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Events

Computational Mathematics Seminar Series

Local Smoothness-Increasing Accuracy-Conserving (SIAC) Filtering for Discontinuous Galerkin Methods

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Johnston Hall 338
August 20, 2008 - 11:00 pm

Abstract:

The discontinuous Galerkin (DG) method continues to be a popular method due to several nice features including flexibility for adaptivity and for the ability to maintain high order approximations when discontinuities occur at inter-element boundaries. There have been previous investigations into post-processing of discontinuous Galerkin solutions for improving the accuracy of solutions to linear hyperbolic equations by Cockburn, Luskin, Shu, and Suli. This post-processing technique relies on negative order norm estimates of the numerical solution and is able to improve the order of accuracy for time-dependent linear hyperbolic partial differential equations from order k+1 to order 2k+1 while filtering out oscillations in the error over a uniform quadrilateral mesh. In this talk I will discuss this post-processing technique and give examples that demonstrate the ability of the post-processor to enhance DG solutions and as a filtering tool for visualization of streamlines. I will present extension of this technique to one-sided post-processing as well as two techniques for extending the applications to smoothly varying and non-uniform mesh structures. Lastly, a discussion on the possibility of using this technique for one-dimensional filtering of multi-dimensional data to aid in calculation of streamlines will be given.

Speaker's Bio:

Jennifer K. Ryan received her Ph.D. in applied Math at Brown University under the guidance of Chi-Wang Shu. Her previous appointments include Householder fellow at Oak Ridge National Lab and Assistant Professor of Mathematics at Virginia Tech. Currently, she is an Assistant Professor in the Delft Institute of Applied Mathematics, Delft University of Technology in the Netherlands.