

Abstract Submitted
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Evolutionarily designing the least obstructive hopper - with application on 3D printing GUO-JIE GAO, Osaka University, COREY O'HERN, Yale University, SHIGENOBU OGATA, Osaka University — Placing an obstacle near an orifice of a granular hopper has been shown to facilitate the gravitational granular flow through the orifice by a factor of 100 [I. Zuriguel et al., Phys. Rev. Lett. 107, 278001 (2011)]. Using multiple obstacles, we want to further clarify the physics behind this phenomenon, and study if this approach can further improve the control of the granular flow rate. We develop molecular dynamics (MD) simulations to study the discharging of frictionless grains, and figure out the best design of placing obstacles that discharges densely stored grains most efficiently using an evolutionary procedure that progressively exhausts all possible placements of multiple obstacles including the one recovering the original design in the cited literature. We emphasize the impact of applying our results to 3D printing that makes solid objects of virtually any shape using granular materials.

Guo-Jie Gao
Osaka University

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