TU Clausthal

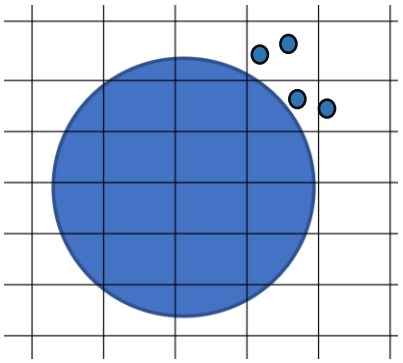
Institut für Technische Mechanik

Bachelor or Master Thesis

Implementation of Hybrid Resolved-Unresolved Approach for Modeling Particles Laden Flows

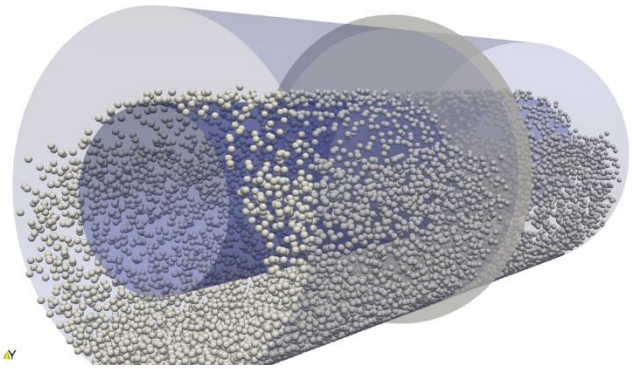
Multiphase flows play an important role in many technical applications and natural orrurrences. In the context of deep drilling technology this affects the hole cleaning process, i.e. the transport of drill cuttings through the annulus over a distance of several thousand meters. Thus, multiphase flows strongly affect safety and efficiency of the drilling process for energy resources like oil, gas and geothermal energy.

To shed some light on the multiphase phenomena during cuttings transport, computational methods are employed. These numerical methods can be categorized into resolved and unresolved methods depending on whether the fluid flow around the particles is resolved or not in the computational mesh.
The resolved methods, such as the Immersed Boundary Method (IBM), accurately captures particle-fluid interactions by explicitly resolving the flow field around individual particles. In contrast, the unresolved approach treats particles as point sources, modeling interactions through coupling forces without explicitly resolving the detailed flow around each particle. Both approaches have distinct advantages and disadvantages regarding computational accuracy, resolution, and computational cost.



This project aims to develop and implement a hybrid approach in OpenFOAM (C++), enabling the simultaneous simulation of particles of varying sizes by leveraging the benefits of both resolved and unresolved particle modeling strategies. This hybrid method will allow accurate modeling of larger particles with resolved methods while efficiently capturing smaller particle dynamics with unresolved approach.

Candidates for this project should have strong programming skills, particularly in C++.



Location:	ITM, TU Clausthal
Start date:	ASAP
Contact:	M.Sc. Hozan Ibrahim hozan.ibrahim.1@tu-clausthal.de