

Numerical Modelling of a Contact Problem with History-dependent Penetration Restricted by Unilateral Constraint

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Abstract: This work is devoted to the numerical modelling of a frictionless contact problem with a history-dependent penetration restricted by a unilateral constraint. The mechanical model describes the contact between a viscoplastic body and an obstacle, the so-called foundation. The process is quasistatic and the contact is modeled with normal compliance and unilateral constraint, in such a way that the stiffness coefficient used for the normal compliance depends on the history of the penetration. Due to these specific contact conditions, the problem is highly nonlinear and it is represented by a system of nonlinear multivalued equations quite difficult to solve numerically. So, the main contribution of this work represents the introduction of an efficient numerical method to solve the contact problem. First, the solution algorithm is discussed and presented in detail. Then, various numerical simulation results on a two-dimensional problem are presented to illustrate both the mechanical behavior related to the contact condition and the good performance of the numerical method.