Wang, Yuanyuan; **Gu, Yan**; **Fan, Chia-Ming**; **Chen, Wen**; **Zhang, Chuanzeng**

Domain-decomposition generalized finite difference method for stress analysis in multi-layered elastic materials. (English) Zbl 1403.74282

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Summary: The generalized finite difference method (GFDM) is a relatively new meshless method for the numerical solution of certain boundary value problems. The method uses the Taylor series expansions and the moving least squares approximation to derive explicit formulae for the required partial derivatives of unknown variables. In this paper, we document the first attempt to apply the GFDM for the numerical solution of two-dimensional (2D) multi-layered elastic problems. A multi-domain GFDM scheme is proposed to model the composite (layered) elastic materials. The composite material considered is decomposed into several sub-domains and, in each sub-domain, the solution is approximated by using the GFDM-type expansion. On the subdomain interface, compatibility of displacements and equilibrium of tractions are imposed. Preliminary numerical experiments show that the introduced multi-domain GFDM is very promising for accurate and efficient numerical simulations of multi-layered materials.

MSC:

74S20 Finite difference methods applied to problems in solid mechanics
65N06 Finite difference methods for boundary value problems involving PDEs
74A10 Stress

Keywords:

multi-layered materials; meshless method; generalized finite difference method; domain decomposition technique; elasticity

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