Rebound Characteristics of Complex Particle Geometries

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ABSTRACT

Digital analysation method for the characterisation of rebound effects of non-spherical DEM-particles:

For the modelling of bulk material in DEM-simulations spherical particles are usually used. Due to their simple form and regarding the computational effort, such spherical particles offer an efficient modelling of bulk material with sufficient accuracy. However, spherical particles may lead to falsified results, especially in the case of highly non-spherical bulk materials (e.g. cylindrical pellets) or when certain effects are analysed in detail (e.g. rebound directions of particles). In general, the contact behaviour of complex particles is very different from the behaviour of idealised, spherical shaped particles.

In this project, a method was developed to analyse and compare the diverging rebound behaviours of different particle shapes: Particles with complex geometry are moved against a plane surface and the resulting rebound directions are detected. These directions are processed, and the distinct rebound direction distribution characterises the analysed particle geometry.

This method allows the analysation of rebound characteristics of bulk material concerning the scattering effects of the bulk. Subsequently, this allows a particle geometry definition in DEM-simulations in such a way, that a simple geometry (e.g. ellipsoids or cylinders) depicts the real bulk material (e.g. grain, hot briquetted iron) in terms of rebound behaviour with high accuracy. Another approach is the modification of spherical particles by repositioning their centre of mass or by adjustment of their mass moment of inertia, so that the modified particle behaves like a particle with a more complex geometry.

This method enables the analyzation of rebound characteristics due to the particles' geometry and allows the modelling of complex bulk materials with simplified digital geometries. Efficient simulations with complex particle behaviour are thus made possible.