6.849: Geometric Folding Algorithms, Spring 2017

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Problem Set 3

Due: Wednesday, March 1, 2017

Solve Problem 3.1 and *either* Problem 3.2 or 3.3.

Problem 3.1 [Mandatory, Collaboration OK]. On each problem set, we will ask you to write a problem (solved or unsolved) related to the material covered in class. The problem should be original to the best of your knowledge, so be creative and diverse! Folding can be applied to mathematics, computation, engineering, architecture, biology, and beyond, so write a problem that is related to a field that interests you. If you write a problem whose solution can be solved from the material covered in class, then we may adapt your problem for future problem sets. If you pose a problem whose solution is not yet known, we may try to solve it in class during our open problem sessions, or it may become inspiration for a class project. Feel free to include solutions or commentary for your problem. While writing a problem is required, your submission will be graded generously, so have fun and share with us your exploration of the course material.

Solve ONE of the two problems below.

Problem 3.2 [Collaboration OK]. Design a piece of origami using some origami design software from the following list and try to fold it.

TreeMaker	(http://www.langorigami.com/article/treemaker)
Origamizer	(http://www.tsg.ne.jp/TT/software/)
ORI-REVO	(http://mitani.cs.tsukuba.ac.jp/ori_revo/)
Tess	(http://www.papermosaics.co.uk/software.html)

Use your judgment of reasonable complexity to work within your folding ability. This problem aims to give you experience using algorithmic tools for origami design, and some practice for how well these work (or fail) to fold. Submit your intended design, any issues you encountered, resulting crease pattern, and your folded origami. Please also send a digital copy of the design (as saved by the software) to 6849-staff@csail.mit.edu.

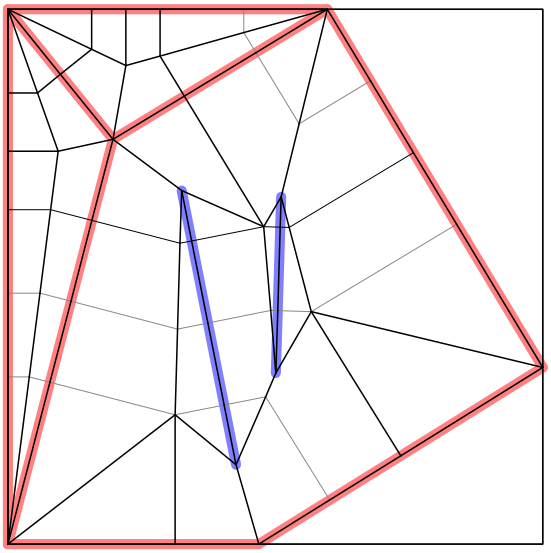
Problem 3.3 [Collaboration OK]. Each of the crease patterns below is for a uniaxial base as generated by TreeMaker. Bold lines represent folded creases while thin lines denote hinge creases that are not folded. As a hint, one axial crease in each crease pattern is highlighted in red.

For each of the crease patterns below, do the following:

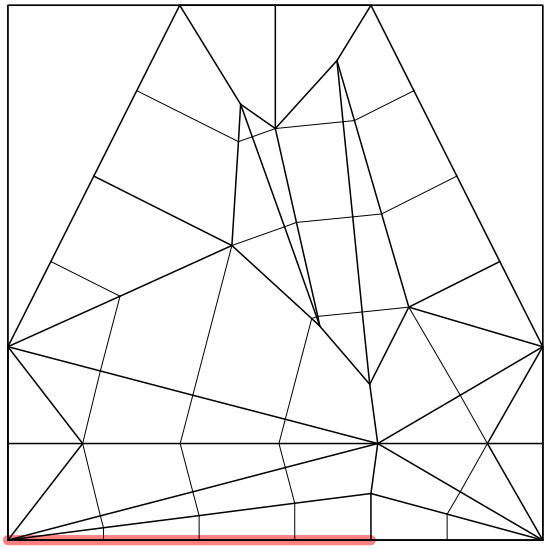
(a) Draw and label the associated shadow tree.

(b) Identify (highlight or mark) all creases that lie along the axis. The first crease pattern is marked for you in red.

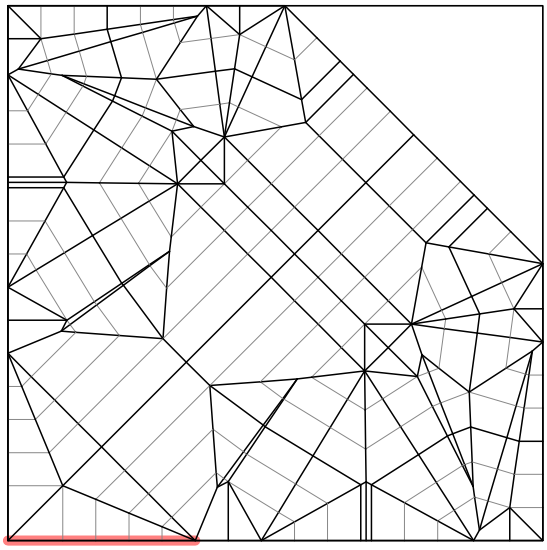
(c) Identify (highlight or mark) all creases that are active paths in the universal molecule construction process. The first crease pattern is marked for you in blue.



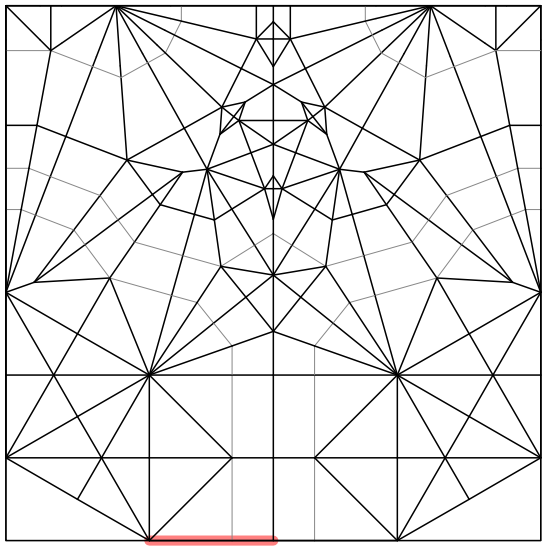
(1) http://courses.csail.mit.edu/6.849/spring17/psets/ps3-cp1.pdf



(2) http://courses.csail.mit.edu/6.849/spring17/psets/ps3-cp2.pdf



(3) http://courses.csail.mit.edu/6.849/spring17/psets/ps3-cp3.pdf



(4) http://courses.csail.mit.edu/6.849/spring17/psets/ps3-cp4.pdf