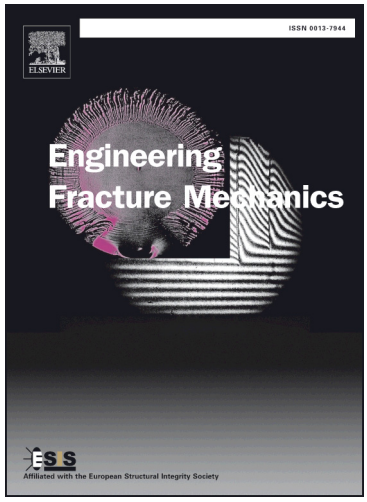

Computational mixed mode failure analysis under fatigue loadings with constant amplitude and overload

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Computational mixed mode failure analysis under fatigue loadings with constant amplitude and overload

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Abstract The integrity of engineering structures can be often compromised under cyclic loading due to the propagation of the pre-existing cracks. Therefore, computationally feasible fatigue crack growth models are essential for the residual strength analysis. In the present paper, a new fatigue design model is developed for the failure assessment of mixed-mode I/II crack situations subjected to cyclic loading with either a constant amplitude or overload. A fracture mechanics-based methodology takes into account Kujawski's crack growth law, Wheeler's retardation model and the maximum principal stress criterion in order to estimate the residual life and crack path. Furthermore, the experimental investigation of two cracks emanating from a hole subjected to mixed mode loading is performed. Then, such a crack problem is numerically simulated applying the finite element method. The predictive capacity and accuracy of the proposed fatigue model are assessed by means of the literature-based experimental and calculated crack growth data.

Keywords: Crack path, FEM, Mixed-mode I/II failure, Overload effect, Residual strength evaluation