

WORKGROUP FOR MULTIPHAS FLOWS

Euler/Lagrange approach

OpenFOAM®

OpenFOAM (Open-source Field Operation And Manipulation) is a C++ (<https://en.wikipedia.org/wiki/C%2B%2B>) open source software for the development of computational fluid dynamics (CFD) and continuum mechanics customized numerical solvers. It can handle several applications in the multiphase flows field.

- ▶ Particle tracking.
- ▶ Reacting multiphase models for heat transfer, population balance, breakup, coalescence, etc.
- ▶ Heat transfer.
- ▶ Reactions/combustion.
- ▶ Turbulence.
- ▶ Mesh interfaces.

In the Multiphase flow working group (MPS – IVT) different codes have been developed for the particle tracking using Euler/Lagrange approach, including:

- ▶ Stochastic particle-particle collision model.
- ▶ particle-wall-collisions.
- ▶ Agglomeration / Deposition.
- ▶ Mass transfer.
- ▶ Evaporation.
- ▶ Different dispersion models (isotropic, anisotropic).
- ▶ Different injection methods.
- ▶ Different particle/bubble forces: Drag, Saffman force, Magnus force, virtual mass, Brownian motion, thermophoresis, bubble lift force, wall force, Basset history force.
- ▶ Adapted Lagrangian time step
- ▶ Source term distribution.

Fastest3D

The flow solver FASTEST (Flow Analysis Solving Transport Equations with Simulated Turbulence) is an efficient program to calculate flows in complex three-dimensional applications.

Further information: ▶ Fastest Website (http://www.fnb.tu-darmstadt.de/forschung_fnb/software_fnb/software_fnb.de.jsp)

Lag3D

Lag3D (Lagrangian 3D) is a program for simulating dispersed phases in a continuous medium, that can be used together with Fastest3D. In doing so the particles' trajectories are determined with the flow field via a Lagrange approach.

Features and implemented models

- ▶ Calculation of volume averaged phase properties
- ▶ Particle-wall-collisions
- ▶ Stochastic particle-particle collision model
- ▶ Agglomeration / coalescence
- ▶ Vaporization
- ▶ Laminar / turbulent tracking
- ▶ Different dispersion models (isotropic, anisotropic)
- ▶

- ▶ Quasi-instationary tracking
- ▶ Particle rotation
- ▶ Different injection geometries
- ▶ 2/4 Way-coupling with flow solver
- ▶ Implemented particle forces: drag, Saffman force, magnus force, virtual mass, Brownian motion, thermophoresis
- ▶ Consideration of Cunningham correcture

The code is available for scientific purposes.

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