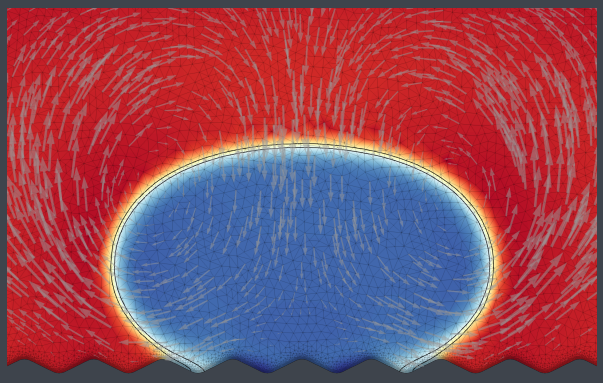
Universität Stuttgart
Institute of Applied Analysis and Numerical Simulation

A Data-driven Approach for Dynamic Contact Angles in Multi-phase Fluid Dynamics



Master's Thesis

Data-driven Simulation Science

In many two-phase flow applications the contact angle between two fluids and a wall is of crucial importance. For instance in wetting and dewetting of surfaces the contact angle is heavily dependent on surface properties. On the other hand the contact angle influences the overall multi-phase dynamics.

Dynamic contact angle measurements are sparse, especially on rough surfaces. To overcome this issue numerical upscaling techniques can be applied. A heuristic contact angle model is used for microscopic simulations, where the roughness of the wall is resolved. The microscopic response will be used for boundary conditions on the macroscopic scale.

However, solving many microproblems is computationally costly. Therefore, in this thesis a data-driven approach will be used to reduce computational effort. Relevant macroscopic boundary conditions should be directly predicted based on few microscopic results, which can be precomputed in an offline phase.

Tasks

- Study available literature
- Setup of suitable microscale simulations
- Implementation of data-driven upscaling approach

Requirements

- Knowledge of computational fluid dynamics
- Programming experience (Python,C++,...)

Supervision

- Prof. Dr. Christian Rohde
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