



Technische
Universität
Braunschweig



Vortrag im Gästeprogramm des GRK 2075

MUSEN Kolloquium im Wintersemester 2017/2018

Prof. Dr. Ernst Rank

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An Adaptive Finite Cell Method for Multiscale and Coupled Problems IN Solid mechanics

Donnerstag, 07.12.2017, 16.45 Uhr
Okerhochhaus, Seminarraum EG
Pockelsstraße 3, 38106 Braunschweig

Fictitious domain or immersed boundary methods embed a domain of computation into a larger, usually simply shaped region, which can easily be discretized in a grid of simple square or cubic cells. These cells are not aligned to the boundaries of the original domain, i.e. they do not follow one of the central requirements of finite element meshes. Whereas FEM matches the boundary of the domain of computation, FCM precisely integrates its interior, only. Low order fictitious domain methods date back to the 1960ies, whereas high order fictitious domain methods like the Finite Cell Method (FCM) have come into the focus in combination with p- version shape functions or Isogeometric Analysis more recently. They combine high accuracy and efficiency with large geometric flexibility, and for a p-extension applied to smooth problems, even exponential rate of convergence could be proven. In case of singular or multiscale problems, however, locally enriched approximation spaces are necessary. This presentation will outline a flexible h- and p-extension strategy which can be applied to a large variety of problems, including those with transient fronts of refinement and coarsening. Application fields of this adaptive Finite Cell Method range from problems with moving contact over very high resolution models in biomechanics to process simulation for laser based metal additive manufacturing. In this thermo-mechanically coupled problem large scale differences need to be bridged, as the local energy input and the phase change from powder via fluid to solid is induced by a laser beam with a focus orders of magnitude smaller than the workpiece.

Kontakt

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