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# Postbuckling behavior of bi-axially compressed arbitrarily straight-sided quadrilateral functionally graded material plates

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## Abstract

In this paper, the problem of the postbuckling behavior of biaxial compressed straight-sided, functionally graded material (FGM) plates of quadrilateral shape is studied. The plate considered is subjected to in-plane loads on all four edges. A computational framework based on an improved moving least-squares (IMLS) approximation for the field variables is developed for the analysis. The solution procedure involves a transformation from the physical domain to a computational domain and then discrete the nonlinear governing equation using the IMLS-Ritz method. The first-order shear deformation theory (FSDT) with the von Kármán nonlinearity is employed. A nonlinear solution to the postbuckling of quadrilateral FGM plates is computed through the modified Newton-Raphson method combined with the arc-length iterative algorithm. A stabilized conforming nodal integration scheme is employed to improve computational efficiency and eliminate shear and membrane locking. The validity and accuracy of the numerical results are established through convergence studies. To the best of the authors' knowledge, the problem has not been attempted in the open literature.

Keywords: functionally graded material; postbuckling; Mindlin plates; first-order shear deformation theory; Ritz method

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