



航空学报 2011, Vol. 32 Issue (5) :792-801 DOI: CNKI:11-1929/V.20101221.1714.059

流体力学与飞行力学

最新目录 | 下期目录 | 过刊浏览 | 高级检索

<< Previous Articles | Next Articles >>

$\gamma-Re_{\theta}$ 转换模型在二维低速问题中的应用

孟德虹, 张玉伦, 王光学, 王运涛

中国空气动力研究与发展中心 空气动力学国家重点实验室, 四川 绵阳 621000

Application of $\gamma-Re_{\theta}$ Transition Model to Two-dimensional Low Speed Flows

MENG Dehong, ZHANG Yulun, WANG Guangxue, WANG Yuntao

State Key Laboratory of Aerodynamics, China Aerodynamics Research and Development Center, Mianyang 621000, China

摘要

参考文献

相关文章

Download: PDF (1834KB) HTML 1KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 介绍了基于当地关联的 $\gamma-Re_{\theta}$ 转换模型,通过Spalart建议的环境源项法对自由流湍流衰减的有效控制,实现了该转换模型的实用化。利用中国空气动力研究与发展中心的TRIP软件平台上实现的该转换模型,对S809翼型、NLR7301两段翼型和30P30N三段翼型3个低速翼型绕流问题进行了计算,将不同迎角下的计算结果与试验结果进行比较分析。计算结果表明:该模型可以比较准确地模拟各种外形的分离转捩与自然转捩的位置及湍流在顺压梯度区的再层流化现象,有效提高了气动力模拟的精度,具有工程应用价值;验证了TRIP软件平台上 $\gamma-Re_{\theta}$ 转换模型在二维问题上模拟的正确性;在中等雷诺数范围,层流区域和湍流区域有相同量级时,计算必须采用转换模型才能准确模拟气动力。

关键词: 边界层 层流湍流转捩 湍流度 流场模拟 间歇因子 低速翼型

Abstract: An introduction is given to the $\gamma-Re_{\theta}$ transition model based on local variables. Through the control of the free flow turbulence attenuation by Spalart's ambient source term method, a practical transition model is achieved. Based on the transition model developed in software TRIP of China Aerodynamics Research and Development Center, the flow over low speed airfoils, including airfoil S809, NLR7301 and airfoil 30P30N, is studied. Numerical simulations and comparisons of their dynamic characteristics indicate that the transition locations of natural transition and separated transition accord with the experimental data; the relaminarization of turbulent flow along the pressure gradient zone is well simulated, and the aerodynamic simulation accuracy is effectively increased. This model may find wide application in engineering; and the correctness of the $\gamma-Re_{\theta}$ transition model in software TRIP of CARD C is validated. The calculated results also indicate that while the Re number in the laminar flow corresponds to that in the turbulent flow, only the transition model can improve the precision of calculated aerodynamics.

Keywords: boundary layer laminar to turbulent transition turbulence intensity flow simulation intermittency low speed airfoil

Received 2010-09-09;

Fund:

空气动力学国家重点实验室基金 (JBKY09000302)

Corresponding Authors: Tel.: 0816-7067914 E-mail: ylzhang@skla.cardc.cn Email: ylzhang@skla.cardc.cn

About author: 孟德虹(1982-) 男,硕士,助理研究员。主要研究方向:流动转捩,气动噪声。 Tel: 0816-7067914 E-mail:

dhmeng@skla.cardc.cn 张玉伦(1963-) 男,研究员。主要研究方向:CFD软件开发。 Tel: 0816-7067914 E-mail:

ylzhang@skla.cardc.cn 王光学(1976-) 男,硕士,助理研究员。主要研究方向:计算空气动力学。 Tel: 0816-7067914 E-mail:

gxwang@skla.cardc.cn 王运涛(1967-) 男,博士,研究员,博士生导师。主要研究方向:计算空气动力学。 Tel: 0816-7067911 E-mail:

ytwang@skla.cardc.cn

引用本文:

Service

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ Email Alert
- ▶ RSS

作者相关文章

