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# Stochastic homogenization of elastic material properties by the variability response method


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**Abstract**

In engineering analysis of solid mechanics problems homogenized, or spatially averaged, material properties are typically used to render problems tractable. Unless the volume over which the homogenization is infinite, however, the resulting homogeneous problem remains stochastic to varying degrees because homogenization amounts to evaluation of a stochastic integral that converges to a deterministic value only in the limit of infinite integration volume. The variability response function (VRF) approach, which has previously been used to evaluate variability in the structural response of structures with random material properties, is modified into an approach for evaluating the residual stochasticity of the homogenized version of a linear elastic solid mechanics problem. Theoretical treatment of the topic is followed by examples for statically determinate and indeterminate structures and for two dimensional elastic continua.


**Bio**: Prof. Arwade has degrees in civil (structural) engineering from Princeton (B.S.E) and Cornell (M.S., Ph.D.) Universities, having earned the Ph.D. degree in 2002. He was a member of the civil engineering faculty at Johns Hopkins University before joining the University of Massachusetts, Amherst, in 2006, where he is now an Associate Professor in the structural engineering and mechanics group. His work, which has been funded by the US National Science Foundation and other sources, has focused on stochastic computational material mechanics problems such as using pattern identification techniques in mechanics, homogenization, probabilistic modeling of material structures, and the mechanics and application of cellular solids. He also has a research interest in the engineering of offshore wind turbines.

**Prof. Paolo Maria Mariano**