

A PRIORI ESTIMATES IN THE THEORY OF VARIATIONAL  
INEQUALITIES VIA STOCHASTIC ANALYSIS

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*Abstract*

This paper is devoted to the proof of new a priori estimates in the theory of variational inequalities (in particular for the obstacle problems) by the techniques of stochastic analysis. We essentially use the semimartingale inequalities for the Snell envelopes and the connection between optimal stopping problems and variational inequalities. Based on these a priori estimates we establish the stability of the solutions of the obstacle problem in the second order Sobolev space  $W^{2,p}(D)$ .

*Key words and phrases:* variational inequalities, multidimensional diffusion processes optimalstopping, shell envelopes, semimartingals.

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