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跨音速操纵面嗡鸣Hopf分叉分析及结构参数对嗡鸣特性影响的研究

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HOPF BIFURCATION ANALYSIS OF TRANSONIC CONTROL SURFACE BUZZ AND INVESTIGATION OF THE INFLUENCE OF STRUCTURAL PARAMETERS ON BUZZ CHARACTERISTICS

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摘要 采用Ｈｏｐｆ分叉分析方法，对跨音速操纵面嗡鸣问题进行了研究。用二维守恒型非定常Ｎａｖｉｅｒ－Ｓｔｏｋｅｓ 方程计算了舵面振动时的非定常气动力，计算了出现Ｈｏｐｆ分叉的Ｍａ 数，研究了一些参数对嗡鸣的影响。将Ｈｏｐｆ分叉的计算结果与嗡鸣的时间历程计算做了对比，两者相当吻合，与飞行试验结果相比，也比较接近。

关键词： Hopf分叉　操纵面嗡鸣　非定常纳维-斯托克斯方程

Abstract： Hopf bifurcation analysis is employed to investigate the problems of the control surface buzz. The unsteady aerodynamic loads acting on the control surface are calculated by the two dimensional Navier Stokes equations. The critical Mach number of the control surface buzz is calculated and the influence of the structural parameters on the buzz characteristics is also investigated. The results of the Hopf bifurcation analysis are consistent with the results of the time integration calculations, and the calculated results both are in good agreement with the flight test data.

Keywords： Hopf-bifurcat ion　control sur face buzz　unsteady Navier -Stokes equat ions

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