Mesh-Refinement and non-conforming interfaces in FETI-substructuring

Interdisciplinary Project (IDP)

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Introduction and Problem Description

For parallelization of large Finite-Elements (FE) simulations on High-Performance-Computers domain-decomposition based approaches have been invented. We work with a method called Finite Elements Tearing and Interconnecting (FETI), where a FE-discretized structure is subdivided into non-overlapping substructures and then assigned to single processing cores. This method works well in linear dynamics, and shall be optimized for local nonlinear dynamics, e.g. cracks in a substructure. In such cases a finer mesh is needed, but one might only want to adaptively refine single substructures due to efficiency, resulting in non-conforming interfaces.

Task Description

In this project a mesh-refinement technique is to be implemented in our FE-research-code AMfe. In order to tackle the arising non-conforming interface between substructures, a Mortar-method has to be implemented as well. Afterwards their effects on our iterative FETI-solver are to be analyzed.

Requirements

- Interest in mechanical-engineering and structural dynamics
- Knowledge in Finite Elements
- Interest in iterative solution methods and method development
- Some programming experience (e.g. Python, Matlab)

Recommended Literature


References