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# Numerical modeling of shear band propagation in porous plastic dilatant materials by XFEM

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## ABSTRACT

This paper studies mixed-mode shear band propagation behaviors in porous plastic dilatant materials by the extended finite element method (XFEM). The Drucker-Prager elastoplastic model is combined with the strong discontinuity method to simulate the dilatant shear band. First, the dissipative nature of the localized area with displacement jump is integrated into the constitutive model by introducing a cohesive law. A new contribution lies that the yielding function is modified in the localized region to calculate the cohesive traction within the framework of the XFEM. The shear band propagation direction is determined by the singularity of the acoustic tensor and the corresponding localization vector is computed by the eigenvalue analysis. Then, the XFEM is used to calculate the numerical dilation with both the normal and shear modes for the localization band. Finally, two typical cases for the shear band propagation are used and numerical results are compared with existing works to confirm the efficiency and robustness of the developed method.

**Keywords**: Shear band; Dilation; Porous plasticity; Strong discontinuity analysis; Cohesive law; Extended finite element method (XFEM)

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