A posteriori error estimation for a heterogeneous multiscale finite element method

Matthias Maier[1]

A big class of modeling problems in physics and engineering is of multiscale character, meaning, that relevant physical processes act on highly different length scales. Due to the huge computational costs that are typically connected with multiscale problems, multiscale schemes were developed to avoid the problem to resolve such problems in full.

Typically, an effective model is solved on a coarse scale and effective parameters are determined with the help of localized sampling problems on a fine scale. However, this introduces significant complexity with respect to sources of error—discretization errors on coarse and fine scale as well as a modeling error for the effective model.

This talk will present a Heterogeneous Multiscale Finite Element scheme for elliptic advection-diffusion problems together with an adaptive framework based on a posteriori error estimation with the help of the Dual Weighted Residual method.

An error splitting will allow for a quantitative error assessment of the different sources of error. Furthermore, a model adaptive approach based on the a posteriori error estimation will be presented.

[1] Heidelberg University, Institute of Applied Mathematics, Heidelberg, Germany, matthias.maier@iwr.uni-heidelberg.de