考虑粘滑摩擦的时变振动系统模态参数辨识 Modal Parameter Identification of Time Varying Vibration Systems Subjected to Stick-slip Friction

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关键词： 时变系统 模态参数 时变多变量Prony法 粘滑摩擦

摘 要： 将摩擦因素引入时变振动系统的模态辨识中。采用时变多变量Prony法，对振动系统的多输出响应信号建立时变多变量Prony模型，并利用递推最小二乘法估计模型参数，提取出振动系统的模态特征信息。数值仿真中，对含复合频率信号的频率进行了辨识，辨识值与理论值较好的吻合性验证了该方法的有效性。应用实例中，对平面两杆操作臂中的滑动质量块建立了考虑LuGre摩擦的运动方程，利用时变多变量Prony法辨识出含粘滑摩擦的操作臂的固有频率，结果令人满意，验证了该方法的可行性。 Friction is introduced into the modal parameter identification of the time varying vibration systems. The modal characteristics of the vibration system are extracted by using the time varying multivariable Prony method. A time varying multivariable Prony model is established for the multi-output response signals of the vibration system and the parameters of the model are estimated by means of the recursive least square method. In the simulation, a signal with composite frequency is identified. The identified results meet the theoretical values well, which verifies the effectiveness of the presented method. In the example, the motion equation of the moving mass on the planar two-bar manipulator is established, in which the LuGre friction is considered. The natural frequency of the manipulator subjected to stick-slip friction is identified by using the time varying multivariable Prony method. The feasibility of the method is verified by the satisfying identification results.

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