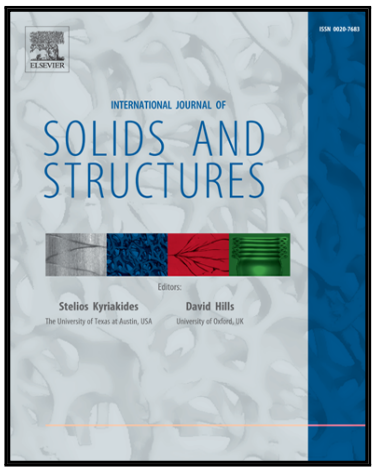

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Application of a new distortional yield surface model in cyclic uniaxial and multiaxial loading

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Abstract

This paper is concerned with the ratcheting prediction for steels. The yield surface evolution is integrated in the elastoplasticity analysis by a new proposed model. First, the new proposed model of Distortional Yield Surface (DYS) is developed and then ratcheting under different uniaxial and multiaxial cyclic loadings is investigated. The capabilities of the DYS model is assessed by using the results of various stress-controlled and strain-controlled tests under uniaxial loading condition and the cyclic uniaxial experimental results of Hassan and Kyriakides [52]. In addition, the model prediction under multi-steps uniaxial loadings is also studied. Effects of DYS consideration in different uniaxial loadings are shown. Strain or stress controlled tests and combined stress-strain control experimental tests [70] are used to be modeled by the present distortional yield surface approach. The biaxial experiments on CS 1018 thin-walled tubes [70] are chosen to be compared with the present model results. With the incorporation of DYS, The new proposed model shows better prediction of uniaxial and multiaxial ratchetting in all ranges of experimentally tested parameters.

Keywords: Ratcheting, Cyclic plasticity, Distortional yield surface, Constitutive modeling.

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