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SMOOTH APPROXIMATIONS ON UNSTRUCTURED NODAL DISCRETIZATIONS: FINITE ELEMENTS, B-SPLINES AND MESHFREE

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ABSTRACT

The purpose of this minisymposium is to bring together researchers who develop and apply novel discretization techniques that extend the regime of standard finite element approaches for the solution of partial differential equations. In particular, emphasis will be placed on methods that deliver smooth basis functions on unstructured/nonuniform grids or point sets. There is a growing interest for such methods because they provide flexibility and also deliver adaptive capabilities with high-accuracy for problems that admit smooth solutions. Furthermore, they allow us to directly deal with higher-order partial differential equations that require C^1 trial functions: for example, weak formulations that arise in Kirchhoff plate theory, strain-gradient theories, thin shells, and phase-field models. A representative list of such methods include finite elements (Clough-Tocher and Bogner-Fox-Schmidt elements), spline-based techniques (subdivision surfaces, NURBS, T-Splines, hierarchical B-Splines), meshfree methods such as moving-least-squares, Sibson and maximum-entropy approximants, and the recently proposed virtual element method. Advances in this field would be greatly enhanced by the exchange of ideas and interactions between researchers in computational mechanics, computational mathematics, computer graphics, and computer-aided geometric design.

Contributions to this mini-symposium are solicited that emphasize new developments in these emerging methods and also applications to problems in engineering sciences where smooth unstructured approximants are particularly beneficial.