Space-time trace FEM for PDEs on evolving surfaces

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Abstract
We present a particular class of finite element methods for the solution of partial differential equations on (evolving) surfaces. The evolving hypersurface is characterized as the zero level of a level set function. The finite element method is based on a (discontinuous in time) space-time variational formulation of a class of diffusion problems on the space-time manifold. Based on this variational formulation a discontinuous Galerkin (DG) space-time finite element discretization is developed. This FEM employs traces of standard volumetric elements on the space-time manifold. This 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. Recently, for the case of a stationary manifold a higher order variant of this method has been developed. This higher method and its error analysis will be outlined.