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Numerical Modeling of Dynamic Anisotropic Damage

***Ioan R. Ionescu[1], and Jia. Li[1]**

[1] LSPM, University Paris-Nord, Sorbonne-Paris-Cité,
99, Av. J.B. Clement, 93430 Villetaneuse, France

*Corresponding author: ioan.r.ionescu@gmail.com

We develop a numerical method for a geometric dynamic anisotropic damage model. The coupled phenomena analyzed here deal with a loading wave, which damages the material and changes the propagation properties of the material. In this way the damage processes induced by it perturbs the speed and the profile of the loading wave. The geometric damage model, represented by micro-cracks growing under dynamical loading, is able to describe the link between the micro and macro-scale characteristic times and the rate of deformation. The micro-crack growth is activated in some privileged directions according to the applied macroscopic loads and the velocity of the micro-crack propagation is estimated by the dynamic stress intensity factor. A discontinuous Galerkin numerical scheme for the numerical integration of the damage model is also proposed. The scheme is robust and precise. Several two-dimensional boundary value problems are selected to illustrate the model and to analyze the robustness of the numerical algorithm.

Keywords: computation, modeling, numerical methods, multi-scale