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Smarticles: smart, active granular matter[1] WILL SAVOIE, Georiga Tech, ARMAN PAZOUKI, DAN NEGRUT, U. Wisconsin-Madison, DANIEL GOLDMAN, Georiga Tech — We investigate a granular medium composed of smart, active particles, or "smarticles". Previously, we discovered that ensembles of "u"-shaped particles exhibited geometrically-induced cohesion by mechanically entangling via particle interpenetration [Gravish et al, PRL, 2012]; the strength and/or extent of entanglement could be varied by changing particle level entanglement by changes in arm-to-base length of the u-particle. Since changing this parameter on demand is inconvenient, we develop a power-autonomous programmable robot composed of two motors and three links with an on-board microcontroller. This smarticle can be activated to change its configuration (specified by its two joint angles) through audio communication. To complement these experiments, since study large ensembles of smarticles is cost and labor prohibitive, we also develop a simulated smarticle in the Chrono multibody simulation environment. We systematically study ensemble cohesiveness and compaction as a function of shape changes of the smarticles. We find that suitable activation of smarticles allows ensembles to become cohesive to "grip" rigid objects and lose cohesion to release on command.

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