

论文

两端固定弹性弦的理论研究与数值模拟

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摘要:

用Frenet标架法及Hamilton原理研究2端固定弹性弦在空间的自由振动,得到了Frenet标架下的非线性振动方程。用最小势能原理导出了弹性弦在重力场中的平衡方程并解出弦平衡时的位形。为讨论弹性弦的振动,建立了弦振动的分子链模型,用分子动力学中的Verlet算法给出简单有效的计算格式,并对弹性弦在重力场中作阻尼振荡的过程进行了模拟。

关键词: 弹性弦 分析力学 Hamilton原理 数值模拟

Theoretical and numerical investigation of elastic string with fixed ends

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Abstract:

Free vibration of a string with fixed ends in three-dimension space was studied with the Frenet frame method and Hamilton principles. Based on the Hamilton principle, the nonlinear equation of free vibration of the elastic string was derived. Then, the equilibrium equation of the elastic string and the configuration of balanced string were discussed. Finally, the molecular chain model was established and the molecular dynamics method was used to simulate the process of damped vibration of an elastic string in a gravity field.

Keywords:

elastic string analytical dynamics Hamilton principle numerical simulation

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