

Bachelor/Master-Thesis or Hiwi

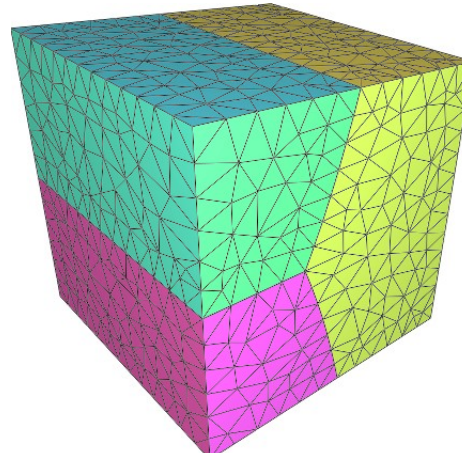
Pipeline for large scale crystal plasticity simulations

Background:

The Continuum Dislocation Dynamics (CDD) project is a C++-based, parallel finite element framework developed at the Institute for Applied Materials (IAM-ZM). It is designed to simulate the complex coupling between the mechanical properties and microstructures of FCC metals using M++, an open-source, multi-method finite element solver.

In materials science, interfaces play a pivotal role in determining mechanical behavior; therefore, modeling them accurately is essential. While our current research focuses on the physical modeling of various interface types, the mathematical discretization (meshing) of the material and these interfaces is equally

critical to ensure numerical convergence and accuracy.



source: https://doc.cgal.org/latest/Mesh_3/index.html

To systematically analyse the effects of various microstructural features (grain size, inclusion size, shape, ...), individual problem-adjusted meshes are required. This is where your work comes in: The automated meshing workflow you build will be implemented into our simulation pipeline to generate better large-scale datasets for Machine Learning or uncertainty quantification.

Objective:

- Analyse the possibilities of implementing automated mesh generation
- Integrate automated meshing into the FEM-pipeline
- Compare and evaluate results of the automated meshing pipeline
- Create guidelines for the use of the newly developed pipeline

Requirements:

- Keen interest in numerical computing/simulation with a C++ project
- Basic knowledge about FEM methodology
- Programming knowledge of C++, Python and Git are advantages

Contact

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