Nonequilibrium mode-coupling theory for driven granular systems

Song-Ho Chong, SNU

Historically, the kinetic theory for gases such as the Boltzmann-Enskog theory has been used in describing dynamics of, even dense, granular fluids. However, correlation effects that develop in dense systems might not be appropriately captured by such a theory in which correlation effects appear only through the contact value of the radial distribution function. In handling dense systems, liquid-theory approach should be more effective. In this talk, we will mention about recent development of a liquid-state theory which aims at describing nonequilibrium steady-state properties of driven dense granular materials. We start from explaining the generalized Green-Kubo relation which provides an exact representation of steady-state properties in terms of the transient time-correlation functions.† Then, a set of self-consistent equations of motion are formulated for the transient time-correlation functions based on the projection-operator formalism and on the mode-coupling approach. Thereby, nonequilibrium mode-coupling theory is constructed that applies to driven dense granular systems far from equilibrium.

References

[1] S.-H. Chong, M. Otsuki, and H. Hayakawa, Phys. Rev. E **81**, 0411130 (2010).