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## 直升机旋翼多层层压黏弹阻尼器多参数动力学建模与分析

### Multiple parameters dynamic modeling and analysis of helicopter rotor multi-layer elastomeric damper

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中文关键词: [直升机](#) [旋翼](#) [动力学](#) [阻尼器](#) [非线性](#) [黏弹材料](#)英文关键词: [helicopter](#) [rotor](#) [dynamic](#) [damper](#) [nonlinearity](#) [elastomeric material](#)

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中文摘要:

针对基于柔性多体系统动力学的直升机旋翼系统动力学建模方法的要求, 结合嵌入式多层层压黏弹阻尼器结构特点, 建立了基于内变量理论的嵌入式多层层压黏弹阻尼器时域模型. 通过引入多层内变量场, 改善模型在较宽应变幅值范围和激振频率范围内计算阻尼器动特性及双频激振下动特性的能力. 在阻尼器建模过程中考虑了嵌入式多层层压黏弹阻尼器中金属隔片的影响, 引入温度传递函数考虑了阻尼器在工作过程中温度上升对黏弹材料的影响, 提高了阻尼器模型的精度. 通过计算分析与实验结果相比较, 验证了阻尼器模型在不同应变幅值、激振频率以及双频激振下的有效性, 为直升机旋翼气弹分析计算提供了一种嵌入式多层层压黏弹阻尼器模型.

英文摘要:

According to the requirement from the helicopter rotor system dynamic modeling method based on the flexible multibody system dynamics method, a time-domain embedded multi-layer elastomeric damper model based on internal variable theory was developed in consideration of the structural characteristics of the embedded multi-layer elastomeric damper. By using the multi-layer internal variable field, the model is more capable to calculate the dynamic characteristic of the damper over a wide strain amplitude and excitation frequency range and under dual frequency excitation condition. The influence of the metal shims of embedded multi-layer elastomeric damper was considered in modeling process, and the influence of the temperature rise during the damper operation on elastomeric material was considered by temperature shift function, improving the accuracy of damper. The calculational results and the experimental data were compared to verify the effectiveness of damper model under different strain amplitudes, excitation frequencies and dual frequency excitation conditions. This work provides an embedded multi-layer elastomeric damper model for calculating and analysis of helicopter rotor system aeroelastic stability.