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A NODAL AVERAGED CONSTITUTIVE MATRIX FOR FINITE ELEMENT NONLINEAR MATERIAL PROBLEMS

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Abstract. In this work, we propose evaluating the constitutive matrix of each element as the average of the nodal constitutive matrices computed at the element's nodes. The nodal constitutive matrix is calculated at each node of the finite element mesh by pre-averaging the strains at the nodes. The resulting stiffness matrix is shown to be convergent. This method achieves a considerable reduction in the computational effort required for evaluating the constitutive matrices. Furthermore, it allows the use of the same stiffness matrices as those used for elements with constant properties, thereby avoiding the need to reprogram these routines for nonlinear material problems. Examples on quadrilateral finite elements are shown.

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