

RECENT ADVANCES IN IMMERSED BOUNDARY AND FICTITIOUS DOMAIN METHODS

TRACK NUMBER (5000)

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ABSTRACT

In scientific and industrial applications, a large part of the overall effort invested for a finite element analysis is very often devoted to geometric modelling and the transition from a computer-aided design to an analysis suitable model including mesh generation. To avoid the need for classical mesh generation procedures, fictitious domain methods were introduced already in the early 1960s. Since then many variants of these appealing approaches have been suggested, like embedded domain and immersed boundary methods or special implementations

of the extended finite element method. Whereas in earlier years the focus was placed on the investigation of its mathematical aspects, more recently a lot of progress has been achieved in engineering sciences. An important reason for this success is an essential paradigm of fictitious domain and immersed boundary methods, which they share with Isogeometric Analysis: ‘To support better design-through-analysis by closely coupling geometric modelling and numerical simulation’.

This mini-symposium will focus on fictitious domain methods dedicated, but not limited to problems in solid mechanics, including possible interactions with other physical fields (e.g. heat, fluid, etc.). The topics of this mini-symposium will range from modelling aspects including the coupling of analysis and CAD, the treatment of the boundary conditions, the treatment of the interface conditions for heterogeneous materials, mathematical analysis, adaptivity and implementational issues, the comparison of new methods with existing techniques to the efficient solution of complex engineering problems. It will address low and higher order fictitious domain approaches, CutFEM and the Finite Cell Method as well as combinations with the Isogeometric Analysis including trimming of spline patches or recent approaches to topology optimization. New numerical methods for PDEs that are more efficient compared to existing techniques are also welcome.