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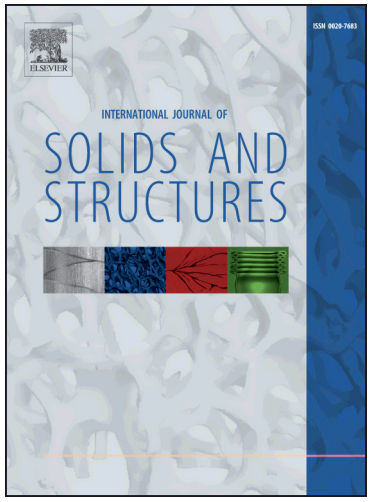

Modeling of multi-strand wire ropes subjected to axial tension and torsion loads

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Modeling of multi-strand wire ropes subjected to axial tension and torsion loads

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Abstract

A new model characterizing the response of a multi-strand wire rope subjected to axial tension and axial torque is presented in this paper. Apart from most of previous approaches which deal with a straight wire strand, the present model fully considers the double-helix structure in multi-strand configuration. To be further, a new method to compute local deformation parameters (two curvatures and a twist defined by Love, 1944) of each wire is introduced. The proposed model well predicts the global stiffness of the rope. It is found that different friction states between adjacent wires can lead to quite a different distribution of local bending and torsion deformation of double-helix wire. The variations of stresses in double-helix wires along the rope axis are analyzed and the results show that torsion stress of a double-helix wire can be neglected when the rope is subjected to axial tension (axial torsion is restrained). The present model provides a new way to estimate the local deformation and stresses at

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