Abstract Submitted
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Exact tools for 2D granular packings ERIC DEGIULI, NEIL BALMFORTH, Dept. of Mathematics, University of British Columbia — Building on the loop force formulation of Ball and Blumenfeld[1], a new, exact potential formulation is given for two dimensional, static packings of frictional, monodisperse disks. Using degree-of-freedom counting and explicit constructions, it is shown that the natural graph for analysis of stress distribution in such packings is the Delaunay triangulation. Edges of this graph which do not correspond to contacts yield "virtual contact" vectors, which are shown to be of great physical importance. In particular, the new potential satisfies force and torque balance identically and is subject only to the Coulomb constraint and a new set of physically transparent constraints on the "virtual contacts." Using the new coordinates, previous results on the contact force distribution are rationalized, and a unified framework is presented for understanding the sources of correlation between contact forces. A new maximum-entropy argument is presented to derive the contact force distribution, and the dependence on shear, friction, and coordination number is discussed.

[1]PRL 88 115505, 2002

Eric DeGiuli
Dept. of Mathematics, University of British Columbia

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