Three-dimensional analysis of functionally graded thermo-piezoelectricity

problems by the local radial basis function collocation method

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Abstract

A strong form meshless numerical method, the local radial basis function collocation method (LRBFCM), is proposed for three-dimensional analyses of the boundary value problems. The coupled thermo-electro-mechanical fields are utilized to describe the behaviors of functionally graded thermo-piezoelectric plates. For the solutions to the partial differential equations of thermo-piezoelasticity with non-constant coefficients, the local radial basis function collocation method is implemented. The multiquadric (MQ) radial basis function and Houbolt finite difference scheme are approximated for the spatial variations of all the physical fields and the temporal variations, respectively. The LRBFCM model is validated with the existing exact solution and extended to analyze continuous variations.

Keywords: Functionally graded materials, Local radial basis function collocation method, Thermo-piezoelectric-elasticity, Three-dimensional analysis.