NITSCHE BASED FINITE ELEMENT METHOD FOR CONTACT WITH COULOMB FRICTION FOR THE STATIC AND DYNAMIC CASES.

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Abstract. The aim of this presentation is to provide some mathematical results for the discrete problem associated to contact with Coulomb friction, in linear elasticity, when finite elements and Nitsche's method are considered. We study both static and dynamic situations. The Nitsche's method aims at treating the boundary or interface conditions in a weak sense, thanks to a consistent penalty term. It differs in this aspect from standard penalization techniques and from mixed methods since no Lagrange multiplier is needed and no discrete inf sup condition must be fullfilled.
In [3], recent achievements in applying Nitsche's method to some contact and friction problems are summarized. Very few works deal with the adaptation of Nitsche's method to frictional contact : the Tresca's friction problem is only considered in [2] for the static case. For the dynamic case, a Nitsche method for frictionless dynamic unilateral contact is presented in [4]. The paper [1] establish well-posedness for particles, undergoing contact with Coulomb friction and the authors of [5] study the well-posedness of the space semi discretization of contact with Coulomb friction, with finite elements and a mass method.
In this presentation we will establish existence and uniqueness results under appropriate assumptions on physical (friction coefficient) and numerical parameters. These results are complemented by a numerical assessment of convergence.

Keywords: unilateral contact, Coulomb friction, finite elements, Nitsche's method

Mathematics Subject Classifications (2010): 65N12, 65N30, 74M15

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