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Analysis of thermal and mechanical response in functionally graded cylinder using cell-based smoothed radial point interpolation method

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Abstract

This study aims to improve the accuracy and efficiency when dealing with thermal and mechanical response in functionally graded cylinder, which is very important in modern aerospace industry. The cell-based smoothed radial point interpolation method (CS-RPIM) is formulated for such analysis. In CS-RPIM, triangular meshes are utilized to discretize problem domains, which can be easily generated. Each triangular element is then partitioned into several smoothing cells. Field functions are constructed by RPIM shape functions and system equations are obtained based on these smoothing cells. Finally, the performances of CS-RPIM are fully investigated through several numerical examples.

***Keywords*:** FGM; RPIM; Meshfree method; Thermal; Gradient smoothing technique

Aerospace industry

1. Introduction

The functionally graded material (FGM) is a new kind of composite material, which has been successfully utilized in modern aerospace industry. In general, FGM is made up of metals and ceramics, in which the material volume fractions change continuously along desired directions [1, 2]. The metal component is utilized to prevent fracture caused by thermo-mechanical loads and the ceramic constituent can offer heat-resistant property

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