Meeting: 1000, Albuquerque, New Mexico, SS 11A, Special Session on Nonlinear Partial Differential Equations Applied to Materials Science

1000-35-58 **Yangsuk Ko*** (yko@csub.edu), Department of Mathematics, 14-SCI, California State University at Bakersfield, 9001 Stockdale Hwy, Bakersfield, CA 93311, and **Robert Haber** (r-haber@uiuc.edu). *Convergence Analysis of a Space-Time Discontinuous Galerkin method for Scalar Conservation Laws.* Preliminary report.

Hyperbolic conservation laws arise from many practical problems in science and engineering such as gas dynamics, multi-phase flow, etc. Nonlinear conservation laws raise mathematical and numerical challenges. Many numerical methods for their approximate solutions have been developed extensively for decades. While these methods have reached a sophisticated level of technical development, they still present some drawbacks.

In this talk, we, first, introduce a newly developed space-time discontinuous Galerkin (STDG) finite element method for scalar conservation laws, which incorporates both conservation law and the associated entropy condition directly in the weak formulation by using physically meaningful Godunov fluxes throughout the formulation. The numerical results of this STDG method seem to have many desirable features: optimal convergence rate, sharp resolution of shocks without excessive smearing or spurious oscillation, element-by-element solution algorithm, no presence of numerical flux terms, etc. Then, we show some results of existence, stability, and convergence of the STDG scheme. Also, we show that optimal convergence rate across shocks ($O(h^{\frac{1}{4}})$) is achieved by connecting the STDG scheme with interesting results of Bouchut and Perthame. (Received August 09, 2004)