World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:9, No:03, 2015

SIF Computation of Cracked Plate by FEM

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Abstract : The main purpose of this paper is to perform a computations comparison of stress intensity factor 'SIF' evaluation in case of cracked thin plate with Aluminum alloy 7075-T6 and 2024-T3 used in aeronautics structure under uniaxial loading. This evaluation is based on finite element method with a virtual power principle through two techniques: the extrapolation and G−θ. The first one consists to extrapolate the nodal displacements near the cracked tip using a refined triangular mesh with T3 and T6 special elements, while the second, consists of determining the energy release rate G through G−θ method by potential energy derivation which corresponds numerically to the elastic solution post-processing of a cracked solid by a contour integration computation via Gauss points. The SIF obtained results from extrapolation and G−θ methods will be compared to an analytical solution in a particular case. To illustrate the influence of the meshing kind and the size of integration contour position simulations are presented and analyzed.

Keywords : crack tip, SIF, finite element method, concentration technique, displacement extrapolation, aluminum alloy 7075-T6 and 2024-T3, energy release rate G, G-θ method, Gauss point numerical integration
Conference Title : ICMEAM 2015 : International Conference on Mechanical Engineering and Applied Mechanics
Conference Location : Istanbul, Türkiye
Conference Dates : March 23-24, 2015