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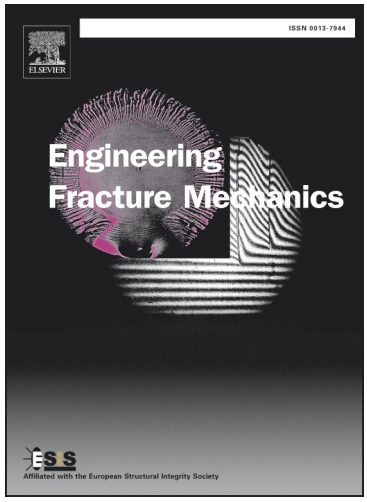

Numerical simulation of *fish-eye* fatigue crack growth in very high cycle fatigue

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Numerical simulation of *fish-eye* fatigue crack growth in very high cycle fatigue

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Abstract

In this paper, we numerically study the *fish-eye* fatigue crack growth after crack nucleation for very high cycle fatigue. The crack growth rate is modeled by the Paris-Hertzberg law. An iterative procedure based on three dimensional finite element analyses is developed to conduct crack growth simulations. The virtual crack closure technique is used to calculate the stress intensity factor for each step of the crack growth process. These stress intensity factors are then used to estimate the fatigue crack growth by integrating the fatigue crack law between the initial and final crack lengths. Our objectives are two-fold: first is to study the variation of the fish-eye shape when the crack tip approaches the edge of structure, second is to study the evolution of the fatigue crack growth life when analytical solutions are not available or not sufficiently reliable.

Keywords: fish-eye crack, very high cycle fatigue, virtual crack closure technique, finite element analysis, fatigue crack growth

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