

Identification of some nonsmooth evolution systems with illustration on adhesive contacts at small strains

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Abstract: A class of evolution quasistatic systems which leads, after a suitable time discretization, to recursive nonlinear programs, is considered and optimal control or identification problems governed by such systems are investigated. The resulting problem is an evolutionary Mathematical Programs with Equilibrium Constraints (MPEC). A subgradient information of the (in general nonsmooth) composite objective function is evaluated and the problem is solved by the Implicit programming approach. The abstract theory is illustrated on an identification problem governed by delamination of a unilateral adhesive contact of elastic bodies discretized by finite-element method in space and a semi-implicit formula in time. Being motivated by practical tasks, an identification problem of the fracture toughness and of the elasticity moduli of the adhesive is computationally implemented and tested numerically on a two-dimensional example. Other applications including frictional contacts or bulk damage, plasticity, or phase transformations are outlined.