## A posteriori error estimates for singularly perturbed equations

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Solutions of singularly perturbed partial differential equations typically exhibit sharp boundary and interior layers, as well as corner singularities. To obtain reliable numerical approximations of such solutions in an efficient way, one may want to use meshes that are adapted to solution singularities using a posteriori error estimates.

In this talk, we shall discuss residual-type a posteriori error estimates singularly perturbed reaction-diffusion equations and singularly perturbed convection-diffusion equations.

The error constants in the considered estimates are independent of the diameters of mesh elements and of the small perturbation parameter. Some earlier results, such as [1,2], will be briefly reviewed, with the main focus on the recent preprints [3,4].

[1] A. Demlow and N. Kopteva, Maximum-norm a posteriori error estimates for singularly perturbed elliptic reaction-diffusion problems, Numer. Math., 133 (2016), 707-742

[2] N. Kopteva, Maximum-norm a posteriori error estimates for singularly perturbed reaction-diffusion problems on anisotropic meshes, SIAM J. Numer. Anal., 53 (2015), 2519-2544

[3] N. Kopteva, R. Rankin, Pointwise a posteriori error estimates for discontinuous Galerkin methods for singularly perturbed reaction-diffusion equations, May 2022

[4] A. Demlow, S. Franz and N. Kopteva, Maximum norm a posteriori error estimates for convection-diffusion problems, July 2022