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Continuum Representation of the Mechanics of Random Fiber Networks ALI SHAHSAVARI, CATALIN PICU, Rensselaer Polytechnic Institute — Solving boundary value problems over large domains of random fiber networks is important in the design of fiber-based engineering materials and in the understanding of the biophysics of biological materials. In most of these applications, systems contain a very large number of fibers, which renders nearly impossible solving boundary value problems while resolving every fiber in the problem domain. Therefore, developing a continuum model for the discrete system is desirable. This presentation focuses on conditions under which this mapping can be performed and the minimum size of the problem beyond which the continuum representation is valid. Random fiber networks are highly heterogeneous and exhibit non-affine deformation with correlated fields at different observation length scales. The scale of transition from the discrete to the continuum model must be large enough to capture all the statistically independent subdomains of the network. This scale cannot be determined exclusively based on geometric considerations (e.g. based on fiber density). These considerations, along with a constitutive model for the small deformation of continuum models of fiber networks are discussed in this talk.

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