Analysis-suitable G^1 multi-patch parametrizations and isogeometric spaces

Mario Kapl[†], Giancarlo Sangalli[‡] and Thomas Takacs[*]

[*] Institute of Applied Geometry
Johannes Kepler University Linz
Altenberger Strasse 69, 4040 Linz, Austria
e-mail: thomas.takacs@jku.at, web page: http://www.ag.jku.at

[†] Johann Radon Institute (RICAM)
Austrian Academy of Sciences
Altenberger Strasse 69, 4040 Linz, Austria
e-mail: mario.kapl@ricam.oeaw.ac.at

[‡] Dipartimento di Matematica "F.Casorati"
Università degli Studi di Pavia
Via Ferrata, 5, 27100 Pavia, Italy
e-mail: giancarlo.sangalli@unipv.it

ABSTRACT

Multi-patch spline parametrizations are used in geometric design and isogeometric analysis to represent complex domains. We deal with a particular class of C^0 multi-patch spline parametrizations called analysis-suitable G^1 (AS-G^1) multi-patch parametrizations, introduced in [1]. This class of parametrizations has to satisfy specific geometric continuity constraints, and is of importance since it allows to construct, on the multi-patch domain, C^1 isogeometric spaces with optimal approximation properties.

Such AS-G^1 multi-patch parametrizations are suitable for modeling complex planar multi-patch domains. We present the theoretical foundations, and construct a basis for a sufficiently large subspace of the C^1 isogeometric space. This subspace maintains the reproduction properties of traces and normal derivatives along the interfaces. In contrast to the full C^1 space, its dimension does not depend on the domain parametrization, but only on the mesh topology. Moreover, we discuss constructions of AS-G^1 multi-patch parametrizations for geometrically complex domains.

REFERENCES

[1] Collin, A., Sangalli, G., Takacs, T.: *Analysis-suitable G^1 multi-patch parametrizations for C^1 isogeometric spaces.* Computer Aided Geometric Design, 47, 2016, pp. 93-113.

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

[3] Kapl, M., Sangalli, G., Takacs, T.: *Construction of analysis-suitable G^1 planar multi-patch parameterizations.* Computer-Aided Design, 97, 2018, pp. 41-55.