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EFFICIENT MODELING OF RANDOM HETEROGENEOUS MATERIALS WITH AN UNIFORM PROBABILITY DENSITY FUNCTION

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Homogenised constitutive laws are largely used to predict the behaviour of composite structures. Assessing the validity of such homogenised models can be done by making use of the concept of "modelling error". First, a microscopic "faithful" -and potentially intractable- model of the structure is defined. Then, one tries to quantify the effect of the homogenisation procedure on a result that would be obtained by directly using the "faithful" model. Such an approach requires (a) the "faithful" model to be more representative of the physical phenomena of interest than the homogenised model and (b) a reliable approximation of the result obtained using the "faithful" and intractable model to be available at cheap costs.

We focus here on point (b), and more precisely on the extension of the techniques developed in [3] [2] to estimate the error due to the homogenisation of linear, spatially random composite materials. Particularly, we will approximate the unknown probability density function by bounding its first moment.

In this paper, we will present this idea in more detail, displaying the numerical efficiencies and computational costs related to the error estimation. The fact that the probability density function is uniform is exploited to greatly reduce the computational cost. We will also show some first attempts to correct the homogenised model using non-conforming, weakly intrusive microscopic patches.

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