

Modeling of cracked structures containing voids subjected to fatigue and dynamic loads using XFEM

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ABSTRACT

In this paper, we present static and dynamic modeling of linear elastic 2D structures containing simultaneously two types of material discontinuities, a void and a crack. The purpose of this modeling consists to evaluate the stress intensity factor (SIF) in dynamic and predict the crack propagation in fatigue using the extended finite element method (X-FEM) [1] due to its high ability to treat material discontinuities without changing the regular meshing of the structure. This method is coupled with the interaction integral method [2] in the aim to quantify the SIF through the concept of the J integral. Some examples of validation of the computer code developed in this work were tested. The good correlation of the obtained results in fatigue with the literature (Wiroj et al. [3] and Giner et al. [4]) proves the effectiveness of the method as well as the developed computer code. In the dynamic case, a parametric study on the presence, position and size of the void with respect to the crack and also on the crack type (crack edge and central crack) was conducted for some practical applications.

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