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Accuracy of three-dimensional analysis of regularized singularities. (English) Zbl 1352.65080
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Summary: In computational mechanics, the quadrature of discontinuous and singular functions is often required. To avoid specialized quadrature procedures, discontinuous and singular fields can be regularized. However, regularization changes the algebraic structure of the solving equations, and this can lead to high errors. We show how to acquire accurate and consistent results when regularization is carried out. A three-dimensional analysis of a tensile butt joint is performed through a regularized extended finite element method. The accuracy obtained via Gaussian quadrature is compared with that obtained by means of CUBPACK adaptive quadrature FORTRAN tool. The use of regularized functions with non-compact and compact support is investigated through an error evaluation procedure based on the use of their Fourier transform. The proposed procedure leads to the remarkable conclusion that regularized delta functions with non-compact support exhibit superior performance.

MSC:

65D30 Numerical integration

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Keywords:

singularities; regularization; 3D quadrature; XFEM; Fourier transform

Software:

CUBPACK

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