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Euler方程与边界层积分方程耦合求解跨音速翼型绕流

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TRANSONIC AIRFOIL ANALYSIS BASED ON THE INTERACTION OF EULER AND INTEGRAL BOUNDARY-LAYER EQUATION

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摘要 应用Euler方程求解跨音速翼型特性时考虑了粘性影响,粘性影响是通过边界层动量和能量积分方程求解的,即粘流/无粘流迭代方法。其中Euler方程采用LU-ADI方法求解;边界层方程均由正解法过渡到反解法,以解决强激波干扰区出现小分离泡的计算问题。计算中使用了贴体C网格,通过一定变换使其保持基本正交。计算结果表明,压力分布、摩阻系数分布与实验结果符合较好。

关键词： 跨音速流动 分离流 粘流/无粘流迭代

Abstract： A method based on viscous/inviscid interactions is used to calculate the transonic flows over airfoils. The two-dimenstional inviscid region is computed by solving the Euler equations using LU-ADI algorithm. The boundary layer is solved by employing a standard two-dimension integral momentum and kinetic energy shape parameter equations, in conjunction with the inverse integral technique based on the velocity profiles of the separated turbulent boundary layer. The viscous/ inviscid interaction is achived using the surface transpiration velocity model. Transonic viscous/inviscid interacting flowsover airfoils with a small separated region are calculated and compared with the experimental data. The results in this paper show that this viscous/inviscid interaction method can provide more agreeable results as compared with experiments, and applied to analyze the separated flows over airfoils.

Keywords： transonic flow separated flow viscous/nonviscous iteration

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