Isogeometric Analysis based on hierarchical Box Splines

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ABSTRACT

Efficient local refinement procedures and easy modelling of complex geometries are crucial ingredients in Isogeometric Analysis (IgA) and in the numerical treatment of partial differential equations (PDEs) in general.

Box splines are established tool in spline approximation theory and form an intermediate approach between classical tensor-product B-splines and splines over triangulations. They can be easily extended to higher dimensions, and therefore box splines represent a promising tool to model complex geometry in the context of IgA (see [1]). Local refinement can be achieved by considering hierarchically nested sequences of box spline spaces. Since box splines do not offer special elements to impose boundary conditions, we consider a weak treatment of such boundary conditions.

In this talk we report about our ongoing results of the use of hierarchical bivariate box splines defined on regular three-directional meshes in numerical simulation (see also [2] for preliminary results). Numerical examples show the optimal convergence rate of box splines and their hierarchical variants for the solution of PDEs.

REFERENCES

[1] F. Pelosi, C. Giannelli, C. Manni, M.L. Sampoli, H. Speleers, Splines over regular triangulations in numerical simulation, *Computer Aided Design* (2017) **82**: 100–111.

[2] T. Kanduč, C. Giannelli, F. Pelosi, H. Speleers, Adaptive isogeometric analysis with hierarchical box splines, *Computer Methods in Applied Mechanics and Engineering*(2017) **316**: 817–838.