1159-65-169 **Cuiyu He***, 452 BOYD GSRC, ATHENS, GA 30602, and **Erik Burman** and **Mats Larson**.

Shape optimization methods for ill-posed Bernoulli Problem using CutFEM method.

In this talk, we discuss a level set approach for the identification of an unknown boundary in a computational domain. The problem takes the form of a Bernoulli problem where only the Dirichlet datum is known on the boundary that is to be identified, but additional information on the Neumann condition is available on the known part of the boundary. The approach uses a classical constrained optimization problem, where a cost functional is minimized with respect to the unknown boundary, the position of which is defined implicitly by a level set function. To solve the optimization problem a steepest descent algorithm using shape derivatives is applied. In each iteration the cut finite element method is used to obtain high accuracy approximations of the pde-model constraint for a given level set configuration without re-meshing. We considered three different shape derivatives.The theoretical discussion is illustrated with a series of numerical examples showing that all three approaches produce similar result on the proposed Bernoulli problem. (Received August 04, 2020)