Modelling micromechanics of discrete and continuous media using real particle morphologies

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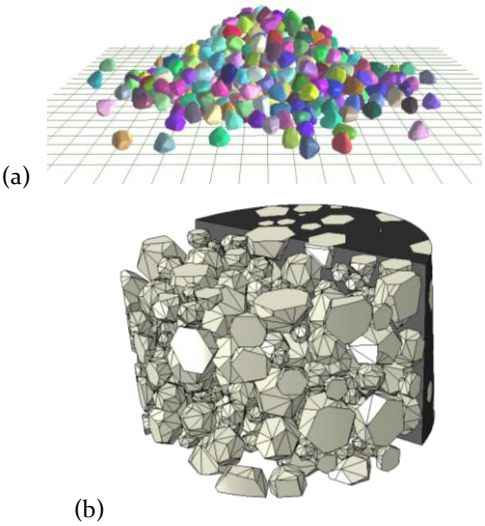
Abstract

The objective of this research is to formulate and combine technologies for modelling the micromechanical behavior of discrete and continuous media using real particle morphologies. Formulations for the virtual modelling of single real particles and packing of samples are presented (Recarey *et al*., 2019). Fourier descriptors are used to describe the morphology of singles particles and to construct a repository of real particle geometries. Particle's packing is achieved using advancing front techniques combined with dynamic methods. A stochastic formulation allows the packing of particle systems following continuous, discrete, and empirical statistical distributions. The combination of both techniques is a very efficient tool to achieve discrete or continuous media geometries to solve engineering problems. Three different examples are presented to illustrate the effectiveness of the formulations (Fig. 1). The first one is a discrete angle-of-repose problem involving clusters of spheres; in the second example the same angle-of-repose problem is resolved with real particles. In the third case, creep tests of asphalt concrete samples with different particle shapes is presented.



(a)

(b)

Fig. 1 Examples: (a) repose angle, (b) creep test of asphalt concrete.

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References

Recarey, C., Pérez, I., Roselló, R., Muniz, M., Hernández, E., Giraldo, R., Oñate, E. (2019) Advances in particle packing algorithms for generating the medium in the Discrete Element Method. *Computer Methods in Applied Mechanics and Engineering*,, 345, pp. 336-362.