A non-local probabilistic method for modelling of crack propagation

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Highlights

- A new computational strategy by combining nonlocal mechanics, random field and continuum damage theories was developed to predict damage evolution direction in heterogeneous materials.
- The novelty of the strategy relies on its ability to capture influence of uncertainty in the mechanical properties of whole simulation domain, not just the properties of the immediate finite neighbourhood around the crack tip, on identifying the direction of crack propagation.
- The computational strategy is on the basis of combining nonlocal mechanics theory which was developed to incorporate influence of local discontinuities and weak points located at further distances from the crack tip in addition to those located just at the immediate neighbouring of the local damage. This allows description of realistic models of the property variation and provides improvements in reliability and efficiency in computational algorithms of stochastic continuum damage theory.
- This strategy makes it possible to generate random realizations for representing random fields, maintaining all the characteristic of the field described in the heterogeneous structure with adequate accuracy.
- The most interesting aspect of The proposed strategy is its capability to use Gaussian-related statistical information of mechanical properties for generating non-Gaussian distribution of the fracture toughness and fracture energy for brittle materials.