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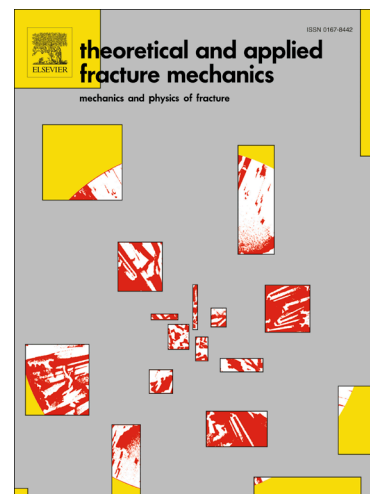
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Evaluation of Mode-I SIF, T-stress and J -integral using Displacement Data from Digital Image Correlation - Revisited

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Abstract

Digital image correlation (DIC) is a unique technique for determining displacements because in a single experiment one can get u_x and u_y displacements if it is 2D DIC and all the three components if one uses 3D DIC. Hence, for data processing one has many options. While processing displacements, rigid body translation and rotation need to be accommodated properly. There has been no comprehensive study in the literature. In this paper, a systematic study is done to determine the choice of suitable individual displacements or a combination to evaluate not only mode-I SIF but also T-stress. Study on influence of data collection zone, a revisit to the multi-parameter displacement field equations on the nature of additional terms to account for rigid body motion, role of out-of-plane displacement in influencing error in estimating SIF and T-stress has been discussed. A simple procedure to reduce the error due to improper identification of crack-tip has been implemented. This study has recommended the use of 2D DIC if one wants to evaluate only SIF. However, if one wants to evaluate T-stress also, then 3D DIC gives better accuracy.

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