

Evaluation of dynamic stress intensity factors using iXFEM

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Abstract

Compared with the existing XFEMs [Belytschko and Black (1999); Moes et al. (1999)], the new XFEM has been developed recently targeting at three aspects of improvement: (1) to overcome the linear dependence and the ill-conditioning issues of the standard and the corrected XFEMs; (2) to get rid of the extra dofs introduced in crack tip enrichment; (3) to be interpolating at enriched nodes. The paper is to present the performance of the new method in dynamic crack problems. At first, the improved XFEM is introduced in short. Then around crack tip, different mass lumping techniques such as the row-sum and the equal mass splitting are compared to find out the optimal mass lumping in dynamic analyses. At last, the emphasis is placed on accuracy comparison/studies of dynamic stress intensity factor between the new and the existing XFEMs. Selected numerical examples for typical elastic dynamic crack problems are provided to demonstrate the numerical performance of the new XFEM in dynamic analyses.

Keywords: improved XFEM, mass lumping technology, dynamic stress intensity factor, crack

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