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Impulse-Based Dynamics for Studying Quasi-static Granular Flows: Application to Hopper Emptying of Non-spherical Particles

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Abstract

Impulse-Based dynamics (IBD) have been successfully utilized to describe mechanical systems in robotics and augmented/virtual reality applications for a long time. However, the method received only limited attention in the field of granular flows so far. In this work, a simulation model based on the bullet physics library has been implemented and applied to a model problem, i.e., the hopper discharge of non-spherical particles. The IBD simulations involved various particle shapes (ideal ellipsoids, cylinders and cuboids) with different aspect ratios and friction coefficients. The results have been compared with discrete element method (DEM) simulations and verified by the Beverloo equation.

Keywords: Impulse-based dynamics, discrete element method (DEM), non-spherical particles, granular flow, hopper emptying

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