

NONLOCAL REGULARIZATION FOR LOSS OF ELLIPTICITY IN INELASTIC PROBLEMS.

Alejandro Mota¹, James W. Foulk III² and Jakob T. Ostien³

¹ Mechanics of Materials Department, Sandia National Laboratories, Livermore CA 94550,
USA, amota@sandia.gov

Key words: *Nonlocal, Variational, Regularization, Ellipticity, Bifurcation*

A mixed three-field finite element formulation is proposed as a method for the alleviation of mesh dependency in finite-deformation inelastic problems subjected to bifurcation.

The additional fields in the formulation are the internal variables that cause bifurcation and the corresponding conjugate thermodynamic forces. The formulation leads to expressions for the additional fields that are akin to nonlocal averages that extend to a domain defined by the interpolation functions selected for these fields. The size of the nonlocal domain controls the length scale of the problem.

The performance of the formulation is demonstrated by several examples where it is shown that it is effective in alleviating mesh dependence.

The formulation provides effective regularization, entirely by-passes the introduction of new and independent mechanical variables into the problem, discretizes naturally, computes averages with regular interpolation functions, and does not require changes to constitutive relationships.

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.