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Development of a Nitsche Method for the Numerical Resolution of Mechanical Contact Problems in Piezoelectricity

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- (1) Nitsche's method
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Abstract

We consider a mathematical model describing the evolution process of contact between a piezoelectric [1] cable under the load of a wheel, used to calculate the weight of vehicles traveling on the road. This load is modeled as point force using the Dirac distribution. The contact is described by Signorini's condition [2]. The variational formulation leads to a coupled system for the displacement field and the electric potential. The study is carried out under the assumption of an isotropic material with linear elastic behavior [3], without taking the friction into account. In numerical resolution, we consider a real piezoelectric material: the zirconate titanate piezoelectric ceramic PZT-5H. We use Nitsche's method [4] to take into account boundary conditions in a weak way. The finite element method library GETFEM++ [5] integrated in C++ program, is used for numerical implementation. To improve this promising model, we hope to later include thermal and friction parameters, and carry out experiments to validate it.

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