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A NODAL FORMULATION FOR PLASTICITY ANALYSIS USING LINEAR QUADRILATERALS

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Abstract. In this work we present a finite element formulation for plasticity problems based on the nodal recovering of stresses and deformations. We employ classical isoparametric linear quadrilateral finite elements but to construct the finite element matrices a simplified analytical procedure is employed that not requires numerical integration rules. This procedure is based on a truncated Taylor series expansion of the gradient matrices and is demonstrated to be convergent. The analytical integration lets the representation of the plastic deformation history by nodal variables that are shared by neighbor elements. This reduces the amount of information needed as compared with classical numerical integration and has an equivalent cost of one point integration rule per element. Also, a better description of advancing plastic fronts is obtained. Comparisons with classical integration rules are shown.