

6.885: GEOMETRIC FOLDING ALGORITHMS

Fall 2007 — Prof. Erik Demaine

Problem Set 3

Due: Friday, October 19, 2007

Problem 1. Design and fold a fold-and-one-cut model.

- (a) Design an interesting set of desired cuts (line segments) in a piece of paper (presumably a square or a rectangle) that does not already appear on <http://erikdemaine.org/foldcut/examples/>.
- (b) Use the straight-skeleton method from Lecture 9 to obtain the crease pattern: straight skeleton plus perpendiculars.
- (c) Fold it flat: print out the crease pattern, precrease along each crease, and then do your best to collapse the thing flat, using every crease and no additional creases. (This is often harder than it sounds!)
- (d) Observe which creases are mountains, which are valleys, and which are not creases at all. Transfer this information to your diagram, erasing unused creases, and denoting valleys with dashes and mountains with dot-dashes (and/or use color).
- (e) (Optional) Try folding it flat again, using the updated diagram and the mountain/valley information. You'll find it much easier this time. You might also find some bugs in part (d) this way.

Electronically, you should submit the diagrams from steps (a), (b), and (d). Physically, you should submit the models from steps (c) and (e) (if you completed step (e)).

You should draw all diagrams using a good computer drawing program or CAD program. All creases must be accurate. So any interactive drawing program better support accurate snapping to enable accurately computing the angular bisectors and perpendiculars. Some possible programs to check out are Adobe Illustrator and AutoCAD (commercial but powerful), Ipe (free and should do the job well), and Cinderella and Cabri (geometric construction but commercial).