



# Continuum Damage Mechanics Approach to Ductile Fracture

*Mubarak ALGrafi*

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Failure of ductile materials such as structural steel is associated with large amount of plastic deformation. Ductile fracture is characterized by three sequential processes; void nucleation, void growth, and void coalescence. Continuum Damage Mechanics (CDM) has emerged as attractive approach for predicting nucleation and growth of cracks in ductile materials. However, comprehensive satisfactory CDM model, which can describe the different physical stages of ductile fracture, has not been formulated yet. In addition, coalescence stage has received less attention compared to void nucleation and growth. In this book, elasto-plastic damage softening models are formulated (unified) into one complete damage softening model. Numerical simulation using LS-DYNA explicit solver carried out utilizing user defined material (UMAT). Return mapping algorithm used as the main numerical tool in updating stress in the plastic regime. Validity of this work is examined by comparison with experimental data for available crack path. Finally, evaluation of J-integral for the damage softening models has been accomplished for the purpose of establishing link between Fracture Mechanics & Damage Mechanics.

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