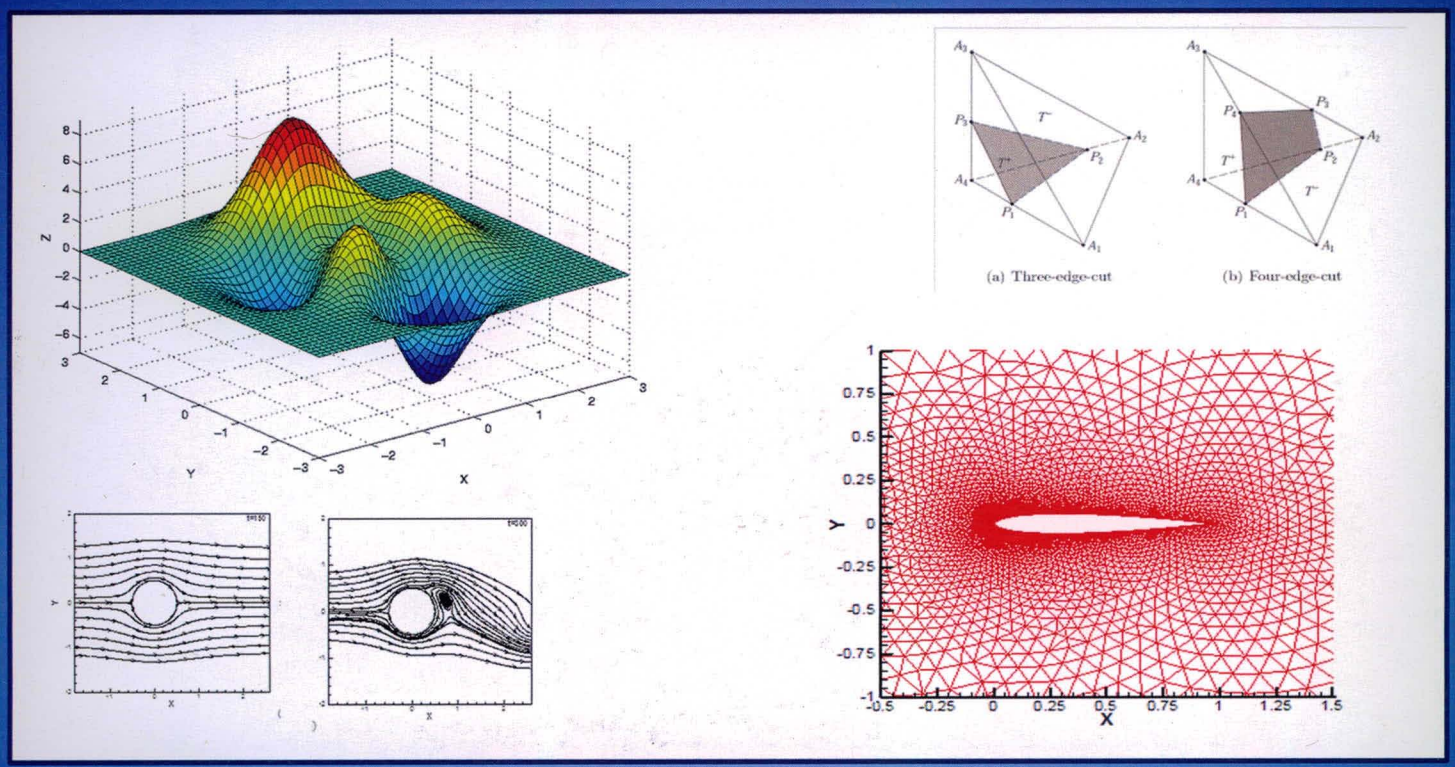
ADVANCED NUMERICAL TECHNIQUES IN ENGINEERING and SCIENCE



Editors
AHMAD TARIQ JAMEEL
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Editors

AHMAD TARIQ JAMEEL
Department of Biotechnology Engineering

WAQAR ASRAR
Department of Mechanical Engineering

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Contents

CHAPTER 10

Lower-Upper Symmetric-Gauss-Seidel (LU-SGS) Algorithm for Pseudo Compressibility Method

ASHRAF ALI OMAR

Department of Mechanical Engineering, Faculty of Engineering, International Islamic University Malaysia, Gombak, 50728 Kuala Lumpur, Malaysia.
aao@iium.edu.my

ABSTRACT

A numerical method based on the Pseudo-compressibility is used for solving incompressible Navier-Stokes equations using Lower-Upper Symmetric Gauss-Seidel (LU-SGS) implicit algorithms. The convective flux terms of the Navier-Stokes equations are discretized by a second order central differencing scheme. The resulting inviscid flux terms are presented by central difference scheme with introduction of third order numerical damping. The method is tested and validated on two test cases. The first test case is for the turbulent flow-field around a multi-element airfoil with leading-edge slat and trailing-edge flap in landing configuration. The second is for three dimensional laminar steady flow over a cylinder body at high angle of attack. The computed results for the studied cases are compared with experimental data in terms of surface pressure and lift coefficients and show reasonable agreement. Also the computed flow field over the cylinder body demonstrates the capability of the LU-SGS algorithms in predicting the development of asymmetric vortices.

Keywords: Pseudo-compressibility, Navier-Stokes Equations, LU-SGS, finite difference