Session 8 *(In preparation for Class 8, students are asked to view Lecture 8.)*

Topics for Class 8

Fold and one cut: software, scissor vs. mathematical cuts, tree folding, density, examples, how many disks, comparison to tree method, continuous flattening.

Detailed Description of Class 8

This class describes several additional details about fold-and-cut:

- Software:
  - David Benjamin and Anthony Lee's 6.849 Fall 2010 project (skeleton method)
  - JOrigami (disk-packing method)
- Skeleton method:
  - Odd-degree vertices are possible with mathematical cuts, but not scissor cuts.
  - Two scissor cuts can (usually) simulate mathematical cuts.
  - Correspondence between linear corridors and shadow tree
  - Correspondence between tree folding and origami folding
  - Why dense configurations should happen only with probability 0
  - Comparison to tree method
- Examples by past students
- A magic trick
- Disk-packing method:
  - Correspondence between disk packing and triangle/quad decomposition
  - How many disks are needed by a disk packing?
  - Comparison to tree method
  - Open problem with curved cuts
  - Continuous flattening: convex polyhedra now solved
  - Comparison to tree method
- Paper cutting art

Topics for Lecture 8

Fold and one cut: history, straight-skeleton method, disk-packing method, simple folds, higher dimensions, flattening polyhedra.

Detailed Description of Lecture 8

This lecture is about my first work in computational origami: folding a piece of paper flat so that one complete straight cut makes a desired pattern of cuts (and resulting polygonal shapes). The problem has a long history (back to the 1700s) and possible applications to airbag folding through a problem called flattening. We'll see two different methods for this problem, each with connections to the tree method of origami design: the first generalizes the universal molecule to nonconvex polygons, but loses the ability to control the shadow tree; the second uses disk packing (but no rivers) and universal molecules for triangles and quadrangles. I'll also talk about a brand new result that started from this class three years ago: what shapes can you make only with simple folds?

6.849 Geometric Folding Algorithms: Linkages, Origami, Polyhedra
Fall 2012