both fluid phases is essential to improve the machining quality.

At the Institute of Aerodynamics a multiphysics solver is developed to enable the simulation of such multiphase flow problems. It offers a variety of numerical methods such as finite volume (FV), discontinuous Galerkin (DG) and lattice Boltzmann method (LBM) to tackle different fluid dynamics problems. The Code is highly parallelized to efficiently utilize high-performance computing hardware.

While the fluid phases are computed using LBM, the phase interface in between is captured by a standard level set method (LS). One of the major drawbacks of this method is it being non-conservative, i.e. depending on the deformation of the interface, significant mass loss can occur. To remedy this problem, different approaches can be found in the literature, which need to be implemented. Existing benchmarks for multiphase flow problems such as rising bubbles will be used to validate the improved mass conservation.

A cluster of rising bubbles undergoes heavy deformation: A challenging task for the interface tracking algorithm.

You ...

- ... are interested in fluid dynamics and applied physics
- ... had significant exposure to modern programming concepts
- ... are eager to learn new skills and are able to work in an independent manner

If you are interested, please contact:

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