Some recent advances of the eXtended Finite Element Method in problems with interfaces and displacement singularities

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Abstract

The eXtended Finite Element Method (XFEM) was first proposed by Belytschko and his collaborators [1] as an innovative computational technology for dealing with discontinuities and singularities without tailored meshes. This goal is achieved by enriching the approximation space by means of additional shape functions that reproduce the non-smooth features of the expected solution. Owing to its great flexibility, XFEM has become one of the most exploited methodology for crack simulation in mechanical and structural engineering. Very recently, an innovative generalized finite element method called Virtual Element Method (VEM) has been proposed capable of dealing with very general polytopal meshes without using polygonal basis functions[2]. VEM introduces a suitable projector operator to approximate the bilinear form arising in the weak formulation of the continuous problem, so that the explicit construction of the elemental basis functions can be avoided. More recently [3], an eXtended Finite Element Method exploiting polygonal basis functions has been proposed for polytopal meshes, that can be especially useful when meshing complex domains, such as those occurring in bodies with cracks and inclusions. Based on illustrative numerical examples, the presentation to be delivered at the conference aims to discuss how to extend the XFEM to polytopal meshes by exploitation of the VEM methodology in problems with singular and discontinuous unknown fields.

Keywords: XFEM, VEM

References

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