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HIGHER ORDER (GENERALIZED) FINITE ELEMENT METHODS FOR PROBLEMS WITH SINGULARITIES

Christopher B. Davis*, Hengguang Li**
and Victor Nistor***

* Louisiana State University
Baton Rouge, LA 70803
cdav135@math.lsu.edu

** Wayne State University
Detroit, MI 48202
hli@math.wayne.edu

*** Pennsylvania State University
University Park, PA 16802
nistor@math.psu.edu

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ABSTRACT

The development of high order numerical methods, such as finite element methods (FEMs) and generalized finite element methods (GFEMs), for equations with singularities has become increasingly popular in computational mechanics. Singularities may appear in many circumstances, including rough data, re-entrant corners, and non-smooth interfaces. Conventional numerical methods for these types of problems only yield low-order sub-optimal convergence rates. Special treatments (e.g., mesh grading, adaptivity, and space enrichments) have to be given in FEMs and GFEMs to obtain higher order rates of convergence when applied to problems with singularities.

The purpose of this mini-symposium is to bring together experts on high-order Galerkin Methods, especially Finite Element and Generalized Finite Element Methods, to discuss recent developments and to exchange ideas regarding various topics. We are especially interested in problems with singularities that normally lead to decreased rates of convergence (at least in the classical implementations). In this minisymposium, mathematicians and engineers will be invited to present their recent research on the following topics related to the title of the mini-symposium: (1) a priori mathematical analysis and convergence estimates; (2) choice of enrichment functions; (3) treatment of boundary/interface conditions; (4) mesh grading techniques; (5) implementation issues; (6) techniques regarding the treatment of singularities in computational mechanics, and (7) adaptivity for problems with singularities in the framework of FEMs and GFEMs.