

Reliability Assessment for Structures with Heterogeneous Materials

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Heterogeneous materials can be characterized by statistical quantities for geometric descriptors. From this statistical description of the geometry, microstructural randomness of material properties on the scale of a volume element can be assessed. Depending on the size of the volume element, the resulting variability in the material properties can be modeled by random fields. Most often, these random fields are non-Gaussian and can be represented by nonlinear transformations of Gaussian random fields. For these random fields, a stochastic finite element procedure is established that works directly with non-Gaussian random variables. This method is presented and its integration into existing finite element codes is demonstrated.