XFEM FINITE STRAIN FRACTURE ANALYSIS OF ORTHOTROPIC MATERIALS

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ABSTRACT

The remarkable needs for modeling orthotropic materials and their applicable role in various structural systems such as aerospace industries have been much more than before. The main advantages of using these materials can be attributed to their high stiffness and low ratio of weight to strength in comparison to other materials. Nonlinear fracture analysis of orthotropic materials is computationally challenging due to a number of complicated numerical problems. These problems are further amplified in orthotropic composites. The aim of this paper is to further extend the XFEM technology for finite strain modeling of orthotropic materials and to study large strain fracture problems based on the orthotropic enrichment functions within the extended finite element method. Comparisons are made between the isotropic and orthotropic enrichment functions. These results, compared with the appropriate isotropic finite strain XFEM formulation, illustrate good agreement with the available benchmarks.