RECENT DEVELOPMENTS IN MATRIX ASSEMBLY AND ITERATIVE SOLUTION TECHNIQUES FOR FEA AND IGA

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ABSTRACT

Since its introduction in October 2005 [1], Isogeometric Analysis (IgA) has attained huge research interest and, more than ten years after, it starts to become a widely-accepted methodology for the numerical analysis of practical engineering problems both in academia and industry. The strong connection to classical Finite Element Analysis (FEA) enables the adoption and extension of advanced methodologies such as iterative, and possibly matrix-free, solution algorithms, which were developed in the finite element context. At the same time, the rich geometric description intrinsically built into the Isogeometric Analysis makes this approach more than just an extension of FEA, giving rise to new challenges, which are not present in classical finite elements. New ways towards matrix assembly strategies that are more efficient than element-wise quadrature adopted from FEA are a hot topic in IgA.

This mini-symposium aims at bringing together experts from FEA and IgA enabling a lively and fruitful exchange of ideas. In particular, the focus is placed on recent developments in the field of theory and algorithmic components for the following topics:

1. Efficient matrix assembly for IgA in less than $O(N_{dof}p^{3d})$ operations

2. Iterative solvers, especially multigrid techniques, designed for high-order approximations

3. Matrix-free solution algorithms

REFERENCES

[1] T.J.R. Hughes, J.A. Cottrell and Y. Bazilevs, "Isogeometric Analysis: CAD, Finite Elements, NURBS, Exact Geometry and Mesh Refinement", *Computer Methods in Applied Mechanics and Engineering*, Vol. **194**, pp. 4135-4195, (2005).