Investigation of the numerical properties of the Volume of Fluid method for the calculation of flows with free surfaces.

The Volume of Fluid (VOF) method is currently the most common used method for calculating flows with free surfaces, it means, flows with at least 2 phases (liquid-gas or liquid-liquid).

With the VOF method, the volume fraction of a phase is stored within a calculation cell as an additional variable α. The movement of α described using a convection equation.

A problem of the method is the lack of conservation of mass and the "smearing" of interfaces due to the finite resolution of computational grids. This can be counteracted by local refinement of the grid. OpenFOAM offers the corresponding functionality for this purpose, which is to be systematically evaluated within the scope of the present project work.

As part of the work, the following aspects are to be implemented or examined:

o Calculation of the interface of a rigid drop. Investigation of mass conservation in different discretization with local refinement and material properties (esp. surface tension, viscosity).

o Detection of the so-called "spurious currents", it means, parasitic currents caused by the discretization.

o Calculation of a moving droplet and the collision of two drops (binary droplet collision in the B-We collision map).

The processing includes a thorough search of the literature. All process steps of model creation and evaluation must be appropriately documented.