Department of Mathematics

University of Houston

Scientific Computing Seminar

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RWTH-Aachen

Space-time trace FEM for PDEs on evolving surfaces

Thursday, Oct. 6, 2016
1:30 PM- 2:30PM
Room 550 PGH

Abstract:

We present a particular class of finite element methods for the solution of partial differential equations on evolving surfaces. The evolving hypersurface in $\mathbf{R}^d$ defines a d-dimensional space-time manifold in the space-time continuum $\mathbf{R}^{d+1}$. We derive and analyze a variational formulation for a class of diffusion problems on the space-time manifold. For this variational formulation new well-posedness and stability results are derived. Based on this formulation a discrete in time variational formulation is introduced that is very suitable as a starting point for a discontinuous Galerkin (DG) space-time finite element discretization. In this finite element method we use trial and test surface finite element spaces which consist of traces of standard volumetric elements on the space-time manifold. This DG space-time method is explained and results of numerical experiments are presented that illustrate its properties. Results of a discretization error analysis are briefly addressed.

The results that we present are based on joint work with J. Grande (Aachen), M. Olshanskii (Houston), X. Xu (Beijing).