米百刚,詹浩,王斑.基于刚性动网格技术的动导数数值模拟[J].航空动力学报,2014,29(11):2659~2664

基于刚性动网格技术的动导数数值模拟

Numerical simulation of dynamic derivatives based on rigid moving mesh technique

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中文关键词: 动导数 刚性动网格技术 俯仰振荡 升沉振荡 CFD技术

英文关键词:dynamic derivative rigid moving mesh technique pitching oscillation plunging oscillation CFD technology

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中文摘要:

基于刚性动网格技术,建立了俯仰动导数的非定常数值计算方法.首先使用小幅度强迫俯仰振荡方法求解俯仰组合动导数,然后利用小幅度强迫升沉振荡方法求解洗流时差导数,通过两者相减即可得到俯仰阻尼导数.利用国际动导数标准模型Finner导弹进行算例验证,计算得到的俯仰组合动导数与试验值误差为2.76%,洗流时差导数值约为俯仰阻尼导数的11.5%,与文献的结果一致.结论表明:动导数单独模拟方法具有较好的工程实用价值,且可以推广到横向以及航向的动导数数值模拟.

英文摘要:

Based on rigid moving mesh technique, a unsteady method of simulating each pitching dynamic derivative was developed. Firstly, the pitching combined dynamic derivative was calculated by using the method of small amplitude pitching forced oscillation; then the lag of wash derivative could also be obtained by using the small amplitude plunging forced oscillation method; finally the pitching damping derivative was calculated by the difference between the combined dynamic derivative and the lag of wash derivative. The international dynamic derivative standard model Finner missile was taken as an example to testify the methods, the calculation error of pitching combined dynamic derivative is 2.76%, and the lag of wash derivative calculated is 11.5% of pitching damping derivative, in agreenment well with the references. The research shows that the methods of separating dynamic derivatives have been proved reliable and useful in engineering, and these methods can also be used in lateral and directional dynamic derivative analysis.

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