

Software Lab:

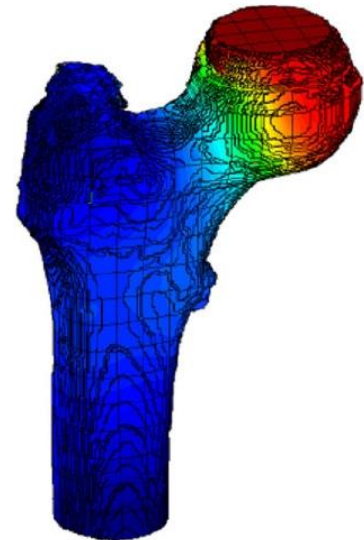
Modeling: ★★☆☆☆
Mathematics: ★★★☆☆
Programming: ★★★★★

Error Estimation for the Finite Cell Method (FCM)

Setting

The FCM is an embedded domain approach for high order finite elements (pFEM) [1]. As such, it embeds the physical domain in a simple Cartesian mesh. The original geometry is recovered at the integration level using adaptive methods, which are easy to implement for Cartesian grids. Since the FCM utilizes high order FEM technology, it is robust against geometric distortions and can be very accurate even for non-smooth problems.

An error estimator is a tool able to automatically estimate the local quality of the discretization and to drive adaptivity: an automatic refinement process (see, e.g., [2]).



Task

- Extend the current C++ implementation of the error estimation in the Finite Element Software AdhoC++ to the FCM method.
- Analyze the quality and performance of the error estimator on various examples.
- Optimize the current implementation.
- (Investigate additional types of estimators.)

Supervisors

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References

- [1] A. Düster, J Parvizian, Z. Yang, and E. Rank. The finite cell method for three-dimensional problems of solid mechanics. *Computer methods in applied mechanics and engineering*, 197(45):3768-3782, 2008.
- [2] P. Hansbo C. Johnson. Adaptive finite element methods in computational mechanics. *Computer Methods in Applied Mechanics and Engineering*, 101(1-3):143-181, 1992.