C^2-smooth Isogeometric Functions on Planar Multi-Patch Geometries

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The space of C^2-smooth isogeometric functions on bilinear planar multi-patch domains, where the graph of each isogeometric function is a multi-patch spline surface of bidegree (d, d), $d = 5, 6$, is considered. We investigate the dimension of the C^2-smooth isogeometric space by decomposing the space into the direct sum of three simpler subspaces. Furthermore, we present an algorithm for the construction of a basis of the space, which is based on the concept of minimal determining sets for the involved spline coefficients. Numerical results indicate that the resulting basis functions are well conditioned.

The potential of the C^2-smooth isogeometric space for applications in isogeometric analysis is demonstrated by solving the triharmonic equation, a sixth order partial differential equation, on different bilinear multi-patch domains. Moreover, we perform L^2-approximation to experimentally show the optimal approximation power of the space. Finally, we describe possible extensions of the construction of C^2-smooth isogeometric functions to more general domains.

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