Enriched Numerical Techniques
Implementation and Applications

2024, Pages 181-209

Chapter 8 - Enriched element-free Galerkin method for elastoplastic crack growth in steel alloys

Showkat Ahmad Kanth [1], G.A. Harmain [1], Mumtaz Ahmad [1], Shuhaib Mushtaq [2]

https://doi.org/10.1016/B978-0-443-15362-4.00002-4

Abstract

The modeling and simulation of elastoplastic crack growth in steel alloys have been carried out by using the enriched element-free Galerkin method (EFGM). The methodology is based on a numerical procedure involving level set method in conjunction with the mesh-free method based on the EFGM. Typical enrichment functions have been invoked at appropriate nodes to introduce the effect of cracks into the formulation. The modeling of finite strain plasticity has been obtained through von Mises yield criteria utilized, assuming isotropic hardening behavior. The Ramberg–Osgood model has been used to determine the stress–strain response of the material. The current work considers several plasticity algorithms, such as the elastic predictor and plastic corrector, the radial return method, and plane stress plasticity for stress computation during the elastoplastic crack growth. Indigenous codes on EFGM have been developed in MATLAB® to solve different elastoplastic crack growth problems, and validation of codes has been established against results already available for some benchmark problems. Finally, several elastoplastic crack growth problems have been solved by employing the enriched EFGM.

References (0)

Cited by (0)