Aerodynamisches Institut und Lehrstuhl für Strömungslehre | RWTH AACHEN UNIVERSITY

Bachelor/Master Thesis

Topics in multiphase flow simulations using the Lattice Boltzmann Method

Multiphase flow phenomena occur in a variety of technical applications such as:

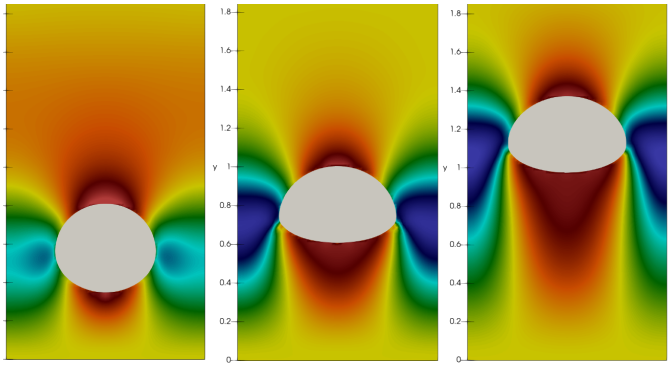
- Bubble laden turbulent flows in chemical processing plants
- Spray dynamics and droplet atomization in internal combustion engines
- Particle laden turbulent flows in solid fuel combustion chambers

The simulation of technically relevant problems imposes many challenges to the numerical scheme used:

- Mass conservative tracking of the deformable phase interface
- High density and viscosity ratio (e.g. water - air, liquid - vapor)
- Highly efficient algorithms with good parallel performance

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.

Due to its good parallelization properties and the incompressible nature of the liquid phase flow, the Lattice Boltzmann Method is the numerical scheme of choice for the simulation of bubble laden turbulent flows. To incorporate the effect of buoyancy and surface tension special forcing and boundary condition schemes are needed.



Rising bubble undergoing deformation.

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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