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The extended finite element method for three-dimensional reinforced composites.

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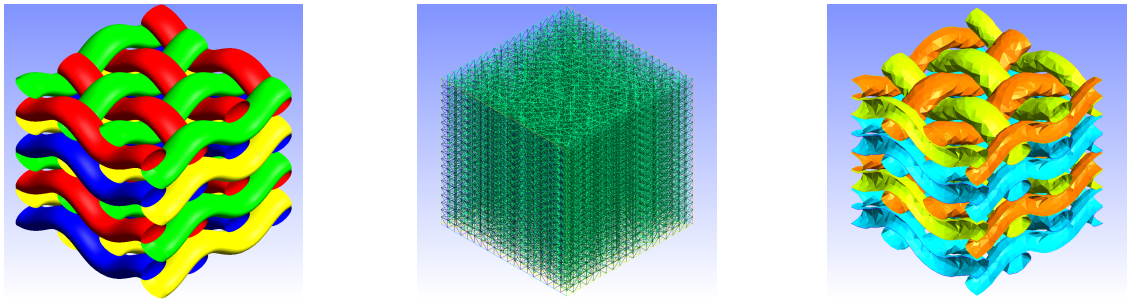
This paper deals with the use of eXtended Finite Element Method (XFEM) to perform local effects in three-dimensional reinforced composites. This method was first introduced to model cracks [1]. It is based on the partition of unity concept [2] and the description of discontinuities like the location of holes and material interfaces is often realized by the level-set method [3].

The approach considered allows (i) to easily model the real geometry of reinforcing fibers (not idealized), (ii) to impose arbitrary Dirichlet and Neumann boundary conditions on the implicit defined boundaries [4,5] and (iii) to introduce models of degradation. Numerical applications are presented on some academic tests.



(a) (b) (c)

Figure 1: Steps in geometry process on a three-dimensional fabric - a) Multiple level-sets modelling - b) Fixed grid - c) Implicit representation of the warp-interlaced 3D weave.

References

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