

Numerical analysis of coupled bulk-surface problems

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Coupled reaction diffusion processes in the bulk and on the surface of some domain have recently attracted interest in different applications in engineering, chemistry and in biology like e.g. biological signal transduction.

In this talk, an overview is given over numerical methods on boundary fitted meshes as well as methods on unfitted meshes. The corresponding a priori error analysis for sufficiently smooth solutions and uniformly refined meshes is briefly discussed. Next, we study a stationary prototype problem and derive a posteriori error control for adaptive FEM. Emphasis is put on the case of only piecewise smooth domain boundaries and solutions of low regularity. A residual error estimator is derived which takes into account the approximation errors due to the finite element discretisation in space as well as the polyhedral approximation of the surface. Finally, a posteriori error estimates for the instationary and nonlinear problems are discussed.