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## 受宽带噪声激励的二元机翼随机振动系统的矩Lyapunov指数

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## On the moment Lyapunov exponent of a binary airfoil subjected to the excitation of wide band noises

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- 摘要
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**摘要** 通过计算受宽带噪声激励的二元机翼随机振动系统的矩Lyapunov指数,研究了系统的矩稳定和概率1稳定。首先在经典二元机翼颤振方程中加入随机激励,通过随机平均法、Girsanov定理和Feynmann-Kac公式得到关于矩Lyapunov指数的特征值问题。其次采用Fourier余弦级数对特征函数进行正交展开,得到系统矩Lyapunov指数的近似解析式。最后,通过Monte Carlo仿真验证了矩Lyapunov指数近似解析式的可信性,并讨论了系统参数、来流平均速度以及随机噪声谱密度对机翼稳定性的影响。

**关键词:** 矩Lyapunov指数 机翼颤振 随机平均法 宽带实噪声

**Abstract:** In the present paper, the moment Lyapunov exponent of a binary airfoil subjected to the excitation of wide band noises is investigated. A aeroelastic model for two coupled degrees-of-freedom airfoil is established. Via the stochastic averaging method, the four-dimensional system is reduced to a two-dimensional one. Through the polar transformation, Girsanov theorem and Feynmann-Kac formula, the backward differential operator is obtained. By expanding the eigenfunctions as a Fourier cosine series, the approximate analytic expansion of the moment Lyapunov exponent is obtained. And then the Monte Carlo simulation results are given, which match the result of the approximate analytical expansion of the moment Lyapunov exponent. Finally, the influences of the system parameters, the average gas velocity and the spectral density of noises on the stochastic stability of viscoelastic plate is studied.

**Keywords:** moment Lyapunov exponent, airfoil flutter, stochastic averaging method, wide band noise

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