Title: **An Eulerian finite-volume scheme for large elasto-plastic deformations in solids**

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Published in: *International Journal for Numerical Methods in Engineering*, **81**, 453–484, (2010)

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By necessity, computational approaches to the mechanics of fluids have been based on formulations closely related to the continuum mechanics approach, i. e., a system of equations formed by a set of integral conservation laws. This approach is finding its way into the computational aspects of the mechanic of solids. In particular, problems involving high strain rates such as those found in impact and wave propagation problems, can benefit from the knowledge and computational approaches developed for CFD.

In this work the authors put forward a conservative formulation of the governing laws of elastoplastic solid media. This formulation have definite advantages for simulating processes involving large deformations and shock waves, in particular when high-order shock capturing methods are used for the numerical solution.

The paper provides a detailed account of the assumptions used to derive the governing equations. The authors present one model where inelastic deformations are accounted for via conservation laws for elastic strain with relaxation source terms while plastic deformations are governed by the relaxation time of tangential stresses. This formulation results on a systems with fewer equations than alternative Eulerian conservative models

The resulting conservative system of equations is solved over a structured grid of quadrilateral elements using higher order schemes that have been developed for the computation of fluid flow problems. Riemann problem solvers based on monotonicity preserving WENO schemes are chosen to eliminate spurious oscillations. A numerical scheme for the inhomogeneous system is proposed based upon the temporal splitting. In this way the reduced system of non-linear elasticity is solved explicitly.

The paper includes the results of test cases involving large deformations and high strain rates in one-, two-, and three-dimensions. The solution obtained for the one-dimensional plate impact problem is presented. For the two- and three-dimensional cases a region outside a sphere is initially ($t = 0$) at much higher pressure and temperature than the inside. The results seem to agree with results found by others using different approaches and they preserve the spherical symmetry. Computations were run at a CFL of 0.6.

In summary, a continuum mechanics consistent formulation being employed together with conservative numerical schemes in the solution of complex solid mechanics problems is, without a doubt, a welcome development in this research area.