PLANE WAVE PROPAGATION THROUGH IMPERFECT INTERFACES: EFFECT OF INTERFACE STRESSES AND ANISOTROPY

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Imperfect interfaces between two rough solids may be modeled through a kinematically driven micromechanical methodology. In this methodology, the effect of interface stresses on nonlinearity are modeled by, (1) using non-linear asperity contact force laws, and (2) explicitly accounting for asperity contact loss and formation of new asperity contacts during loading. Furthermore the methodology allows for the modeling of both inherited as well as stress induced anisotropies. The inherited anisotropy is modeled by using a directional distribution function of asperity contact orientations, recognizing that the asperity contacts are not equally likely in all directions. The loading induced anisotropy is modeled by considering the asperity contact loss and formation during loading as well as the nonlinear behavior of asperity contact force laws [1]. The stress-deformation relationships obtained using the micromechanical methodology are utilized here to study the effect of interface stresses and anisotropy on plane wave propagation behavior based upon the well established imperfectly bonded interface model [2]. The amplitudes of the reflected and transmitted waves are significantly influenced by the interface stresses and anisotropy. We also investigate the behavior of interface waves generated by the incidence of plane waves on such interfaces. It is noteworthy that the polarization and velocities of interface waves are affected both by the interface stresses and anisotropy.

References:

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[2] Rokhlin, S.I. and Wang, Y.J. Analysis of boundary conditions for elastic wave interaction with an interface between two solids. *J. Acoust. Soc Am*., 89, 503-515, 1991.

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