Modeling Cracks Using Digital Images Correlation and Phase-Field FE Analysis Techniques

Brick Chaouche Amine, Masmoudi Youcef-Amine, Mokhtari Ahsan, Tala-Ighil Nacer

Abstract : In this work, the recently developed phase field fracture along with digital images correlation DIC techniques are used to study mode I crack behavior, an elastic brittle phase field model which is well implemented in some finite elements codes is used, in this model the damage evolution is driven only by elastic strains and is governed by the classical brittle phase-field law, the opensource digital images correlation Ncorr code is used to extract full displacement and strain field from experiments, this open-source DIC code can treats cracks in structure by taking into account discontinuities through the sub-sets, the discontinuities in the displacement field are well captured and used in the out-puts to compute the size of crack by tracking and locating the position of the crack tip, the best results are obtained by finding the smallest DIC parameters (sub-sets size and radius) which gives results without noise. Results are expressed in term of plots of displacement vs reaction-force, contour plots of displacement and strain field components, crack tip opening displacement and fracture path tracking. Results from both approaches are presented and then a discussed is conducted to show the capabilities of both methods to study and track crack evolution in structures under mode I loading.

Keywords : Cracks, Finite Element Analysis, Phase Field Fracture, Digital Images Correlation, Ncorr