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# Adaptive isogeometric boundary methods with optimal convergence rates

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Since the advent of *isogeometric analysis* (IGA) in 2005, the *finite element method* (FEM) based on *splines* on rectangular meshes has become an active field of research. The central idea of IGA is to use the same functions for the approximation of the solution of the considered partial differential equation (PDE) as for the representation of the problem geometry $\Omega$ in computer aided design (CAD); see [1].

Usually, CAD provides only a parametrization of the boundary $\partial\Omega$ instead of the domain $\Omega$ itself. Since FEM requires a mesh of $\Omega$, the parametrization needs to be extended to the whole domain, which is a non-trivial and still open research topic. The *boundary element method* (BEM), which can be seen as FEM applied to the PDE equivalent boundary integral forumlation, circumvents this difficulty by working only on the CAD provided boundary mesh. However, compared to the literature on isogeometric analysis with FEM (IGAFEM), only little is found for isogeometric analysis with BEM (IGABEM).

In our talk, we present recent results on adaptive IGABEMs. In 2D, we investigate an adaptive BEM with one-dimensional splines which exploits the full potential of IGA: We modify a standard mesh-refining adaptive algorithm so that it additionally uses knot multiplicity increase which results in local smoothness reduction of the ansatz space. The algorithm guarantees linear convergence of the employed weighted-residual error estimator at optimal algebraic rate; see [2, 3]. In 3D, we consider an adaptive BEM with hierarchical splines, which are a generalization of the standard two-dimensional tensor-product splines. For a standard mesh-refining adaptive algorithm, we prove linear convergence of the error estimator at optimal rate; see [3].

## REFERENCES

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