Department of Mathematics

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Scientific Computing Seminar

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Discontinuous Galerkin Method for the Biharmonic Equation

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3:00 PM- 4:00 PM
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Abstract: For the biharmonic problem, we study the convergence of adaptive C^0-Interior Penalty Discontinuous Galerkin (C^0-IPDG) methods of any polynomial order. We note that C^0-IPDG methods for fourth order elliptic boundary value problems have been suggested in [3], whereas a residual-type a posteriori error estimator for a quadratic C^0-IPDG method applied to the biharmonic equation has been developed and analyzed in [2]. Following the convergence analysis of adaptive IPDG methods for second order elliptic problems [1], we prove a contraction property for a weighted sum of the C^0-IPDG energy norm of the global discretization error and the estimator. The proof of the contraction property is based on the reliability of the estimator, a quasi-orthogonality result, and an estimator reduction property. Numerical results are given that illustrate the performance of the adaptive C^0-IPDG approach.

[1]. A. Bonito and R. Nochetto, *Quasi-optimal convergence rate of an adaptive Discontinuous Galerkin method.* SIAM J. Numer. Anal. **48**, 734–771, 2010.

[2]. S.C. Brenner, T. Gudi, and L.-Y. Sung, *An a posteriori error estimator for a quadratic C^0-interior penalty method for the biharmonic problem.* IMA J. Numer. Anal., **30**, 777–798, 2010.

[3]. S.C. Brenner and L.-Y. Sung, *C^0 interior penalty methods for fourth order elliptic boundary value problems on polygonal domains.* J. Sci. Comput., **22/23**, 83–118, 2005.