A partly and fully cracked triangular XFEM element for modeling cohesive fracture

This paper discusses the build-up of a partly cracked cohesive crack tip element. The crack tip element is based on the principles of the eXtended Finite Element Method (XFEM) and is of Linear Strain Triangle (LST) type. The composition of the enrichment has been in focus to achieve as complete a description as possible on both sides of the crack. The stress accuracy within the crack tip element has been improved to a level, so that the crack tip stresses can be evaluated locally without introducing nonlocal averaging in the surroundings of the crack tip. The partly cracked element can also be applied as a fully cracked element with a few restrictions in the displacement field. The performance of the developed element has been tested in three examples. One example is an infinite sheet with an initial flaw in pure tension, where a semianalytical solution exists. The two other examples are the two benchmark tests: Three-point Bending Test (TPBT) and the Four-point Shear Beam (FPSB). The partly cracked element performs well, and captures the overall structural response even for coarse meshes in all the three examples. Copyright © 2010 John Wiley & Sons, Ltd.

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