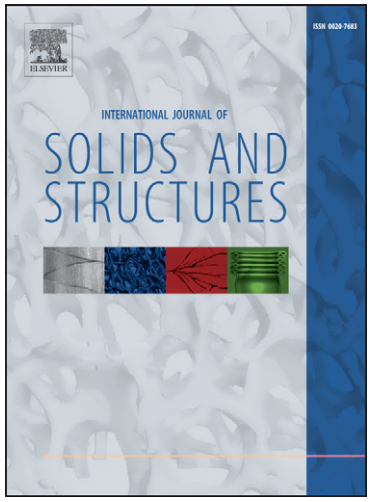

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Ali R. Hadjesfandiari, Gary F. Dargush

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Fundamental solutions for isotropic size-dependent couple stress elasticity

Ali R. Hadjesfandiari, Gary F. Dargush

Department of Mechanical and Aerospace Engineering
University at Buffalo, State University of New York
Buffalo, NY 14260 USA

ah@buffalo.edu, gdargush@buffalo.edu

Abstract

Fundamental solutions for two- and three-dimensional linear isotropic size-dependent couple stress elasticity are derived, based upon the decomposition of displacement fields into dilatational and solenoidal components. While several fundamental solutions have appeared previously in the literature, the present version is for the newly developed fully determinate couple stress theory. Within this theory, the couple stress tensor is skew-symmetrical and thus possesses vectorial character. The present derivation provides solutions for infinite domains of elastic materials under the influence of unit concentrated forces and couples. Unlike all previous work, unique solutions for displacements, rotations, force-stresses and couple-stresses are established, along with the corresponding force-tractions and couple-tractions. These fundamental solutions are central in analysis methods based on Green's functions for infinite domains and are required as kernels in the corresponding boundary integral formulations for size-dependent couple stress elastic materials.

1. Introduction

It has long been suggested that the strength of materials has size-dependency in smaller scales. Recently, in Hadjesfandiari and Dargush (2011), we have developed the consistent size-dependent couple stress theory for solids. Unlike previous work, this