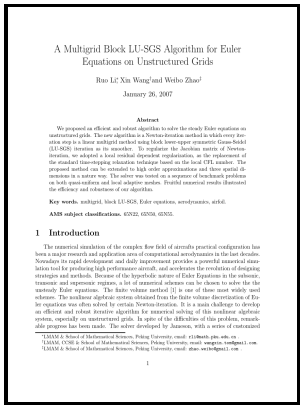
Implementation of a parallel unstructured Euler solver on the CM-5

Institute for Computer Applications in Science and Engineering - Implementation Of A Parallel Unstructured Euler Solver On The Cm


A Multigrid Block LU-SGS Algorithm for Euler Equations on Unstructured Grids

Rao Li[1] Xin Wang[2]and Weibo Zhao[3]

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Abstract

We proposed an efficient and robust algorithm to solve the steady Euler equations on unstructured grids. The new algorithm is a Newton-iteration method in which every iteration step is a linear multigrid method using block lower-upper symmetric Gauss-Seidel (LU-SGS) iteration as its smoother. To regularize the Jacobian matrix of Newton-iteration, we adopted a local residual dependent regularization, as the replacement of the standard time-stepping relaxation technique based on the local CFL number. The proposed method can be extended to high order approximations and three spatial dimensions in a nature way. The solver was tested on a sequence of benchmark problems on both quasi-uniform and local adaptive meshes. Fruitful numerical results illustrated the efficiency and robustness of our algorithm.

Key words. multigrid, block LU-SGS, Euler equations, aerodynamics, airfoil.

AMS subject classifications. 65N22, 65N50, 65N55.

1 Introduction

The numerical simulation of the complex flow field of aircrafts practical configuration has been a major research and application area of computational aerodynamics in the last decades. Nowadays its rapid development and daily improvement provides a powerful numerical simulation tool for producing high performance aircraft, and accelerates the revolution of designing strategies and methods. Because of the hyperbolic nature of Euler Equations in the subsonic, transonic and supersonic regimes, a lot of numerical schemes can be chosen to solve the the unsteady Euler equations. The finite volume method [1] is one of those most widely used schemes. The nonlinear algebraic system obtained from the finite volume discretization of Euler equations was often solved by certain Newton-iteration. It is a main challenge to develop an efficient and robust iterative algorithm for numerical solving of this nonlinear algebraic system, especially on unstructured grids. In spite of the difficulties of this problem, remarkable progress has been made. The solver developed by Jameson, with a series of customized

[1]LSEC & School of Mathematical Sciences, Peking University, email: rli@math.pku.edu.cn

[2]LSEC, ICMSEC & School of Mathematical Sciences, Peking University, email: wangxin_tom@pku11.com.

[3]LSEC & School of Mathematical Sciences, Peking University, email: zhaoweibo@pku11.com.

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Description: -
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Telomere -- genetics
Telomerase -- physiology
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Evolution, Molecular
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Telomere
Euler equations of motionImplementation of a parallel unstructured Euler solver on the CM-5
-Implementation of a parallel unstructured Euler solver on the CM-5
Notes: Bibliographical references: p. 11.
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Tags: #Implementation #of #a #parallel #Euler #solver #with #GRIDS

[2007.00094] Efficient parallel 3D computation of the compressible Euler equations with an invariant

It works for quadrilateral grids, triangular grids, and mixed grids also.

Parallel Computational Fluid Dynamics '97

Simulation of accoustic wave propagation within unsteady viscous compressible gas flows on parallel distributed memory computer systems A. Implementation of a Navier-Stokes solver on a parallel computing system G.

[2007.00094] Efficient parallel 3D computation of the compressible Euler equations with an invariant

In particular, the kinematics of impact and run-up on structures and beaches are drastically important in the case of hazardous events such as surges and tsunamis. Application of a parallel Navier-Stokes model to ocean circulation C.

Hybrid cell finite volume Euler solutions of flow around a main

This serves also as verification of the hand-coded Jacobians which are complicated.

Parallel Computational Fluid Dynamics '95

In this paper, the SIMD strategy is employed through the use of the CM Fortran language and the CMSSL scientific library. I wrote this in 1999 when I was interested in aerodynamic optimization problems. Grab this code, look inside to see how it is written, get good understanding, and then write your own.

Free CFD Codes: Learn through examples.

Numerical Fluxes 3D Euler Ver. Modelling the global ocean circulation on the T3D C. This code computes a steady flow over a bump with the Roe flux by two solution methods: an explicit 2-stage Runge-Kutta scheme and an implicit defect correction method with the exact Jacobian for a 1st-order scheme, on irregular triangular grids.

[2007.00094] Efficient parallel 3D computation of the compressible Euler equations with an invariant

This solution has been used by many people to verify the accuracy of their Navier-Stokes code. Authors:, Abstract: We discuss the efficient implementation of a high-performance second-order collocation-type finite-element scheme for solving the compressible Euler equations of gas dynamics on unstructured meshes.

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