A POSTERIORI ERROR ESTIMATION FOR ADAPTIVE IGA BOUNDARY ELEMENT METHODS

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Abstract. A posteriori error estimation and optimal adaptive mesh-refinement are well-established for the standard boundary element method (BEM) with piecewise polynomial ansatz functions on polygonal boundaries (see e.g. [1] for convergence even with optimal rates). In contrast to that, the mathematically reliable a posteriori error analysis for isogeometric BEM (IGABEM) is still in its infancy. In our talk, we discuss recent results on reliable a posteriori error estimators [2, 3] and on optimal convergence of corresponding adaptive IGABEM algorithms in 2D (see [4]).

As model example, we consider the weakly-singular for the 2D Laplacian and the corresponding weighted-residual error estimator which controls the (in general, non-computable and unknown) discretization error in the $\widetilde{H}^{-1/2}$ norm. Its local contributions are used for adaptive IGABEM computations to steer an adaptive algorithm for which optimal convergence behaviour is proved. Unlike available results in the literature, the algorithm steers the local mesh-refinement as well as the local smoothness of the ansatz functions across nodes of the boundary partition. The algorithm automatically detects jumps and singularities of the exact solution as well as possible smooth parts. If compared to uniform mesh-refinement as well as adaptive standard BEM based on piecewise polynomials, this dramatically reduces the storage requirements as well as the computing time needed to achieve a certain prescribed accuracy.

Keywords: isogeometric analysis, boundary element method, a posteriori error estimate, adaptive mesh-refinement, optimal connvergence

Mathematics Subject Classifications (2010): 65N12, 65N30, 65N38, 65N50

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