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Novel Discrete Element Method for 3D non-spherical granular particles. LUUK SEELEN, JOHAN PADDING, HANS KUIPERS, Eindhoven University of Technology — Granular materials are common in many industries and nature. The different properties from solid behavior to fluid like behavior are well known but less well understood. The main aim of our work is to develop a discrete element method (DEM) to simulate non-spherical granular particles. The non-spherical shape of particles is important, as it controls the behavior of the granular materials in many situations, such as static systems of packed particles. In such systems the packing fraction is determined by the particle shape. We developed a novel 3D discrete element method that simulates the particle-particle interactions for a wide variety of shapes. The model can simulate quadratic shapes such as spheres, ellipsoids, cylinders. More importantly, any convex polyhedron can be used as a granular particle shape. These polyhedrons are very well suited to represent non-rounded sand particles. The main difficulty of any non-spherical DEM is the determination of particle-particle overlap. Our model uses two iterative geometric algorithms to determine the overlap. The algorithms are robust and can also determine multiple contact points which can occur for these shapes. With this method we are able to study different applications such as the discharging of a hopper or silo. Another application the creation of a random close packing, to determine the solid volume fraction as a function of the particle shape.

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