Adaptive T-spline refinement for isogeometric analysis in planar geometries

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Abstract

We present a new strategy, based on the meccano method [1, 2, 3], to construct a T-spline parameterization of 2D geometries for the application of isogeometric analysis. The proposed method only demands a boundary representation of the geometry as input data. The algorithm obtains, as a result, high quality parametric transformation between 2D objects and the parametric domain, the unit square. The key of the method lies in defining an isomorphic transformation between the parametric and physical T-mesh finding the optimal position of the interior nodes by applying a new T-mesh untangling and smoothing procedure. Bivariate T-spline representation is calculated by imposing the interpolation conditions on points sited both on the interior and on the boundary of the geometry. The proposed method also permits modeling of objects with embedded geometries that can be used for domains composed of several materials. The efficacy of the proposed technique is shown in several examples. Some results of the application of isogeometric analysis are presented. We also carry out a comparison of two possible strategies for performing adaptive refinement: isoparametry (redefining the parametric mapping for each iteration) and without isoparametry (using an unique parametric mapping for all adaptive iterations).

References

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