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# SMOOTHED REDUCTION OF FRACTURE MECHANICS SOLUTIONS TO 1D CRACKED MODELS

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**Abstract:** In the framework of fracture mechanics 2 or 3 dimensional modelling approaches are mostly employed in order to simulate cracks. However, in many applications 1D models that represent cracked structural members can be proved to be very useful. A crack contributes to abrupt stiffness reduction, causing "jump" in the displacement field close to the crack, in the present work the observation that the presence of cracks causes also stress and strain redistribution at some distance from the crack tips as resulted from fracture mechanics solutions is underlined. An appropriate "smoothed" stiffness reduction is introduced as a function from the distance from the crack consistent energetically with the Linear Elastic Fracture Mechanics (LEFM) solutions. These smoothed 1D solutions capture the strain variations in some distance from the crack(s) achieving very good accuracy. Some modeling examples in static and dynamic (eigenfrequencies, mode shapes) cases are examined and compared to existing 1D models, 3D FEM simulation and experimental data.

**Keywords:** Crack model; strain variations; cracked bar finite element; stiffness function; structural health monitoring; fracture mechanics.

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