

PARTITION OF UNITY ENRICHMENT FOR BIMATERIAL INTERFACE CRACKS

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Partition of unity enrichment techniques are developed for bimaterial interface cracks [1]. This work is an extension of the extended finite element method [2] to cracks that lie at an interface of two elastically homogeneous isotropic materials. A discontinuous function and the 2-d near-tip asymptotic displacement functions are added to the finite element approximation using the framework of partition of unity [3]. This enables the domain to be modeled by finite elements without explicitly meshing the crack surfaces. The crack-tip enrichment functions are chosen as those that span the asymptotic displacement fields ($u_i \sim \sqrt{r}e^{i \log r}$) for a bimaterial interfacial crack [4]. The concept of partition of unity facilitates the incorporation of the oscillatory nature of the singularity within a conforming finite element approximation. The implementation is carried out within DynaflowTM, a standard finite element package. The mixed mode (complex) stress intensity factors for bimaterial interfacial cracks are numerically evaluated using the domain form of the interaction integral. Good agreement between the numerical results and the reference solutions is realized.

References

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