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NEW CHALLENGES FOR UNFITTED METHODS IN COUPLED AND MULTIPHYSICS PROBLEMS

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ABSTRACT

The mathematical description of multiphysics and coupled problems (e.g. fluid-structure interactions, multiphase flows, thermo-mechanical problems) usually involves partial differential equations of different types or with discontinuous coefficients, so that the computational domain is decomposed into several regions, which may evolve in time. Thus, the finite element discretization of such problems requires an accurate representation of the geometry. The construction of fitted meshes, which take into account the presence of interfaces, may be challenging and computationally expensive. Therefore, unfitted methods have gained particular interest and many approaches have been proposed; we mention, for instance, fictitious domain and level set methods, Nitsche's method, cutFEM, Finite Cell, Shifted Boundary Method, and Immersogeometric Analysis.

We invite researchers working in this field to present their latest results and discuss the related challenges and future perspectives. We encourage contributions coming from all kinds of applications as topics of interest include, in a broad sense, mathematical analysis, error analysis, mesh adaptivity, integration strategies, geometric representation, efficient algorithms, and parallel solvers.