# 基于振动台试验的加速度积分位移

郭翔鹰[1], 李长坤[1], 陈春雷[2], 韩 志[2], 梁志明[2]
(1. 北京工业大学材料与制造学部机械结构非线性振动与强度北京市重点实验室, 北京 100124;
2. 中国铁道科学研究院集团有限公司基础设施检测研究所, 北京 100081)

**摘 要**: 轨道不平顺是铁路车辆系统振动的主要激励源,车体构架运行姿态的变化会对轨道几何不平顺检测精度造成影响. 理论上可通过位移传感器对车体构架的运行姿态进行测试,但多数情况下测量困难且精度较低,而采用加速度传感器测试,又存在各种噪声干扰,使积分位移中含有趋势项漂移误差. 针对此类问题,提出了一种从加速度数据中获取位移时间序列的低频衰减频域积分方法. 该方法从测量加速度积分开始,采用基于滑动平均的最小二乘法预处理方法,去除积分过程中的噪声产生的误差,还原实际由于轨道不平顺产生的振动响应. 结合滑动平均方法、高通滤波器和频域积分,通过多次平滑、滤波和积分,得到重构位移信号,避免了信号的失真. 该方法的主要优点是重构位移不存在长周期漂移. 通过与振动台实测数据的对比分析,验证了该方法的准确性和可靠性.

**关键词**: 轨道不平顺; 加速度积分; 频域积分; 位移重构; 六自由度振动台; 低频衰减
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# Acceleration Integral Displacement Based on Shaking Table Test

GUO Xiangying[1], LI Changkun[1], CHEN Chunlei[2], HAN Zhi[2], LIANG Zhiming[2]
(1. Beijing Key Laboratory of Nonlinear Vibrations and Strength of Mechanical Structures, Faculty of Materials and Manufacturing, Beijing University of Technology, Beijing 100124, China;
2. Infrastructure Inspection Research Institute, China Academy of Railway Sciences Corporation Limited, Beijing 100081, China)

**Abstract**: Track irregularity is the main excitation source of the vibration of railway vehicle system, and the change of the running posture of the car body frame will affect the detection accuracy of track geometric irregularity. In theory, the running posture of the car body frame can be measured by the displacement sensor, but in most cases, the measurement is difficult and the accuracy is low. When the acceleration sensor is used to test, there are various kinds of noise interference, so that the integral displacement contains the trend term drift error. To solve this problem, a low-frequency attenuation frequency-domain integration method was proposed in this paper to obtain displacement time series from acceleration data. The method started from the integration of acceleration measurement, and used the least square method based on moving average to remove the error caused by random noise in the integration process and restored the actual vibration response caused by track irregularity. Combined with

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作者简介: 郭翔鹰(1982—), 女, 教授, 主要从事非线性动力学方面的研究, E-mail: guoxy@ bjut. edu. cn
通信作者: 韩 志(1993—), 男, 助理研究员, 主要从事铁路专业评定校准方面的研究, E-mail: han15210234687@ 126. com