1014-35-1744   **Randolph Garfield Cooper*** (`rcooper2@calstatela.edu`), Department of Mathematics, California State University, Los Angeles, CA 90032-8204. *Sobolev Space Interior Regularity Results for a Variational Inequality Involving an Elliptic Pseudo-Differential Operator.* Preliminary report.

We consider the problem defined in the half space $\mathbf{R}_+^{n+1} = \{x \in \mathbf{R}^{n+1} : x_n > 0\}$,

$$-\Delta w = 0 \ \ x_n > 0$$

$$w \geq 0 \ \ x_n = 0$$

$$-\frac{\partial w}{\partial x_n} \geq h \ \ \text{on } \Omega$$

$$w\left(-\frac{\partial w}{\partial x_n} - h\right) \ \ \text{on } \Omega$$

This problem is an idealized model of a symmetric crack in a infinite elastic domain. Here Ω is a domain in $\mathbf{R}^n = \{x \in \mathbf{R}^{n+1} : x_n = 0\}$, $w|_{x_n=0}$ represents the displacement of the upper face of the crack, and h represents applied stresses. A unilateral condition is imposed on the displacement of the crack face so that the faces do not penetrate one another. This problem reduces to a variational inequality. The unique solvability of this variational inequality is well known. However interior regularity results to the best of my knowledge have not been shown for it. It was conjectured by Gregory Eskin (UCLA) that the square root singularities seen at the boundary of Ω do not occur in the interior. We show this is in fact true. We also show L^p style regularity results for the solution. (Received September 29, 2005)

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