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The relationship between mechanically stable packings of frictional particles and low-dimensional saddle points of frictionless particles TIANQI SHEN, Department of Physics, Yale University, COREY O'HERN, Department of Mechanical Engineering and Materials Science, Yale University, MARK SHATTUCK, Benjamin Levich Institute and Department of Physics, City College of New York of the City University of New York — We perform computational studies of static packings of bidisperse frictionless and frictional disks. We show that there is a one-to-one correspondence between highly probable mechanically stable packings of frictional disks and low-dimensional saddle points for hard frictionless disks. To show this, we enumerate static packings of frictionless disks with one less contact than that required for mechanical stability $N_c = N_c^{\rm iso} - 1$. We find that the collection of these states forms lines in configuration space that emanate from the mechanically stable packings. Saddles with two missing contacts form branches that emanate from the one-missing-contact lines, and so on. For each saddle point, we calculate the minimum static friction coefficient $\mu_{\rm min}$ required to make each one mechanically stable. These studies allow us to calculate the allowed mechanically stable packings of frictional particles using MS packings of frictionless particles as a reference.

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