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Field Dislocation Mechanics for heterogeneous elastic materials: A numerical spectral approach

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Abstract

Spectral methods using Fast Fourier Transform (FFT) algorithms have recently seen a surge in interest in the mechanics of materials community. The present contribution addresses the critical question of determining accurate local mechanical fields using FFT methods without artificial fluctuations arising from materials and defects induced discontinuities. Precisely, the present work introduces a numerical approach based on intrinsic discrete Fourier transforms for the simultaneous treatment of material discontinuities arising from the presence of dislocations and from elastic stiffness heterogeneities. To this end, the elasto-static equations of the field dislocation mechanics theory for periodic heterogeneous materials are numerically solved with FFT in the case of dislocations in proximity of inclusions of varying stiffness. An optimal intrinsic discrete Fourier transform method is sought based on two distinct schemes. A centered finite difference scheme for differential rules are used for

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