Analysis of Growing Crack Tip Deformation in Ductile Material by Stereo Vision

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Abstract

The stereo vision is applied to obtain both in-plane and out-of-plane deformation fields near a growing crack tip in a compact tension (CT) specimen made from 304L stainless steel. For the crack extension up to a = 4 mm, the in-plane displacement components near the crack tip region are determined and used to compute the J integral along several rectangular contours surrounding the crack tip based on the plane stress and the deformation theory. The J integral evaluated by the in-plane displacement data shows path independence and is in a good agreement with that obtained by the Merkle-Corten formula for the crack growth up to a = 3.531 mm. But large discrepancies exist, when comparing the experimental J integral with that obtained by EPRI report. For small crack growth of a = 0.685 mm and moderate crack growth of a = 3.531 mm, the HRR field was observed for several radial lines.

Keyword：CT specimen, J integral, HRR field, crack growth, stereo vision