

New approach for computing hyper-singular interface stresses in IIBEM for solving multi-medium elasticity problems

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Abstract

In this paper, a single stress integral equation is presented for solving multi-medium elasticity problems, and by using a newly proposed method for treating arbitrarily high order of singular boundary integrals, a new method is developed for computing the stresses on the interfaces of multi-media. Comparing to conventional multi-domain boundary element methods, the presented Interface Integral BEM (IIBEM) is more efficient in computational time, data preparing, and program coding. However, a big issue is encountered in IIBEM when computing the stresses on interfaces since the commonly used traction-recovery method in computing outer boundary stresses cannot be applied on the interfaces. Therefore, a direct method for handling a hyper-singular stress interface integral equation has to be used to obtain the interface stresses. In the direct method used in the paper, singularities are analytically removed by expressing the non-singular part of the integration kernel as a power series in a local distance defined on a projection line/plane, and the stresses on the interfaces can be evaluated precisely. Numerical examples are given to verify the correctness of the derived boundary-interface integral equations.

Keywords: Multi-medium problems; Boundary-interface integral equation; Boundary element method; Interface stress.

References

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