

## **SGBEM for Damage Tolerance Analysis and Safe Life Estimation**

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### **Summary**

The solution of 3-D arbitrary cracks is obtained by using the alternating method between the Symmetric Galerkin Boundary Element Method (SGBEM) and the finite element method (FEM). It is based on an iteration procedure, which alternates between FEM solution for the uncracked body, and the SGBEM solution for the crack in the local finite-sized subdomain. In addition, some crack growth models are used to advance the crack front in fatigue and other stable-crack-growth situations. The crack-surface mesh is also changed correspondingly in the BEM model, while the FEM model for the uncracked structure is kept unchanged. The automatic crack growth analysis is achieved by repeating the fracture analysis, and the life of the structural components is estimated. Furthermore, the initial crack size and shape in a structure, as emanating from a microscopic defect, can be determined by utilizing the automatic crack-growth feature. Some state-of-the-art numerical solutions are also presented to indicate the type of problems that can now be solved using currently available techniques.

