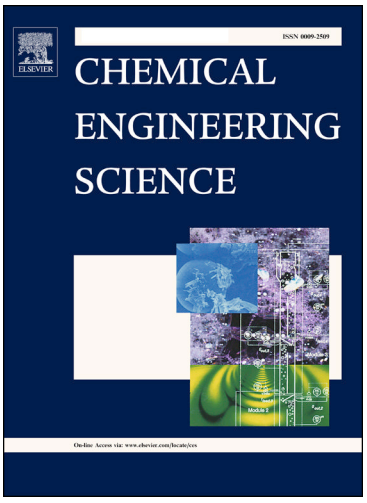

A granular Discrete Element Method for arbitrary convex particle shapes: method and packing generation

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A granular Discrete Element Method for arbitrary convex particle shapes: method and packing generation

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Abstract

A novel granular discrete element method (DEM) is introduced to simulate mixtures of particles of any convex shape. To quickly identify pairs of particles in contact, the method first uses a broad-phase and a narrow-phase contact detection strategy. After this, a contact resolution phase finds the contact normal and penetration depth. A new algorithm is introduced to effectively locate the contact point in the geometric center of flat faces in partial contact. This is important for a correct evaluation of the torque on each particle, leading to a much higher stability of stacks of particles than with previous algorithms. The granular DEM is used to generate random packings in a cylindrical vessel. The simulated shapes include non-spherical particles with different aspect ratio cuboids, cylinders and ellipsoids. More complex polyhedral shapes representing sand and woodchip particles are also used. The latter particles all have a unique shape and size, resembling real granular particle packings. All packings are analyzed extensively by investigating positional and orientational ordering.

Keywords: Discrete element method, Non-spherical particle, Contact detection, Packing, Solid volume fraction, Orientational ordering

Nomenclature

Variables

a	half-length in x-direction, [m]

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