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Developing new enrichment functions for crack simulation in orthotropic media by the extended finite element method. (English) Zbl 1194.74358
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Summary: New enrichment functions are proposed for crack modelling in orthotropic media using the extended finite element method (XFEM). In this method, Heaviside and near-tip functions are utilized in the framework of the partition of unity method for modelling discontinuities in the classical finite element method. In this procedure, by using meshless based ideas, elements containing a crack are not required to conform to crack edges. Therefore, mesh generation is directly performed ignoring the existence of any crack while the method remains capable of extending the crack without any remeshing requirement. Furthermore, the type of elements around the crack-tip remains the same as other parts of the finite element model and the number of nodes and consequently degrees of freedom are reduced considerably in comparison to the classical finite element method. Mixed-mode stress intensity factors (SIFs) are evaluated to determine the fracture properties of domain and to compare the proposed approach with other available methods. In this paper, the interaction integral (M-integral) is adopted, which is considered as one of the most accurate numerical methods for calculating stress intensity factors.

MSC:

74S05 Finite element methods applied to problems in solid mechanics
74R10 Brittle fracture
74B05 Classical linear elasticity

Cited in **29** Documents

Keywords:

extended finite element method (XFEM); orthotropic media; stress intensity factors; crack

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