COMPARISON OF GFEM AND XFEM FOR PROBLEMS IN COMPLEX DOMAINS

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The GFEM (Generalized Finite Element Method) was developed by Strouboulis, Copps, and Babuska [1] as a combination of the classical FEM and the Partition of Unity Method. The main idea is to enrich the finite element approximation by handbook functions reflecting the local character of the solutions, computed by solving local "handbook" problems. In [2] it was shown how to generalize the GFEM to problems with many voids and that the method can be used to obtain results with high accuracy (0.1%) for problems where the accuracy of the FEM is very poor (60%).

The XFEM (Extended Finite Element Method) of Belytschko, et. al. [3], is understood as an extension of the classical FEM which uses the PUM along with level set functions in order to avoid meshing complicated geometries due to inclusions or propagating cracks.

In this work we address the similarities and differences of the GFEM with the XFEM and illustrate their accuracy potential and the ease of difficulty of their implementation for problems in domains with many features (voids, inclusions, etc.)

References

[1] T. Strouboulis, K. Copps, I. Babuska, The generalized finite element method, Comput. Methods Appl. Mech. Engrg. 190 (2001) 4081-4193.
[2] T. Strouboulis, L. Zhang, and I. Babuska, Generalized finite element method using mesh-based hand-books: application to problems in domains with many voids, (submitted for publication).
[3] N. Sukumar, D.L. Chopp, N. Moes, and T. Belytschko, Modelling holes and inclusions by level sets in the extended finite-element method, Comput. Methods Appl. Mech. Engrg. 190 (2001) 6183-6200.