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Computation of mixed mode stress intensity factor for parallel edge cracks

Abstract

This paper presents the extensions of newly developed finite element (FE) formulation to evaluate fracture behavior of parallel edge cracks problems. The numerical formulation used Barsoum singular finite elements to compute fracture parameters in two dimensional finite element models subjected to different crack-width ratio and cracks interval ratio. Mixed mode stress intensity factors (SIFs) of parallel edge cracks are computed in extending of FE formulation for pure Mode I formulation proposed by authors. In 2D linear elastic problem under mixed mode condition, the variation of SIF value near crack tips are discussed comprehensively. The newly finite element formulations are resulted with remarkable agreement with energy release rate based method compared to analytical solution available in the literatures.

Keywords — Crack interaction, linear elastic fracture mechanics, multiple cracks, singular finite element, stress intensity factor