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Finite element modeling of the dynamic effective mass of granular media JOHN VALENZA[1], Schlumberger-Doll Research, DAVID HENANN[2], KEN KAMRIN[3], Massachusetts Institute of Technology, DAVID JOHNSON[4], Schlumberger-Doll Research — Finite sized granular media have a frequency dependent, complex valued effective mass, characterized by several resonant features. In the vicinity of the corresponding frequencies the associated mass can be several times the static mass. This complicated behavior is due to mechanical interactions between neighboring grains. In contrast we investigate the viability of using a continuum approximation for the mechanical response to model the effective mass. We find that the granular medium is suitably represented by a linear elastic stress-strain relationship with viscous damping. The free parameters in the linear elastic model, the elastic modulus and poisson's ratio, are measured using conventional mechanical testing equipment, and a novel sensor which permits the measurement of lateral stress. Moreover, we characterize the frequency dependent displacement profile on the surface of the granular medium. In this talk we demonstrate that our continuum model is suitable for reproducing the frequency dependent effective mass, and the displacement profile at the resonant frequencies.

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