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Rothe Method for an Adhesive Contact of a Nonlinear Viscoelastic Rod

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Abstract: We consider a nonlinear viscoelastic rod which is in adhesive contact with a foundation along its length and is in contact with an obstacle at its end. The rod is acted up by body forces and, as a result, its mechanical state evolves. Our aim is twofold. The first one is to construct an appropriate mathematical model which describes the evolution of the rod. It leads to the coupled system consisted of two relations, a nonlinear dynamic hemivariational inequality for the displacement and an ordinary differential equation for the adhesion field. The second goal is to prove the weak solvability of the problem. To this end, we apply the Rothe method based on the time discretization of the problem.