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Adaptive finite element methods: abstract framework and applications

We consider a general abstract framework of a continuous elliptic problem set on a Hilbert space V that is approximated by a family of (discrete) problems set on a finite-dimensional space of finite dimension not necessarily included into V. We give a series of realistic conditions on an error estimator that allows to conclude that the marking strategy of bulk type leads to the geometric converge of the adaptive algorithm. These conditions are then verified for different concrete problems like convection-reaction-diffusion problems approximated by conforming $\mathbb{P}_1$ finite elements or by a discontinuous Galerkin method with an estimator of residual type or obtained by equilibrated fluxes. Numerical tests that confirm the geometric converge will be presented.