# Regularity of solutions to the inner obstacle problems*

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### Abstract

In this paper we study regularity of the solutions to the inner obstacle problem. Investigations into $H^{2,p}$ regularity of the solutions to global obstacle problems were initiated by G. Stampacchia and H. Brezis. The $H^{2,p}(\Omega)$ regularity for the inner obstacle problems, as far as we are aware, has not been fully developed. A partial exception is the result given by J. Banasiak, K. Szczepaniak in the paper "On regularity of solutions to inner obstacle problem" (Zeitschrift für Analysis und ihre Anwendungen, vol.12, 401-404, 1993) where regularity of this class is obtained for solutions to the inner problem with the so-called egg-shaped impediments.

Using special concave and convex extentions of the impediments we derive the $H^{2,p}(\Omega)$ regularity of the solutions to the inner obstacle problems if certain assumptions are satisfied by the impediments and the region $\Omega$.

We shall also see when for a given impediment the inner obstacle problem may be identified with the Dirichlet problem.

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*oral communication.