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ENRICHED FINITE ELEMENT METHODS AND NON-INTRUSIVE COUPLING ALGORITHMS

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ABSTRACT

Enriched Finite Element Methods (EFEMs) such as Generalized/eXtended FEM have received increased attention and undergone substantial development during the last two decades. More recently, focus has been placed on improving the method's conditioning through Stable Generalized FEM, and in the development of Interface- and Discontinuity-Enriched FEMs as alternative procedures for analyzing weak/strong discontinuities. These methods offer unprecedented flexibility in the construction of shape functions and corresponding approximation spaces. With the proper selection of enrichment functions, these methods are able to address many shortcomings and limitations of the classical FEM while retaining its attractive features. However, the implementation of these discretization methods in industrial-grade commercial software is often difficult, time-consuming, and therefore expensive. As a result, available commercial software lack recent EFEM developments. One strategy to address this issue is to non-intrusively couple commercial and research software and thus provide the end user with simulation and modeling capabilities not available in any single software.

This mini-symposium aims to bring together engineers, mathematicians, computer scientists, and national laboratory and industrial researchers to discuss and exchange ideas on new developments, applications, and non-intrusive coupling algorithms for Enriched FEMs. While contributions to all aspects of EFEMs and their implementation are invited, topics of particular interest include

- verification and validation; accuracy, computational efficiency, convergence, and stability of EFEMs and coupling algorithms;
- new developments for immerse boundary or fictitious domain problems, flow and fluid-structure interaction, *etc.*;
- applications to industrial problems exhibiting multiscale phenomena, localized non-linearities such as fracture or damage, and non-linear material behavior;
- acceleration techniques for coupling algorithms; and;
- coupling algorithms for multi-physics and time-dependent problems.