

On error estimates for solutions of the stationary thin obstacle problem

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We consider elliptic variational inequalities generated by obstacle type problems with thin obstacles. This mathematical model arises in various real life problems. Among them are an equilibrium of an elastic membrane above a very thin obstacle, the Signorini problem, analysis of flow through through semi-permeable walls subject to the phenomenon of osmosis, etc.).

For this class of problems, we deduce estimates of the distance (measured in terms of the natural energy norm) between the exact solution and any function that satisfies the boundary condition and is admissible with respect to the obstacle condition (i.e., it is valid for any approximation regardless of the method by which it was found).

Computation of the estimates does not require knowledge of the exact solution and uses only the problem data and an approximation. The estimates provide guaranteed upper bounds of the error (error majorants) and vanish if and only if the approximation coincides with the exact solution. The efficiency of obtained error majorants is confirmed by several example, where the exact solution is known.

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