OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

WORKGROUP FOR MULTIPHAS FLOWS

Spatial distributed coupling Euler/Lagrange methods

Grant number

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Project title

Development of an Euler / Lagrange method with spatially distributed coupling

Project leader

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Realized by

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Short description of the project

The Euler/Lagrange method simulating disperse multi-phase flows is based upon the assumption that particles are notably smal than the used control volumes. This includes a point by point coupling between phases (point particle approximation). In many practical applications this requirement is not met. In bubbly flows with a wide size spectrum the bubble diameter is similar to the grid size or even larger. In the pneumatic transport of large particles the grid has to be multiple times finer close to the wall, so th grid size becomes inevitably smaller than the particles.

To simulate those multi-phase processes efficiently nonetheless, the Euler/Lagrange method shall be extended by an innovative approach to take the finite dimensions of particles during phase coupling into account. The fluid velocity acting on the particle is not calculated for its center of mass, but from the control volumes located in the direction of movement. The particles retroaction on the flow is modeled via spatially distributed source term, respectively a spatially distributed perturbation. Preliminary studies have confirmed the feasibility of this method. The turbulence is modeled with a sub-grid model, in a way that the particles retroaction on the flow is fully described by the momentum sources. This proposed method also has the advantage that the hydrodynamic interaction between particles is automatically covered.

In the last part of the project a hybrid method will be developed, that can be used on heterogeneous multi-phase flows. In the presence of large and small particles spatially distributed coupling as well as pointwise coupling are combined.

final report of the research 

project