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弹性梁碰撞阻尼识别的新方法

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NEW METHOD FOR IDENTIFYING IMPACT DAMPING OF TWO ELASTIC BEAMS

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摘要 首先将连续碰撞系统离散成包括任意个模态的状态方程,然后基于Ｈｅｒｔｚ定理和能量平衡原理,证明弹性碰撞阻尼取决于碰撞冲量和最大碰撞力,提出了确定弹性梁碰撞阻尼的新方法,解决了碰撞阻尼识别中的关键问题。最后由两个弹性梁的碰撞实验检验了其正确和有效性。

关键词: Hertz理论　碰撞　阻尼　参数识别

Abstract: The contact force of two impacting elastic bodies is widely modeled as the parallel combination of a nonlinear spring and a nonlinear dashpot.The restoring force of the nonlinear spring can be determined according to Hertzian contact law in elasticity, while the model and corresponding parameters of the nonlinear damping force have to be identified through experiments.The current approach of damping identification is based on the measured time histories of both contact force and relative approaching velocity of two impacting bodies.In this paper, a new technique is presented for the damping identification on the basis of the measured time history of the contact force alone.Hence, the tough problem of measuring the relative approaching velocity of two impacting bodies just before impact is removed.The efficacy test of the new technique is given in the paper through an example of identifying the impact damping of a pair of clamped beams.

Keywords: Her tzian theor y　impact　damping　pa rameter identificat ion

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