Discontinuous Galerkin methods

Raytcho D. Lazarov[1] Satyendra Tomar[2]

[1]Department of Mathematics,
Texas A&M University, College Station, Texas, USA

[2]Johann Radon Institute for Computational and Applied Mathematics,
Austrian Academy of Sciences, Linz, Austria

RICAM-SSCM - Progress report meeting, 12th Dec 2005

Outline

Lectures on DG methods

- Origin (1973, Reed & Hill), for the transport equation
- Self-adjoint elliptic equations of second order, Lagrange multiplier technique, various symmetric and non-symmetric forms, dependence of the stability on η
- Convection-diffusion-reaction equations
- Hybridization techniques (J. Gopalakrishnan, Univ. of Florida)
- Second order problems in mixed forms
- Error analysis for second order problems (LDG - mixed form)
- Stokes system and linear elasticity
- Unified analysis for elliptic problems - Derivation and Stability and error analysis

All the lecture notes are available online

Seminars on DG methods

- Held during the semester
  - A Simple Nonconforming Bilinear Element for the Elasticity Problem (Ivan Georgiev)
  - Dual-consistent treatment of functional output for compressible Navier-Stokes equations (James Lu)
- 3-4 seminars are planned in the next semester (Shuai Lu, Hui Cao etc.)

Miniworkshop on DG methods

- Nitsche mortaring for elliptic problems with corner singularities and boundary layers (B. Heinrich)
- DG methods for elliptic problems: An overview and error analysis (S. Tomar)
- A posteriori error estimates for DG schemes (S. Repin)
- Preconditioning of DG systems (R. Lazarov)
- Multilevel preconditioning of graph-Laplacian (S. Margenov)

Collaborative research

- Adaptivity and aposteriori error control for DG methods (Lazarov, Repin, and Tomar)
- Preconditioning of DG systems (Lazarov and Margenov)