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Discrete-continuum mapping for fiber network mechanics

CATALIN PICU, ALI SHAHSAVARI, HAMED HATAMI-MARBINI, Rensselaer Polytechnic Institute — Semi-flexible random fiber networks are the structural element of many biological and non-biological systems such as the cytoskeleton, artificial tissue and cellulose-based products. We have shown that in these systems the density, as well as mechanical fields (elastic moduli, strain energy etc), are long-range power-law correlated. The correlation length evolves during deformation. A procedure to map the elasticity of the discrete system to continuum representations is developed. The method is used to solve boundary value problems defined over large fiber network domains. However, the mapping can be performed only in some situations, limitations which are discussed in this talk.

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