A high-order edge-based smoothed finite element method with piecewise linear strain fields

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Abstract

This talk presents a high-order edge-based smoothed finite element method (ES-FEM) that produces linear strain fields in edge-based smoothing domains. This linear strain ES-FEM is one order higher than that of the standard ES-FEM that uses piecewise constant strain fields in each edge-based smoothing domain. This approach still uses piecewise linear displacements within each triangular element, but piecewise linear strains over smoothing domains created using Liu's pick-out theory. Because the smoothed strain and compatible strain within a local region are equal in an integral sense, the linear strain functions can be determined uniquely by using linearly independent weight functions. It is found that our new linear strain ES-FEM passes all the standard patch tests and shows significant improvement on accuracy.

Keywords: High-order ES-FEM, linear strain field, pick-out theory, edge-based smoothing