

Combining NURBS-Enhanced Finite Elements and Isogeometric Methods in the Context of Fluid-Structure Interaction

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The introduction of isogeometric analysis (IGA) [1], made it possible to directly exploit the favorable geometric properties of NURBS for numerical analysis. The method has become wide-spread in structural mechanics. However, parametrizing complex three-dimensional domains — as needed for CFD — using closed volume splines can be challenging. NURBS-enhanced finite elements (NEFEM) [2] can be a viable alternative. Both methods together lead to a geometrically compatible coupling interface for FSI. Within a partitioned FSI method, it was demonstrated that the necessary projection methods simplify due to the matching geometry; while at the same time increasing accuracy [3]. In the current work, we present two extensions of the approach. On the one hand, we focus on problems involving enclosed domains. In these problems, accurate geometric representation can be beneficial. On the other hand, the projection scheme is extended towards the usage of isogeometric collocation [4] on the structural side.

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