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多阶复合振动的模糊推理移相控制研究

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MULTI-FREQUENCY VIBRATION CONTROL BASED ON FUZZY-REASONING PHASE-SHIFT

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摘要

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摘要 针对空间柔性结构阻尼小、非线性以及不确定性等特点,采用模糊推理智能控制方法,对柔性结构多阶频率的振动进行控制。结果表明,模糊推理智能控制对于非线性、不确定性结构的振动控制较为有效,控制精度较高,并具有较强的鲁棒性和稳定性

关键词: 多阶复合振动 模糊推理 移相控制

Abstract: The flexible space structures have properties of low damping, nonlinearity and uncertainty. It is difficult to establish the mathematics models. Traditional control methods are no longer adaptable to the vibration control of the flexible structures. For example, position, velocity or acceleration feedback control loses its stability and spills over when feedback gain is large enough. As a result, the vibration suppress ratio is not high. In order to realize precise control of flexible structures multi frequency vibration, fuzzy reasoning intelligent control of phase shift is adopted in this paper. That is, extracting the information of eigenvalues from the response of vibration, fuzzy reasoning according to Mamdani's theory and the laws of vibration control, and giving out the control decision values of amplitude, phase and frequency. Control experiments are conducted on a flexible beam excited by continuous force with multi frequency. The results of experiment show that fuzzy reasoning phase shift control is efficient to flexible structures with nonlinearity and uncertainty, and the control has high precision, good stability and strong robustness.

Keywords: multi-frequency vibration fuzzy-reasoning phase-shift control

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