SM11L_12763

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Level-Sets and Mixed Approaches for Dynamic Contact Problems

Hachmi Ben Dhia, **Chokri Zammali**

École Centrale Paris, France

Impact problems are nonlinear in essence, but also irregular and multiscales in space and time. Theses evidences are shown by analytical investigations giving explicit solutions of simple model impact problems (see e.g. Gloldsmith, . . .). General industrial impact problems have however to be approximated by means of numerical tools. Hughes et al. have designed special numerical schemes since the late seventies and increasing efforts have been since furnished by the computational contact community to address this numerical issue (see e.g. (Laursen and Love 2002 and the sampling references therein). The present work is a contribution to this wide and complex theme. Using the “viability lemma” of J.J. Moreau, the unilateral contact laws are written as equations by using two unknown Level-Set type fields standing for i) a location of the position of contact surfaces with respect to each other and ii) the Sign of the normal velocity jump on the interface. A weak-strong formulation of dynamic unilateral contact conditions is then derived in a straightforward manner. An original continuous weak-strong mixed formulation of a dynamic 3-D contact problem is carried out. The associated discrete nonlinear systems are then derived by using a Theta_scheme time discretization, a Galerkin method and a collocation one. The numerical solution strategy used to solve this problem is briefly commented and numerical tests are carried out. The numerical solutions do not exhibit pathologies (due to shocks) such as spurious oscillations. The paper is ended with a prospective use of the local multiscale Arlequin method. First promising numerical results exemplifying this approach are given.

View the extended summary