Chair for Computation in Engineering
Prof. Dr.rer.nat. Ernst Rank

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Software Lab:

Literature: ★★★★☆
Programming: ★★★☆☆
Mathematics: ★★★★★

Implementation of different Error estimators in MATLAB

Setting

For every numerical analysis, the estimation of the approximation error is of essential importance. In the framework of the Finite Element Method, various error estimators have been developed which explore the solid mathematical framework of the FEM.

Your task in this Software Lab is to understand these different approaches, implement them in your own MATLAB code and to compare the results with respect to accuracy, efficiency and implementation complexity. This will give you the chance to gain detailed inside into this challenging and yet very important field of numerical analysis.

Task

The rough schedule might look the following:
- Learn about the mathematical background of the Finite Element Method
- Implement a simple 2D Finite Element Code in MATLAB
- Learn about the different possibilities of the error estimation and understand the most important methods using the provided literature
- Implement a selection of the various methods in the MATLAB code
- Derive an appropriate benchmark test case
- Compare the different error estimators

Supervisors

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References

[1] M. Ainsworth, J. T. Oden, A posteriori error estimation in finite element analysis. Wiley, 2000.