Supremum-norm a posteriori Error Control of Quadratic Discontinuous Galerkin Methods for the Obstacle Problem

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Elliptic obstacle problem is a prototype model for the class of elliptic variational inequalities of the first kind. It is a nonlinear model that describes the vertical movement of an object restricted to lie above a barrier (obstacle) while subjected to a vertical force (with suitable boundary conditions). In this talk, we are going to discuss about $aposteriori$ error analysis in the supremum norm for the quadratic Discontinuous Galerkin(DG) method for the elliptic obstacle problem. In comparison with the energy norm estimates, supremum norm estimates gives the pointwise control on the error. We have carried out the analysis on two different discrete sets, one set having integral constraints and other one with the nodal constraints at the quadrature points, and discuss the pointwise reliability and efficiency of the proposed a posteriori error estimator. In the analysis, we employ a linear averaging function to transfer DG finite element space to standard conforming finite element space and exploit the sharp bounds on the Green's function of the Poisson's problem. Moreover, the upper and the lower barrier functions corresponding to continuous solution u are constructed by modifying the conforming part of the discrete solution u_h appropriately. The analysis is carried out in a unified setting which holds for several DG methods. Finally, the numerical results for adaptive FEM are presented in order to exhibit the reliability and the efficiency of the proposed error estimator.

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