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Abstracts of Papers to Appear in Future Issues

AUTOMATIC FEYNMAN GRAPH GENERATION. P. Nogueira. *CFMC-INIC, Av. Prof. Gama Pinto 2, P-1699 Lisboa Codex, Portugal.*

A general method is devised for the automatic generation of Feynman diagrams in gauge (and other) field theories. The performance of an implemented computer program is also described, as well as a number of tests that rely on complementary enumeration techniques.

A SELF-ADAPTIVE DOMAIN DECOMPOSITION FOR THE VISCOUS/INVISCID COUPLING. I. BURGERS EQUATION. Renzo Arina. *Dipartimento di Ingegneria Aerospaziale, Politecnico di Torino, 10129 Torino, Italy*; Claudio Canuto. *Dipartimento di Matematica, Politecnico di Torino, 10129 Torino, Italy and Istituto di Analisi Numerica del C.N.R., 27100 Pavia, Italy.*

A new formulation of the viscous/inviscid coupling, termed χ-formulation, has been applied to the Burgers equation: the equation is modified in such a way that the viscous terms are neglected in dependence of their magnitude. We show that the modified χ-equation can be solved on a single domain at a cost comparable to the cost of solving the original equation, despite a nonlinearity being added. Furthermore, we consider a domain decomposition method, based on the χ-formulation, by splitting the original problem into an inviscid Burgers equation and a χ-viscous Burgers equation. The interface between the subdomains is automatically adjusted by the proposed method, yielding an optimal resolution of the boundary-layer structure.

A CONSISTENT FORMULATION OF THE ANISOTROPIC STRESS TENSOR FOR USE IN MODELS OF THE LARGE-SCALE OCEAN CIRCULATION. Roxana C. Wajsowicz. *The Institute of Low Temperature Science, Hokkaido University, Sapporo 060, Japan.*

Subgrid-scale dissipation of momentum in numerical models of the large-scale ocean circulation is commonly parameterized as a viscous diffusion resulting from the divergence of a stress tensor of the form $\boldsymbol{\sigma} = \mathbf{A}:\nabla\mathbf{u}$. The form of the fourth-order coefficient tensor $\mathbf{A}$ is derived for anisotropic dissipation with an axis of rotational symmetry. Sufficient conditions for $\mathbf{A}$ to be positive definite for incompressible flows, so guaranteeing a net positive dissipation of kinetic energy, are found. The divergence of the stress tensor, in Cartesian and spherical polar coordinates, is given for $\mathbf{A}$ with constant and spatially varying elements. A consistent form of $\mathbf{A}$ and $\boldsymbol{\sigma}$ for use in models based on the Arakawa B- and C-grids is also derived.

NON-OSCILLATORY SPECTRAL ELEMENT CHEBYSHEV METHOD FOR SHOCK WAVE CALCULATIONS. David Sidilkover and George Em Karniadakis. *Department of Mechanical and Aerospace Engineering, Program in Applied and Computational Mathematics, Princeton University, Princeton, New Jersey 08544.*

A new algorithm based on spectral element discretization and non-oscillatory ideas is developed for the solution of hyperbolic partial differential equations. A conservative formulation is proposed based on cell averaging and reconstruction procedures, that employs a staggered grid of Gauss–Chebyshev and Gauss–Lobatto–Chebyshev discretizations. The non-oscillatory reconstruction procedure is based on ideas similar to those proposed by Cai *et al.* (*Math. Comput.* **52**, *389 (1989)*) but employs a modified technique which is more robust and simpler in terms of determining the location and strength of a discontinuity. It is demonstrated through model problems of linear advection, inviscid Burgers equation, and one-dimensional Euler system that the proposed algorithm leads to stable, non-oscillatory accurate results. Exponential accuracy away from the discontinuity is realized for the inviscid Burgers equation example.

A CHEBYSHEV SPECTRAL COLLOCATION METHOD FOR THE SOLUTION OF THE REYNOLDS EQUATION OF LUBRICATION. Peter E. Raad. *Mechanical Engineering Department, Southern Methodist University, Dallas, Texas 75275*; Andreas Karageorghis. *Mathematics Department, Southern Methodist University, Dallas, Texas 75275.*

A multi-domain, Chebyshev collocation method is presented for the solution of ultra-thin gas bearing problems. The behavior of the flow varies across the computational domain with very sharp gradients occurring in the side and trailing edge boundary layers. The decomposition of the computational domain allows independent control over the representation of the solution in each subdomain. A multi-parameter continuation scheme is used to facilitate the convergence as the parameters of the problem are varied over a wide range. The method is shown to be well suited for the simulation of lubrication flow between textured surfaces even in the presence of very steep pressure boundary layers.

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