Flutter instability in granular media

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Flutter instability in an infinite medium is a form of material instability corresponding to the occurrence of complex conjugate squares of the acceleration wave velocities. Although its occurrence is known to be possible in elastoplastic materials with nonassociative flow law and to correspond to some dynamically growing disturbance, its mechanical meaning has to date still eluded a precise interpretation. This is provided here by constructing the infinite-body, time-harmonic Green's function for the loading branch of an elastoplastic material in flutter conditions. Used as a perturbation, it reveals that flutter corresponds to a spatially blowing-up disturbance, exhibiting well-defined directional properties, determined by the wave directions for which the eigenvalues become complex conjugate.
Flutter is shown to be connected to the formation of localized deformations, a dynamical phenomenon sharing geometrical similarities with the well-known mechanism of shear banding occurring under quasi-static loading.
Flutter may occur much earlier than shear banding in a process of continued plastic deformation.