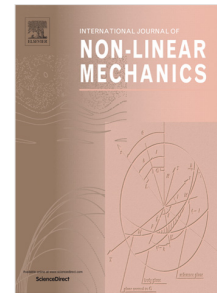


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A semi-explicit algorithm for solving multibody contact dynamics with large deformation

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Abstract

This work is devoted to the numerical modeling of contact problems in the context of multibody dynamics. Non-linearities including large deformation and frictional contact are modeled based on the finite element method. An improved approach by means of a semi-explicit calculation is applied to integrate the equation of motion. The frictional contact forces and the relative velocity establish an implicit relationship within the bi-potential framework. A hybrid methodology consisting of the Octree structure and the bounding volume hierarchy is proposed to reduce exhaustive contact inspections. Two numerical examples implemented in our in-house finite element software FER/Impact are given to illustrate the efficiency and accuracy of the resulting methods.

Key words: Semi-explicit algorithm, Contact detection, Multibody dynamics, Large deformation, Bi-potential method.

1 Introduction

Impact and friction phenomena play a noticeable role in multibody contact dynamics. These phenomena are very complex and usually difficult to be modeled because multiple nonlinearities are involved. Besides, variables like velocity, acceleration show sudden changes and discontinuity in a very short duration. For the early studies, multibody systems were mostly analyzed by

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