6.885	Lecture 24	Dec. 10, 2007

Po-Ru Loh: Curved Creases

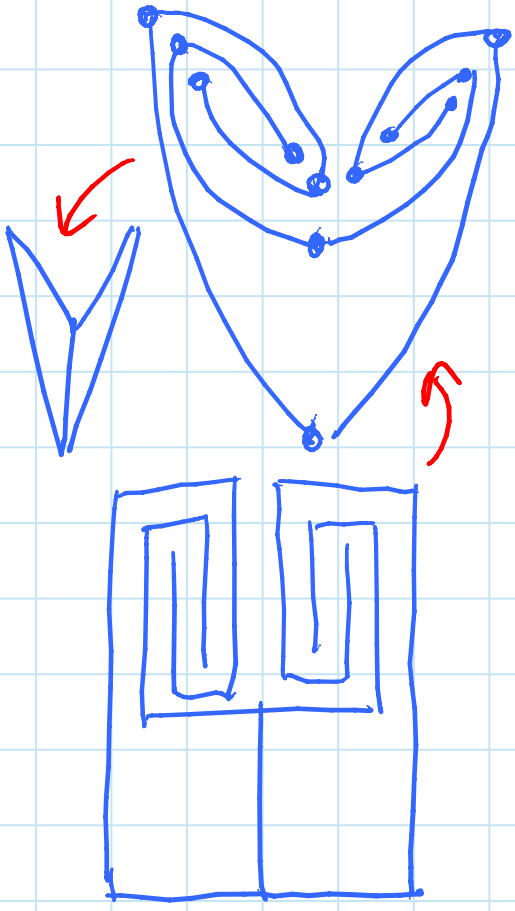
THEORY

- applicable surface = isometric to plane
  - arbitrary creases - not well studied
- developable surface = applicable + smooth
  - better studied
- new result: nontangential single-vertex neighborhood folds continuously
- 1DOF "mechanism" if regions "stay flat"

David Charlton: Locked orthogonal trees

THEORY

- result: there is a locked orthogonal 2D tree
- model by nonorthogonal tree with tiny edges contracted
- rigid in self-touching state by Rules 1 & 2: →
- handle zero-length edges by Lecture 22 contrapositive: self-touching disconnected ⇒ nontouching disconnected
- joint with various people in particular Ling



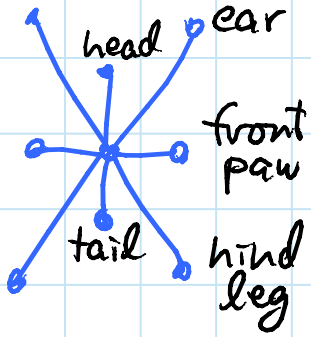
Hoda Bidkhori: Chain folding problems SURVEY

- Whitesides et al.: can one chain config. be folded into another, allowing self-intersect, but inside a polygon confinement
- l-ruler [Pei & Whitesides]: all edges length l
- characterization of collapsibility of l-ruler

  within regular $2k$-gon:
  - always for $l \leq w$ — width
  - not for $w \leq l \leq m$ — vertex-midpoint dist.
  - always for $m < l \leq d$ — diameter
- characterization in equilateral Δ:
  - always for $l < x_1$ &

Amy Wibowo: Origami rabbit design SCULPTURE

- Lang's tree method & TreeMaker to optimize
- added some disks during design



Edwin Chen: Origami & Kolmogorov complexity THEORY

- Kolmogorov complexity = length of shortest program outputting the string
- most strings of length n have Kolmogorov complexity $n + O(n)$
- Soloveichik & Winfree: unique tile assembly requires $\Theta(K / \lg K)$ tile types (up to additive constants)
- new result: for suff. large $n > m$, ($m > \lg \lg \ldots$) most $n \times m$ maps cannot be folded flat by simple folds
  - proof: this would compress

Zach Abel: Hinged dissections exist THEORY

- Wallace-Bolya-Gerwein Theorem: every two polygons of equal area have a common dissection
- new results:
  1. ditto for hinged dissections
  2. using pseudopolynomial # pieces (optimal)
  3. continuously folding without overlap
  4. dissections of 3D polyhedra can be turned into edge-hinged dissection
- many ideas
- OPEN: higher dimensions (hinging part easy) # pieces, motions in 3D?

Duks Koschitz: Curved crease explorations

SCULPTURE

- concentric circles & ellipses
- variations thereof, e.g. offsets
- quadratic curves, mainly closed loops
- only geometric failure: 3 parabolas in a cycle
- materials: cotton paper, ← laser cutter
  tin metal (difficult), polycarbonate ← waterjet cutter