# ACOUSTICS2008/3423
# Numerical simulations of resonant granular layers

Joseph Turner, Florin Bobaru and Kitti Rattanadit
University of Nebraska, Dept. of Engineering Mechanics, W317.4 NH, Lincoln, NE 68588, USA

A coupled Discrete Element Method-Finite Element Method (DEM-FEM) model is developed and implemented for simulating the dynamic response of a dry granular layer on top of an elastic beam. The implementation is first validated against the quasi-static results for spherical particles which are compared with well-bonded effective-medium models. In the dynamic regime however, the effective-medium analytical result differs from experimental values in terms of the dependence of particle size. The simulations developed are used to understand the discrepancy between the theory and the experiments. The first resonance of the system is examined with respect to particle size using a variety of particle sizes and a frequency sweep input. The particle size dependence observed experimentally is reproduced in the simulations only through inclusion of cohesive forces between the particles. Rolling resistance and friction between particle is shown to be of minor importance. This new modeling tool offers promise for understanding the dynamic interactions of granular materials. [Work supported by ARL]