GRADIENT PLASTICITY WITH THE NODALLY INTEGRATED NATURAL ELEMENT METHOD

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A multi-field variational formulation of strain-gradient elastoplasticity, where the functional appears as a generalized Hu-Washizu type, is exploited in the context of a meshless method termed the natural element method. The gradient fields of the primary unknowns are approximated by discontinuous interpolations over a nodal domain, defined with first order Voronoi diagrams. The integrals in the weak form are evaluated by subdomain-collocation-type contour integration, resulting from defining the assumed-gradient fields by piece-wise constant functions. The present approach enables the relaxation of continuity requirements and incompressibility constraints in strain-gradient elastoplastic analysis. The approach, in addition, enables simple data structure since all the computations are accomplished at nodes once the discrete gradient operators are determined. Solution algorithm, with discrete Kuhn-Tucker conditions, is presented.

References

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