

ISOGEOMETRIC ANALYSIS IN ANSA USING LOCAL REFINEMENT AND THB-SPLINES

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KEYWORDS –

hierarchical splines, isogeometric analysis, Bézier extraction

ABSTRACT –

The concept of hierarchical splines is a well-established approach to adaptive refinement in the isogeometric analysis (3). The approach considers a set of nested spaces that are generated by globally refining a coarse mesh. They are generated using a certain selection mechanism that ensures high global smoothness and efficient local refinement. More recently, a slight modification of this approach, the so called truncation mechanism, was shown to provide a basis with better properties, such as the partition of unity property, better stability and robustness (4).

An open-source implementation of truncated hierarchical splines is available in the G+Smo (Geometry plus Simulation Modules) library for isogeometric analysis. G+Smo is an object oriented, templated library, that implements a generic concept for isogeometric analysis, based on abstract classes for basis, geometry, assembler, solver etc.

With the help of G+Smo we create hierarchical spline models that use local refinement to capture small features, such as small drill holes in car body. We transfer the model to ANSA (1) using Bézier extraction in order to setup and perform suitable analysis. This first experience of hierarchical spline analysis in ANSA shows the strong potential of this novel spline technology.

REFERENCES

- (1) ANSA version 17.0.0 User's Guide, BETA CAE Systems, July 2015.
 - (2) Mantzaflaris, A. An Overview of Geometry Plus Simulation Modules. in *Mathematical Aspects of Computer and Information Sciences*, vol. 11989 453–456 (Springer 2020).
 - (3) Hughes, T. J. R., Cottrell, J. A. & Bazilevs, Y. Isogeometric analysis: CAD, finite elements, NURBS, exact geometry and mesh refinement. *Computer Methods in Applied Mechanics and Engineering* 194, 4135–4195 (2005).
 - (4) C. Giannelli, C., Jüttler, B., Kleiss, S.-K., Mantzaflaris, A., Simeon, B., Špeh, J. THB-splines: An effective mathematical technology for adaptive refinement in geometric design and isogeometric analysis, *Computer Methods in Applied Mechanics and Engineering*, 299, 337-365, 2016.
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