Homogenised modeling of bi-pantographic fabrics: micro-to-macro transition and experimental validation

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Abstract

It is nowadays well-established that so-called generalized continua, as opposed to Cauchy continuum, are the proper tool to capture relevant micro-scale deformation mechanisms originating from non-local interactions and strong local stiffness contrast. In this talk, I will address how to get more insight into these phenomenological theories, aimed at bridging the gap between micro-scale and continuum. A special class of extremely compliant material architectures will be considered, namely architectures based on a pantographic-like motif, i.e. a mechanism which is well known from everyday life (pantographic mirrors, expanding fences, scissor lifts, etc.), characterized by a zero-energy accordion-like homogeneous extension/compression deformation mode. Asymptotic homogenization will be the key-tool enabling to give a precise meaning to many features of the macro-model in terms of those of the micro-model. At the end of the presentation, I will eventually report on how the presented multi-scale modeling approach has been validated experimentally, making use of digital image correlation techniques.

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