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ISOGEOMETRIC BOUNDARY ELEMENT METHOD WITH HIERARCHICAL MATRICES

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In this work we address the complexity problem of the Iso-Geometric Boundary Element Method (IGABEM) by proposing a formulation for practical problems in linear elasticity and the application of hierarchical matrices ($\mathcal{H}$-matrices)[1]. The geometry and Cauchy data are approximated independently, which increases the flexibility of a collocation-based BEM. For instance, given data is approximated with the coarsest description possible, while unknowns are described on a much finer level. Also, a block system of matrices, similar to Galerkin formulations is constructed allowing an effective application of the $\mathcal{H}$-matrix format. For Lagrange elements, this concept has been successfully applied to linear elasticity or elasto-plasticity [2]. Here, we show the application to the IGABEM for linear elasticity and mixed boundary value problems. That is, classical shape functions are replaced by NURBS. This has important implications for the implementation of $\mathcal{H}$-matrices which is the key point of this work. The approximation of system matrices is carried out with the Adaptive Cross Approximation algorithm or kernel interpolation. A number of numerical results are shown that prove the success of the formulation.

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