 ICCES, vol.18, no.3, pp.71-71

A novel boundary element approach for solving the anisotropic elastic problems

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Summary

Abstract The presentation is mainly devoted to the research on the regularized boundary integral equations with indirect unknowns for anisotropic elastic problems. Based on a new idea, a novel regularization technique is pursued, in which the nonsingular indirect BIE excluding the CPV and HFP integrals is established. The proposed indirect BEM has many advantages. Firstly, the anisotropic problems to be considered can be solved directly without transforming them into isotropic ones so that no inverse transform is required. Secondly, the proposed method doesn't need to calculate multiple integral as the Galerkin method, and but rather treat CPV integrals indirectly, so it is simple and easy for programming. Thirdly, it is also suited for the computation of the displacement derivatives on the boundary, not only limited to traction equation. Finally, the proposed gradient BIEs are independent of the displacement BIEs and can be collocated at the same locations as the displacement BIEs. This provides additional and concurrently useable equations for various purposes. In the numerical implementation, the boundary geometric is depicted by the exact elements and the quadratic elements, while the distribution of the boundary quantity on each element is approximated by a discontinuous quadratic element. Some numerical examples will be applied to validate the current scheme. It is shown that a better precision and high computational efficiency can be achieved by the presentation.

Key words:BEM; anisotropic; elastic problems; indirect boundary integral equation (IBIE); nonsingular IBIE