Annotated references for rigidity/packing/granular materials
Session on Granular Matter
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The first place to look for a given reference, given the author’s name and approximate
time of publication is in Math Reviews on line at MathSciNet
(http://www.ams.org/mathscinet/search) or Zentralblatt (http://www.emis.de/ZMATH/).
Both of these give you some free searches, but it is more convenient to work through a
library work station or use, say, your institution’s access, if it exists. Often, but not always,
you can link from those sites to the journal’s archive. Some places that have archived several journals is Jstor
(http://www.jstor.org/) and a particularly difficult journal to find in libraries, which has a lot of articles on rigidity from the mathematical
perspective, is Structural Topology. It is now no longer publishing, but all issues are available at
http://www-iri.upc.es/people/ros/StructuralTopology/. Another place to look
for preprints is the archive at http://front.math.ucdavis.edu/. Of course, it is often useful
to google the author and hunt in his/her web page.

The following are some of my papers from MathSciNet.


This explains how linear programming is used to do numerical simulations and
free log jams of circle or spherical packings.


This explains the lack of a positive percolation threshold for rigidity that needs
tension for stability. This is in my lecture V.

MR1626699 (99c:52027) Bezdek, A.; Bezdek, K.; Connelly, R. Finite and uniform

This discusses the rational for a sense of rigidity for large packings, other that just
infinitesimal rigidity. Also the collapsing square lattice is described.


This is where we define and prestress stability, second-order rigidity, and show
how they are connected. The theory here is used to prove some conjectures of B. Roth
about cabled polygons in the plane. This is the main reference for Lecture VI here.
This is an example that shows that a naïve definition of higher-order rigidity does not have reasonable properties.

This explores some of the alternate definitions of stability for infinite packings. The theory here is applied to several symmetric packings to determine their stability by the various definitions. This is relevant to Lectures III and IV.

This explains how the basic rigidity theory applies to packings of circles and spheres. The canonical push is presented showing the importance of infinitesimal rigidity.

This is starting point for stress component of the Hessian of a more-or-less arbitrary energy functional. This can be used to show the stability of a wide variety of tensegrity structures used by artists, for example.

The title is the theorem. Actually, arbitrarily triangulated convex polyhedra in 3-space, even with judiciously placed holes in the faces, are prestress stable, which is a bit stronger statement.

This is the best write-up of my example of a flexible triangulated surface that is
embedded in 3-space.

Some of my papers not in Math Reviews:


The remarkable thing here is that in general ellipsoid packings are not infinitesimally rigid, and they tend to pack more densely than packings of spheres.

Numerical computations and an argument for the concept of strictly jammed packings.

Comments on related papers and correcting misconceptions about our work.

Papers by others:

This is a survey of some of the general literature on rigidity from wide perspective.

MR1237630 (94g:52028) Crapo, Henry; Whiteley, Walter Autocontraintes planes et polyèdres projetés. I. Le motif de base. (French) [Plane self stresses and projected polyhedra. I. The basic pattern] Dual French-English text. Structural Topology No. 20 (1993), 55--78. (Reviewer: Robert Connelly) 52C25 (52B70 73H99 73K05)  
This is a discussion of the Maxwell-Cremona correspondence and other matters related to stresses on frameworks.

This is a survey of several of the results related to rigidity from the combinatorial point of view and matroids.

Basic constructions using Hennemberg moves to create isostatic bar frameworks.
The basic duality result as discussed in Lecture II.

This is the beginning article that discusses the homework problem.

The title is the result.

This discusses the difficulty of describing what is happening when uniform spherical balls are packed “randomly” in a container.


This is an introduction to the pebble game to determine the generic rigidity of a bar framework in the plane.

This is a good description of the infinitesimal rigidity of convex triangulated, Dehn’s Theorem. But his proof has a gap for the case when the faces are not triangles.