SimTech
Cluster of Excellence

Institute of Applied Mechanics (CE)
Chair of Continuum Mechanics

University of Stuttgart
Germany

MSc. research project
[computational mechanics; voxel data]

EMMA
Efficient Methods for Mechanical Analysis
www.mechbau.uni-stuttgart.de/EMMA

Efficient simulations of periodic heterogeneous microstructures on Cartesian grids

Imaging techniques like x-ray [micro-]tomography provide voxel-based representations of real three-dimensional microstructures. The generation of nonuniform finite element meshes from such data sets is generally cumbersome and is avoided when using methods acting directly on voxel discretizations. Several homogenization techniques of that kind are found in the literature, e.g. the voxel-based finite element method, the fast Fourier transform (FFT) or the space Lippmann-Schwinger (SLS) method. The aim of this work is to compare the above-mentioned methods and to investigate how the key ideas can be combined into a new hybrid homogenization method.

Tasks

- bibliographic study on numerical homogenization schemes

- generation of artificial microstructures

- implementation and comparison of different voxel-based homogenization schemes

Requirements

- elementary knowledge of continuum mechanics

- basic knowledge of the finite element method

- fundamental programming skills (`C/C++`)

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(Dr.-Ing. Dipl.-Math. techn. Felix Fritzen)

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