ISOPARAMETRIC GRADED FINITE ELEMENTS FOR NONHOMOGENEOUS MATERIALS

Jeong-Ho Kim[1] and Glaucio H. Paulino

Department of Civil and Environmental Engineering,
University of Illinois at Urbana-Champaign,
Newmark Laboratory, 205 North Mathews Avenue, Urbana, IL 61801, U.S.A.

Isoparametric graded finite elements are used for modeling nonhomogeneous materials. The spatial gradation of material properties is incorporated into the element stiffness matrix based on a generalized isoparametric formulation. The solutions for displacements and stresses obtained by the finite element method are compared with analytical counterparts by considering a graded plate. The assumptions and limitations of the analytical solutions are reviewed and assessed in the numerical investigations. Numerical implementation is done by means of Matlab, and an example is presented for verification and validation of the implementation.

Keywords: Finite element method, graded finite element, functionally graded material (FGM), generalized isoparametric formulation (GIF).

[1] Corresponding Author, Phone (217)333-0498, e-mail: kim33@uiuc.edu