A 2D constitutive non-linear model with anisotropy for granular materials

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Dense granular materials behave differently from classical fluids or solids and can not be described through the continuum theories developed for those. In fact behavior at macro-scale is strongly related to smaller-scale field variables and kinetic processes. The influence of the micromechanics on the non-coaxiality of stress, strain and anisotropy of soils, is an essential part of a constitutive model for granular matter because it contains the information how the different modes of deformation have affected the mechanical state of the system. The paper presents a constitutive model for two-dimensional stress-strain behaviour of anisotropic granular materials, based on non-linear tensorial functions [1]. The history dependence is represented by a symmetric 2nd-rank fabric tensor, which characterizes the geometric arrangement of the geometric material microstructure. Non-linear constitutive evolution equations relate the stress and the anisotropy to the strain between them. The local field variables are expressed in terms of material parameters, that can be measured by DEM simulations. The complete calibration of the model by means of suitable numerical experiments allows for an accurate prediction of the material behavior under different loading conditions [2]. Some special cases are analized and comparisons are made to previous proposed models of granular media [4, 5].

References

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