# Differential evolution algorithm for optimization of functionally graded cylindrical panels based buckling analysis

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## Abstract

Cylindrical panels are common in construction structures, aerospace vehicle engineering etc., and buckling behaviors are often an important problem in analysis and design considerations for these structures. This study deals with a material distribution optimization of functionally graded (FG) cylindrical panel. The two constituent FG cylindrical panel consists of metal and ceramic, piecewise cubic interpolation of volume fraction are used to calculate volume fractions of constituent material phases at a point; these fractions are defined at a limited number of evenly spaced control points. The closed-form solution with Galerkin method is applied to investigate the critical buckling loads for the FG cylindrical panel. In addition, the governing equation are established using classical shell theory with von-Karman nonlinear kinematics. A differential evolution (DE) algorithm is employed to solve maximum critical buckling loads with ceramic volume constrain. In numerical results, optimal results in all examples created by proposed method are compared to those of a combination of closed-form solution and DE to examine its effectiveness and robustness.

**Keywords:** Functionally graded materials; cylindrical panel; FGMs; Differential evolution algorithm.

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