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Numerical Approach for Dynamic Fracture in Piezoelectric Solids

Jose Dominguez[(1)], Andres Saez[(1)], Felipe Garcia-Sanchez[(2)]

(1) *Continuum Mechanics Department, Universidad de Sevilla, Sevilla, Spain*
(2) *Civil Engineering Department, Universidad de Málaga, Málaga, Spain*

A mixed boundary element approach for two-dimensional dynamic piezoelectric fracture mechanics problems is presented. The numerical approach is based on displacement and traction integral equations for external and crack boundaries, respectively. Integral equations for time harmonic problems are considered. Integrals with strongly singular and hypersingular kernels are analytically transformed into weakly and regular integrals by using an integration variable consistent with the material characteristic parameters. Transient problems are analyzed by means of the FFT.Curved and quarter-point elements are used.Stress and electric displacement intensity factors are evaluated from nodal values next to the crack tip. The present BE approach has allows for solution of a variety of crack problems including curved cracks. Several piezoelectric crack problems are studied in the paper. Some of these problems had never been studied before.

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