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刚体单元及其在多体系统动力学中的应用

Rigid elements and their application in dynamics of multibody systems

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英文关键词: [multibody systems](#) [rigid elements](#) [moments of inertia](#)

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中文摘要:

多体系统动力学分析软件要求人工输入形状复杂物体的质量、质心位置和转动惯量, 而实际上这些参量并不容易获得。本文探索了一种以组成物体的刚体单元为基本要素的新方法, 并结合实际需要具体构造了刚性四面体和刚性梁单元。以刚体单元为基础并内嵌网格剖分模块的分析软件能够自动获得这些参数, 从而具备处理任何复杂系统的能力。仿真结果的对比分析验证了单元构造的正确性。

英文摘要:

In many multi-body software based on the traditional theories of dynamics of multibody systems, parameters such as the mass, the center of mass and the moments of inertia of a body usually have to be given artificially, which results in many difficulties in practice applications, because these parameters are not easy to obtain especially when bodies are complicated in shape. This paper presented a methodology enables to overcome these difficulties. The main idea is to divide a body into many pieces with regular shape called rigid elements. Two kinds of element, the rigid beam element and the rigid tetrahedron element are constructed in this paper, with the consideration of their ability to represent any solid body. Based on the new methodology, a software with mesh generator was developed, which can obtain the inertia parameters of bodies with any shape automatically. The correctness of present rigid elements was verified by numerical examples.

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