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# MODELING SIZE-DEPENDENT BENDING AND BUCKLING OF MINIATURIZED CRACKED BEAMS

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Miniaturized beams find various applications in MEMS and NEMS, serving as actuators, switches, and sensors. Numerous experimental studies have shown that theories based on classical continuum mechanics are insufficient for examining the structural response of beams at the micro- and nanoscales. This inadequacy results from a failure to incorporate size dependency into the formulation. Additionally, micro- and nanobeams may experience damage during service life due to manufacturing defects, environmental conditions, and severe loadings. Therefore, it is crucial to consider the size effect when modeling the structural response of miniaturized cracked beams.

This study investigates the size-dependent bending and buckling of micro- and nanobeams containing multiple cracks, utilizing the nonlocal theory formulated in [1,2]. The model introduces the size effect by defining the strain at each point as the integral convolutions of stresses and their first-order gradients in all points. The formulation involves decomposing the domain into different sections at the cracked cross-sections. The effect of edge cracks on the structural response of the beam is modeled by assuming that adjacent sections are connected by rotational and translational springs. The problem is closed by solving the variationally consistent and nonlocal constitutive equations in different sections and imposing proper continuity and boundary conditions. The obtained results are compared with the results of Molecular Dynamics simulations.

## REFERENCES

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