

An improved smoothed XFEM for analysis of axisymmetric problems with interface discontinuity

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Abstract:

Interface discontinuity plays an important role in mechanical performance of composite material and structure. In this paper, an improved smoothed extended finite element method (SmXFEM) is developed to model the axisymmetric problems with weak discontinuity. The weak discontinuity is represented by a level set which is also used in the construction of the element enrichment. Comparing with the original SmXFEM, the domain integrals can be totally transformed into boundary integrals by introducing integration with arbitrary polygonal element based on symbolic integration and divergence theorem in the improved SmXFEM, when the domain integrals term of elements related to shape function (not partial derivative term of shape function in strain matrix of enriched approximation) cannot be transformed into boundary integrals only by strain smoothing technique for axisymmetric problems. The code of the improved SmXFEM is validated by numerical results of axisymmetric problems.

Keywords: interface discontinuity, improved SmXFEM, strain smoothing technique, integration with arbitrary polygonal element, axisymmetric problems