Postprint: Elastoplastic Adaptive Finite Element Analysis for Mesoscopic Numerical Simulation of Soil-Rock Mixtures

Authors: Yu Ke

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Abstract

In mesoscopic elastoplastic finite element analysis of soil-rock mixtures, adaptive mesh technology is necessary to effectively overcome stress concentration near irregular rock blocks, better capture large plastic strains in plastic zones, and improve computational accuracy in these zones, thereby avoiding blind mesh refinement. An adaptive remeshing algorithm based on a posteriori error estimation is employed, and combined with secondary development of Abaqus, a corresponding elastoplastic adaptive finite element Python script is developed, implementing the complete adaptive solution process for mesoscopic numerical simulation of soil-rock mixtures. By applying this Python script to numerical simulations of several typical two-dimensional mesoscopic structural models of soil-rock mixtures, the effectiveness and adaptability of the adaptive finite element method based on the remeshing algorithm in overcoming stress concentration, better capturing large plastic strains in plastic zones, and improving computational accuracy are verified.

Full Text

Preamble

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