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Dynamic fracture analysis of piezoelectric materials using scaled boundary finite element method

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The scaled boundary finite element method is extended to solve the fracture problems of piezoelectric materials under dynamic electromechanical loading conditions. In this method, the displacement and electric potential, and stress and electric displacement fields are expressed as an matrix power function which separates the singular stress term from other high-order terms. The polygon mesh is used to accurately represent the singular stress and electric displacement field in the vicinity of the crack tips under the dynamic load. The dynamic stress and electric displacement intensity factors are evaluated directly from the scaled boundary finite element solutions of the singular stress and electric displacement fields. A continued fraction solution is used to model the inertial effect at high frequencies. High convergence rate is observed when applying high orders of continued fraction.

Keywords: Piezoelectric materials, Dynamic stress and electric displacement intensity factors, Scaled boundary finite element method