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Maximum-Entropy Estimates and Virtual Thermomechanics for Granular Assemblies

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This is an extension of previous works, dating back some thirty years on more, on maximum-entropy estimates of the statistical distribution of quasi-static contact forces in granular assemblies. The precise form of the probability density is shown to depend on the statistical weight assigned to elements in the state space of contact forces or displacements. A brief review is given of comparisons with experiment and computer simulations. The formal methods of statistical thermodynamics are employed to establish a virtual thermomechanics. without reference to a granular temperature. This leads to an elastoplastic work function, of the type appearing in various phenomenological models of complex solids and fluids. The possibility of non-convexity, leading to continuum- and meso-scale material instability, is discussed.

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