Meeting: 998, Houston, Texas, SS 14A, Special Session on Space and Time Decomposition Methods in Computational and Applied Mathematics

998-65-312 **Edward J. Dean*** (dean@math.uh.edu), Department of Mathematics, University of Houston, Houston, TX 77204-3008, and **Roland Glowinski** (roland@math.uh.edu), Department of Mathematics, University of Houston, Houston, TX 77204-3008. *A Numerical Method For A Fully Nonlinear Elasticity Equation.*

We investigate a numerical method for a modified conjecture of B. Dacorogna in Nonlinear Elasticity. We define the functional $J_{\gamma,f} : (W_0^{1,4}(\Omega))^2 = \mathbf{V} \to \mathbf{R}$ by

$$J_{\gamma,f}(\mathbf{v}) = \frac{1}{4}\int_\Omega |\nabla \mathbf{v}|^\mathbf{4}\,\mathbf{dx} - \frac{\gamma}{\mathbf{2}}\int_{\mathbf{\Omega}} \det \nabla \mathbf{v} |\nabla \mathbf{v}|^\mathbf{2}\,\mathbf{dx} - \int_{\mathbf{\Omega}} \mathbf{f}\cdot\mathbf{v}\,\mathbf{dx},$$

where γ is a positive parameter. The conjecture is that, for $\gamma_c = \frac{2}{\sqrt{3}}$, we have $\inf_{\mathbf{v}\epsilon\mathbf{V}} J_{\gamma,f}(\mathbf{v}) =$ finite, if $0 \leq \gamma < \gamma_c$, and $= -\infty$, if $\gamma > \gamma_c$. The method includes time discretization by operator-splitting of an initial value problem associated with an Euler-Lagrange equation. At each time step, we have to solve a system of three nonlinear equations at each grid point, and a linear variational problem; we use a conjugate gradient algorithm for the solution of the second problem. The result of numerical experiments will be presented.

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