

عنوان مقاله:

A Modified Indirect Boundary Element Analysis for Fatigue Behavior Assessment of Rock-Like Materials Based on Linear Elastic Fracture Mechanics

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خلاصه مقاله:

In this work, an effective methodology is introduced for modeling the fatigue crack propagation in linear elastic brittle media. The displacement discontinuity method is used to accomplish the analysis, and the boundaries are discretized with quadratic elements in order to predict the stress intensity factors near the crack tips. This procedure is implemented through 2D linear elastic fracture mechanics. The normal and shear displacement discontinuity around the crack tip is applied to compute the mixed-mode stress intensity factors. The crack growth is incremental, and for each increment of extension, there is no need to use a re-meshing procedure. This method has benefits over the finite element method due to its simplicity in meshing. The crack growth direction is assessed using the maximum principal stress theory. In these analyses, a repetition method is used in order to estimate the correct path of crack propagation. Therefore, the different lengths of incremental growth do not affect the crack growth path analysis. The results are exhibited for several examples with different geometries to demonstrate the efficiency of the approach for analyzing the fatigue crack growth. The accuracy represents that this formulation is ideal for describing the fatigue crack growth problems under the mixed-mode conditions.

کلمات کلیدی:

fatigue crack propagation, mixed-mode condition, stress intensity factor range, cyclic loading

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