

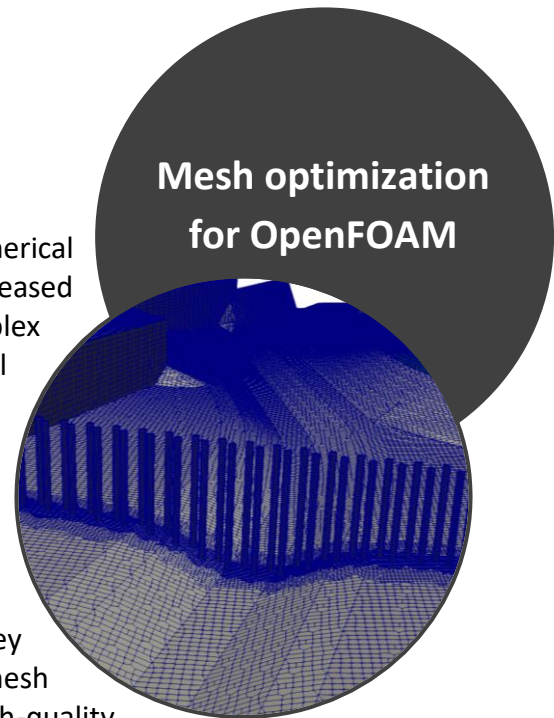


B.Sc./M.Sc. Topic

Mesh optimization for OpenFOAM

Background

The application of computational fluid dynamics (CFD) in the numerical modeling of fishpasses and free surface hydraulics has considerably increased in recent years, as a result of the improved flexibility in analyzing complex cases and detailed outputs. In numerical modeling, the spatial discretization is implemented by generating a computational mesh, which in the case of OpenFOAM consists of hexahedral and split-hexahedral cells. With a smaller mesh resolution, simulations can achieve higher precision but this leads also to long computing time. Therefore, a good balance between an adequate representation of complex geometries and reasonable computing time needs to be found. In addition to the resolution, also the type of elements plays a key role in the stability and accuracy of the simulation results. Several mesh generators are available to automate and facilitate the creation of high-quality meshes. This Bachelor's or Master's thesis focuses on comparing various available mesh generators. A comparison will be performed focusing on quality criteria, file system integrity, and compatibility. Moreover, the student will apply the different mesh generators and evaluate their performance also in terms of user control, adaptivity and parallel processing. In the case of a Master's thesis, the work will be accompanied by a comprehensive, systematic analysis of an available case study.



Thesis Overview

1. Literature review on the basics of hydrodynamic numerical modeling with OpenFOAM, focusing on mesh generation and quality criteria.
2. Familiarize with the available mesh generation tools.
3. Compare the mesh generators in terms of quality criteria, file system integrity and compatibility with OpenFOAM.
4. Apply mesh generators and evaluate their performance.
5. Master's thesis only: test mesh generators with systematic analysis of calibration parameters.



Apply now!

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The thesis can be written in German or English.

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