Einladung zum Vortrag

Material symmetry characterization of soft tissue deformation by sets of vectors

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Abstract

Many contemporary developments of constitutive relations for the large deformation behavior of soft tissues have employed sets of vectors to characterize the material symmetry rather than Noll's (1958) definition of material symmetry in terms of invariance of the constitutive relations under one of the specific crystallographic symmetry groups. The present work shows that this contemporary development of using sets of vectors to characterize material symmetry is fully equivalent to the group theoretic crystallographic viewpoint and provides a geometrically intuitive view of the elastic symmetries as a companion to the group theoretic crystallographic viewpoint. In this work it is shown that the different forms of the elasticity or compliance tensors that represent the different material symmetries in the generalized Hooke's law, at a point in the deformation process, may be obtained by assuming the strain energy depends on a set of structural unit vectors as well as the strain tensor or deformation gradients. The particular set of structural unit vectors is different for each of the eight linear elastic symmetries. This method permits the direct and evolving calculation of the changes in symmetry as a result of a deformation, a feature not contained in the traditional approach. The determination of the development-induced changes in the material symmetry employs results from the theory of an infinitesimal strain superposed on a finite strain in an elastic material.

References: