■ 论文摘要

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作大范围运动弹性结构振动频率及模态的摄动解

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摘　要：根据参数摄动理论, 建立了作大范围运动弹性结构特征频率与模态的摄动理论, 推导了作大范围运动弹性结构的特征频率与模态的1阶、2阶摄动方程. 以作大范围运动弹性梁为例, 求解了作大范围转动弹性梁振动频率与模态的1阶、2阶摄动近似解, 并与结构动力学意义下的频率与模态进行了比较. 该方法解决了在柔性多体系统中大范围运动对柔性体变形运动的振动频率与模态的影响这类刚-柔耦合问题, 同时为任意柔性多体系统刚-柔耦合动力学程式化建模提供了高效、精确的离散方法.

关键字：弹性结构; 频率; 模态; 大范围运动; 摄动解

The perturbation solution of frequencies and mode of elastic structure in large overall motions

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Abstract: The objective of this study is to obtain higher precision approximate solution of vibration frequencies and mode shapes of elastic structure in large overall motions, which change with the large overall motions changing. Using the parametric perturbation theory, the first and second perturbation formula of the frequencies and mode shapes of elastic structure in large overall motions are obtained. A simple rotating cantilever beam model is used to demonstrate the feasibility of perturbation solution of vibration frequencies and mode shape of this system. The coupled effect between the large over all motion and the frequencies and mode shapes is successfully solved, and the discrete method with higher precision and high computational efficiency is provided for the study of dynamics of flexible multibody system.

Key words:frequency; mode; large overall motions; perturbation solution