A Contact Problem for a Nonlinear Viscoelastic Rod with Subdifferential Boundary Condition

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We study the behavior of a nonlinear viscoelastic rod in contact with a deformable foundation along its length and with an obstacle at its end. The system is subjected to body forces, which drive the evolution of its mechanical response over time.

A key feature of the model is a boundary condition that describes the contact at the rod's end, where the internal stress depends on both displacement and velocity. This relation is formulated using a subdifferential inclusion and, in a particular case, reduces to the damped normal compliance condition introduced recently in [1].

The proposed model extends earlier approaches [2] in which the stress depended only on velocity, allowing for a more general and physically realistic description of contact effects.

From a mathematical perspective, we establish the existence of a weak solution to the problem. The analysis is based on a time discretization scheme for second-order differential inclusions with multivalued pseudomonotone operators.

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