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Times Scales in Dense Granular Material[1] DUAN ZHANG, XIA MA, Los Alamos National Laboratory — Forces in dense granular material are transmitted through particle contacts. The evolution of the contact stress is directly related to dynamical interaction forces between particles. Since particle contacts in a dense granular material are random, a statistical method is employed to describe and model their motions. It is found that the time scales of particle contacts determinate stress relaxation and the fluid- like or solid-like behavior of the material. Numerical simulations are performed to calculate statistical properties of particle interactions. Using results from the numerical simulations we examine the relationship between the averaged local deformation field and the macroscopic deformation field. We also examine the relationship between the averaged local interaction force and the averaged stress field in the material. Validities of the Voigt and the Reuss assumptions are examined; and extensions to these assumptions are studied. Numerical simulations show that tangential frictions between particles significantly increase the contact stress, while the direct contribution of the tangential force to the stress is small. This puzzling observation can be explained by dependency of the relaxation time on the tangential friction.

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