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## 干摩擦对称黏滑响应的级数解及黏滑边界特性

## Series solution of symmetric dry frictional stick-slip motion and stick-slip boundary characteristics

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中文关键词: [干摩擦](#) [对称黏滑运动](#) [级数解](#) [黏滑边界](#) [超谐波共振](#)英文关键词: [dry friction](#) [symmetric stick-slip motion](#) [series solution](#) [stick-slip boundary](#) [super-harmonic subresonant](#)

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中文摘要:

针对航空发动机中的摩擦振动问题, 给出了对称黏滑运动摩擦力的分段表达式. 利用谐波平衡方法推导了具有偶数次黏着的黏滑运动的级数形式解析解, 并基于该解析解给出了参数平面内的黏滑边界线方程. 黏滑运动响应仅包含奇次谐波成分, 在奇次分数倍频处存在超谐波共振. 当频率比小于0.4时, 黏滑边界线呈现凸凹交替特征, 局部极小值位于各阶超谐波共振频率处. 黏性阻尼增大能够缩小无黏着运动的参数范围, 但在各阶超谐波共振频率附近, 黏性阻尼增大会扩大无黏着运动的参数区域.

英文摘要:

To study frictional vibration problems in aero-engine, piecewise expression of frictional force in symmetric stick-slip motion was presented. Analytical series solution of symmetric stick-slip motion with even stops was derived by using harmonic balance method. Stick-slip boundary function in parameter plane was derived based on the series solution. Stick-slip response contained only odd harmonic components and super-harmonic resonances existed at odd fractional frequency ratios. When frequency ratio was less than 0.4, the stick-slip boundary curve had the feature of concave-convex alternation and its local minimums located at the super-harmonic resonant frequencies. Increase in viscous damping reduced the non-sticking parameter range at most frequency ratio ranges except near super-harmonic resonant frequencies, where larger viscous damping led to larger non-sticking parameter range.

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