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综述评论

多体系统Lagrange方程数值算法的研究进展

王琪, 陆启韶

北京航空航天大学理学院

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摘要 Lagrange方法是建立多体系统动力学方程的普遍方法之一，其方程的形式为常微分方程组或微分-代数方程组，数值计算与数值分析是研究多体系统动力学特性的重要方法。本文简要介绍了多体系统动 力学方程的第一、二类Lagrange方程和修正的Lagrange方程的基本形式及这些方程的正则形式，着重介绍了正则方程在数值计算中的特点，就多体系统Lagrange方程的隐式算法、辛算法和多体系统动力学特性的数值分析方法(包括数值仿真、 Poincarè映射和Lyapunov指数的计算方法)的研究现状进行了综述。

关键词 多体系统 Lagrange方程 数值方法 非线性动力学

分类号

ADVANCES IN THE NUMERICAL METHODS FOR LAGRANGE'S EQUATIONS OF MULTIBODY SYSTEMS

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北京航空航天大学理学院

Abstract

The Lagrange's method is one of the general methods to derive the dynamic equations for multibody systems, which are in the form of ordinary differential equations or differential-algebraic equations. Numerical analysis is an important way to investigate the behaviors of the dynamics of multibody systems. In this paper, the first kind and the second kind of Lagrange's equations and the modified Lagrange's equations for multibody systems with their canonical forms are introduced, together with the characteristics of their numerical solutions. The advances are reviewed in the following numerical methods, symplectic algorithms and the implicit algorithms for the dynamic equations of multibody systems, as well as other algorithms for dynamic behaviors of multibody systems, such as Poincaré maps and Lyapunov exponents.

Key words multibody system Lagrange's equation numerical method nonlinear dynamics

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通讯作者