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On Symmetry Properties of a Class of Constitutive Models in Two-dimensional Nonlinear Elastodynamics

We consider the Lagrangian formulation of the nonlinear equations governing the dynamics of isotropic homogeneous hyperelastic materials. For two-dimensional planar motions of Ciarlet–Mooney–Rivlin solids, we compute equivalence transformations that lead to a reduction of the number parameters in the constitutive law. Further, we classify point symmetries in a general dynamical setting and in traveling wave coordinates. A special value of traveling wave speed is found for which the nonlinear Ciarlet–Mooney–Rivlin equations admit an additional infinite set of point symmetries. A family of essentially two-dimensional traveling wave solutions is derived for that case.