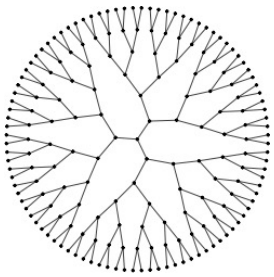

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# Some aspects of the multiscale finite element method

*vendredi 12 janvier 2024 11:05 (45 minutes)*

We shall talk about computational methods for multiscale partial differential equations, and in particular the multiscale finite element method (MsFEM). This is a finite element type method that performs a Galerkin approximation of the PDE on a problem-dependent basis. We shall discuss two aspects of these methods based on our recent work with Rutger Biezemans, Claude Le Bris, and Frédéric Legoll (ENPC & INRIA).

First, the intrusiveness of the MsFEM is considered. Since the MsFEM uses a problem-dependent basis, it cannot easily be implemented in generic industrial codes and this hinders its adoption beyond academic environments. A generic methodology is proposed to translate the MsFEM into an effective problem that can be solved by generic codes.

Second, a new convergence analysis for the MsFEM is presented that establishes convergence under minimal regularity hypotheses. This bridges an important gap between the theoretical understanding of the method and its field of application, where the usual regularity hypotheses are rarely satisfied.

**Auteur principal:** Prof. LOZINSKI, Alexei (Laboratoire de mathématiques de Besançon, Université de Franche--Comté)

**Orateur:** Prof. LOZINSKI, Alexei (Laboratoire de mathématiques de Besançon, Université de Franche-Comté)