CS6: Contributed Session VI

High-Order Time-Stepping Through Rapid Estimation of Block Gaussian Quadrature Nodes

James Lambers, *University of Southern Mississippi*

The stiffness of systems of ODEs that arise from spatial discretization of PDEs causes difficulties for explicit and implicit time-stepping methods. Krylov Subspace Spectral (KSS) methods present a balance between the efficiency of explicit methods and the stability of implicit methods by computing each Fourier coefficient from an individualized approximation of the solution operator of the PDE. In this talk, an asymptotic study of KSS methods is performed in order to drastically reduce computational expense without sacrificing accuracy. Generalization to nonlinear PDE is also presented.

The Application of Homotopy Analysis Method for the Solution of Time-Fractional Diffusion Equation with A Moving Boundary

Ogugua Onyejekwe, *Indian River State College*

It is difficult to obtain exact solutions to most moving boundary problems. In this paper, we employ the use of Homotopy Analysis Method to solve time-fractional diffusion equation with a moving boundary condition. The comparison of the results obtained in this paper with those obtained with other numerical methods shows the validity of HAM (Homotopy Analysis Method). Maple 18 software was used to carry put the computations.

A Model Reduction Algorithm for Simulating Sedimentation Velocity Analysis

Hashim Saber, *University of North Georgia*

An algorithm for the construction of a reduced model is developed to efficiently simulate a partial differential equation with distributed parameters. The algorithm is applied to the Lamm equation, which describes the sedimentation velocity experiment. It is a large scale inverse model that is costly to evaluate repeatedly. Moreover, its high-dimensional parametric input space, compounds the difficulty of effectively exploring the simulation process. The proposed parametric model reduction is applied to the simulating process of the sedimentation velocity experiment. The model is treated as a system with sedimentation and diffusion parameters to be preserved during model reduction. Model reduction allows us to reduce the simulation time significantly and, at the same time, it maintains a high accuracy.

One Nonlinear Model Based on Maxwell System

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The model which is based on Maxwell system that describes the electromagnetic field diffusion process into a substance is investigated. Large time behavior of solutions of corresponding initial-boundary value problems as well as numerical solution of considered problems are studied.

On One System of Nonlinear Multidimensional Partial Differential Equations

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versity, Tbilisi, Georgia and Giorgi Jangveladze, *I. Javakhishvili Tbilisi State University, Tbilisi, Georgia*

The multi-dimensional system of nonlinear partial differential equations is considered. In two-dimensional case this system describes process of vein formation in higher plants. Variable directions finite difference scheme is constructed. Absolute stability and convergence of this scheme are studied. Rate of convergence is given. Various numerical experiments are carried out. Comparison of numerical experiments with the results of the theoretical investigation is given too. The appropriate graphical illustrations are given.