

WORKGROUP FOR MULTIPHASE FLOWS

Lattice Boltzmann approach

The program LBsim3D (Lattice-Boltzmann simulation 3D) is based on the Lattice-Boltzmann method and is used for direct numerical simulation of disperse fluid-solid flows in electric and thermic fields.

Features and implemented models:

1. flow solver:

- ▶ Structured equidistant and non-equidistant 3D grids
- ▶ Discretisation with the D3Q19 model
- ▶ Single-Relaxation-Time collision operator based on BGK approach
- ▶ Laminar and turbulent flows (spectral stimulation of isotropic homogenous turbulence)

2. Handling of numerically highly resolved particle surfaces:

- ▶ Curved Boundaries for complex morphologies
- ▶ Generation and characterization of agglomerates
- ▶ Determination of forces and flow coefficients of arbitrary particles
- ▶ Lagrangian particle tracking (translation and rotation)

3. Lagrangian tracking of point particles:

- ▶ Stationary and instationary particle tracking
- ▶ Considered Forces acting on particle: drag, gravitation, lift, pressure gradient, virtual mass, Basset, Saffman, Magnus, Brownian motion Bewegung, electric field
- ▶ Particle rotation
- ▶ Different injection methods
- ▶ Deterministic particle-particle collision model
- ▶ Deterministic particle-wall deposition model

4. Solver for the temperature field:

- ▶ Hybrid Temperature-Lattice-Boltzmann method
- ▶ Stationary and instationary coupling

5. Solver for electric fields:

- ▶ Solution of the Laplace equation