J-integral evaluation in two dimensional interacting cracks

Abstract

This paper investigates crack interaction of multiple edge cracks in elastic solid finite body under pure Mode I loading. The cracks are located in parallel to another in 2D plate model. The stress intensity factors (SIFs) are determined based on strain energy release rate. The J-integral path independent is employed to study the interaction between cracks in regards to the effect of crack shielding and amplification of various cracks arrangement. The aim of present work is to test several numerical techniques reported in literature. J-integral approach are applied in 2D ANSYS finite element models subjected to different crack-width ratio (a/w) and cracks interval ratio (a/b). For validation, the results are compared to singular finite element approach and related analytical formulation. The results obtained by these methods are found in good agreement with singular finite element. Some discrepancies between analytical solutions are discussed. Nevertheless, since strain energy release is concern to characterize the near crack tip field, the J-integral method seems to be more applicable and accurate for interacting cracks analysis.