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NUMERICAL METHODS FOR POLYGONAL AND POLYHEDRAL MESHES

700 - NUMERICAL METHODS AND ALGORITHMS IN SCIENCE AND ENGINEERING

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ABSTRACT

The purpose of this minisymposium is to bring together researchers who develop and apply novel discretization technologies for partial differential equations supporting polygonal and polyhedral meshes. A few examples of such technologies are: continuous and discontinuous Galerkin methods (including their mass-lumped versions), structure-preserving mimetic discretizations, virtual element methods, finite element exterior calculus, hybrid high-order methods, and finite volume methods. The use of polygonal and polyhedral meshes with convex and concave elements provides greater flexibility in mesh design, and the discretizations on such meshes afford robustness in material design simulations, capturing flow in heterogeneous subsurface porous media, modeling of layered stratification of faults and fractures at geological sites, and approximation of equations or solutions with singularities via local mesh refinement. These technologies have given rise to many new opportunities in computational mechanics as well as new mathematical challenges. Contributions to this minisymposium are solicited that emphasize methods development, mathematical analysis and/or applications to problems in engineering sciences that involve the use of polygonal and polyhedral discretizations. While contributions in all aspects related to these methods are invited, some of the featured topics will include:

- finite volumes; gradient discretization methods; methods based on generalized barycentric coordinates; methods with hybrid unknowns (HHO, HDG); discontinuous Galerkin methods; conforming/nonconforming/mixed virtual element methods; structure-preserving algorithms like mimetic schemes and methods based on the finite element exterior calculus;
- use of polygonal/polyhedral meshes in applications such as flow simulations, material design and microstructural discretization, topology optimization and additive manufacturing, deformation of nonlinear continua, fracture modeling, and computer graphics and animations.

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