Advances in Polytopal Methods with Applications in Engineering

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ABSTRACT

Polytopal methods have gained increasing attention due to their ability to handle complex geometries, heterogeneous materials, and intricate interface conditions while ensuring computational efficiency and accuracy. These methods span Discontinuous Galerkin (DG) methods, Hybrid High-Order (HHO), Hybridizable Discontinuous Galerkin (HDG), Mimetic Finite Difference (MFD), and the Virtual Element Method (VEM). They offer significant advantages in problems involving irregular domains and adaptive refinement [1-3]. Indeed, thanks to their ability to work with general polygonal and polyhedral meshes, they represent a natural framework for h-adaptivity (mesh coarsening and refinement) and p-adaptivity. Furthermore, they can be used to devise efficient agglomeration-based multilevel solvers, and their compatibility with high-order discretization makes them suitable for problems requiring accuracy and robustness across different physical regimes.

This minisymposium aims to gather and discuss recent developments in polytopal methods, covering theoretical advancements, implementation, and practical application. Topics of interest include error analysis, adaptivity, efficient solvers, and applications spanning engineering disciplines such as biomechanics, porous media flows, fracture mechanics, fluid dynamics, contact mechanics, geophysics, and multiphase and multiphysics problems. This minisymposium will foster discussions on the state of the art and future perspectives in the field by bringing together experts from applied mathematics, computational sciences, and engineering.

REFERENCES

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