## Software Lab:

Modeling: ★★★☆☆
Mathematics: ★★★★★
Programming: ★★★★☆

Extension of the FCMLab Toolbox for geometrical and material nonlinear analysis

Setting

FCMLab is a toolbox that allows the use of the Finite Cell Method (FCM) within Matlab. The Finite Cell Method combines high-order Finite Elements (p-FEM) with an embedded domain approach, yielding a robust method for the solution of partial differential equations. By embedding the physical mesh in a domain of simple shape, a non-geometry-conforming discretization can be used for the numerical analysis. The actual geometry is captured on an integration level and does not introduce any additional degrees of freedom.

The idea behind the FCMLab is to provide a simple framework which allows researchers to become familiar with FCM. The toolbox was developed in a previous software lab project and until now only allows the use of linear-elastic material behavior and geometrically linear analysis. The goal of this follow-up software lab is the extension of FCMLab for nonlinear analysis through the implementation of nonlinear kinematics and simple nonlinear material laws in the existing code. By choosing this software lab, participants will get a good overview on the important aspects of nonlinear continuum mechanics.
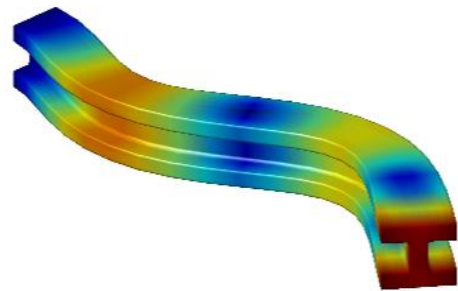
Task

- Implementation of nonlinear kinematics and programming of a nonlinear solver.
- Implementation of the simple nonlinear material models.
- Verification of the code by means of different benchmark tests

Supervisors

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References

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[3] EA de Souza Neto, D. Peric, DRJ. Owen, Computational methods for plasticity theory and applications, Wiley, 2008.