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Hemivariational inequalities and fan-variational inequalities. New applications and results.

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The paper is devoted to study the dynamic hemivariational inequality problem consisting in finding $u : [0, T] \rightarrow [H^1(\Omega)]^2$ with $u'(t) \in U_{ad}$ and $u''(t) \in [L^2(\Omega)]^2$ such that

$$(\rho u'', v - u') + a(u, v - u') + \sum_{i=1,2} \int_{\Omega} j_i^0(u'_i, v_i - u'_i) d\Omega \geq (f, v - u') + \int_{\Gamma_F} F_i(v_i - u'_i) d\Gamma, \forall v \in U_{ad}$$

with the initial conditions

$$u_i = u_{0i}, \quad u'_i = u_{1i} \quad \text{for } x \in \Omega \quad \text{and } t = 0,$$

where the nonlinear and nonsmooth part is represented by the Clarke generalized gradient of locally Lipschitz functions $j_i(\xi) = \int_0^\xi \beta_i(\tau) d\tau$ with $\beta_i \in L^1_{loc}(\mathbb{R})$, $i = 1, 2$. The method employed has been next used to prove the existence of solutions to the problems describing the behavior of von Kármán plates and thermoelastic bodies with nonmonotone multivalued boundary conditions.

In the last part of the paper, a new type of variational inequality problems based on the notion of “fan” has been presented. Such an approach enables the consideration of a much wider class of nonmonotone multivalued laws in mechanics as shown in appropriate examples. The new derived fan-variational inequalities serve as an important mathematical tool in the formulation of variational theory of damage problems.

Reviewer: [Z.Naniewicz \(Warszawa\)](#)

MSC:

[49J40](#) Variational inequalities
[74K20](#) Plates
[74A15](#) Thermodynamics in solid mechanics

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thermoelasticity; hemivariational inequality; von Kármán plates; fan-variational inequalities