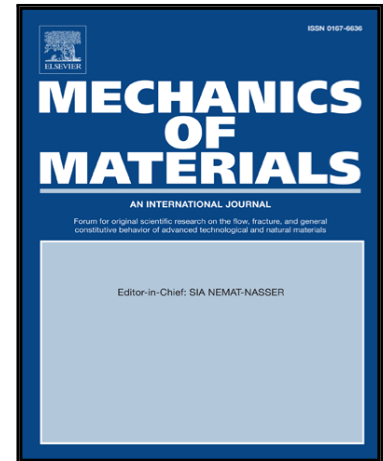


Accepted Manuscript

On elastic waves in granular assemblies: from a continuumization viewpoint

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PII: S0167-6636(16)30468-9
DOI: [10.1016/j.mechmat.2017.04.002](https://doi.org/10.1016/j.mechmat.2017.04.002)
Reference: MECMAT 2726



To appear in: *Mechanics of Materials*

Received date: 10 November 2016
Revised date: 31 March 2017
Accepted date: 3 April 2017

Please cite this article as: J. Chen, S. Supprasert, H. O-tani, K. Fujita, L. Wijerathne, M. Hori, On elastic waves in granular assemblies: from a continuumization viewpoint, *Mechanics of Materials* (2017), doi: [10.1016/j.mechmat.2017.04.002](https://doi.org/10.1016/j.mechmat.2017.04.002)

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Highlights

- A novel continuumization technique is applied to study elastic waves in assemblies of spherical particles in 3D lattices.
- Macroscopic material properties are presented in neat tensor forms, determined by the micro-mechanics (the spring constants) and the microstructures (fabrics) of the lattices.
- Theoretical wave velocities for p- and s-waves, the frequency for the pure spin mode and the group velocity for the spin motion coupled with s-waves, are derived.
- The influence of spring constant ratios on the wave velocities and on the anisotropy is examined.
- The similarity is revealed between the coupled s-wave and spin motion in the lattices and the acoustic and optical branches of waves in the diatomic model in solid-state physics.
- We found out that anisotropic close-packed lattices would degenerate to a special isotropic state with a zero Poisson's ratio and a constant velocity ratio of between p- and s-waves.
- The theoretical results obtained are useful for quantitative verification and for parameter calibration of discrete-element-method simulations using spherical particles.

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