C^1-smooth geometrically continuous isogeometric functions on hexahedral two-patch domains: basis and dimension

Katharina Birner[*], Mario Kapl[†], Bert Jüttler[+†] and Angelos Mantzaflaris[†]

[*] Institute of Applied Geometry
Johannes Kepler University
Altenbergerstraße 69, 4040 Linz, Austria
e-mail: katharina.birner@jku.at

[+] Institute of Applied Geometry
Johannes Kepler University
Altenbergerstraße 69, 4040 Linz, Austria

[†] Johann Radon Institute for Computational and Applied Mathematics (RICAM)
Johannes Kepler University
Altenbergerstraße 69, 4040 Linz, Austria

ABSTRACT

One main advantage of isogeometric analysis is that it facilitates discretization spaces providing high order smoothness. However, when using multi-patch parameterizations of the computational domain, this needs special constructions to achieve smoothness across the interfaces between patches. In particular it is important to study the space of C^1-smooth geometrically continuous functions on such domains. More precisely, it is of interest to investigate the dimension and to construct local bases for this space.

The space of C^1-smooth geometrically continuous isogeometric splines on bilinear two- and multi-patch domains was studied in [1, 2], including explicit constructions of basis functions and numerical experiments indicating optimal approximation power. Similarly analysis-suitable G^1 multi-patch parameterizations are considered in [3, 4], generalizing the piecewise bilinear case while maintaining the optimal approximation properties.

In this talk we extend these results to the trivariate case. In particular, we focus on two hexahedral volumetric domains given as general B-Spline maps with a suitable parameterization of the interface.

REFERENCES

[1] M. Kapl, V. Vitrih, B. Jüttler and K. Birner, Isogeometric analysis with geometrically continuous functions on two-patch geometries, *Computers & Mathematics with Applications*, Vol. **70**, pp. 1518–1538 (2015).

[2] M. Kapl, F. Buchegger, M. Bercovier and B. Jüttler, Isogeometric analysis with geometrically continuous functions on planar multi-patch geometries, *Computer Methods in Applied Mechanics and Engineering*, Vol. **316**, pp. 209–234 (2017).

[3] M. Kapl, G. Sangalli and T. Takacs, Dimension and basis construction for analysis-suitable G^1 two-patch parameterizations, *Computer Aided Geometric Design*, Vol. **52**, pp. 75–89 (2017).

[4] M. Kapl, G. Sangalli and T. Takacs, Analysis-suitable C^1 multi-patch isogeometric spaces: basis and dual basis, *arXiv:1711.05161v1* (2017).