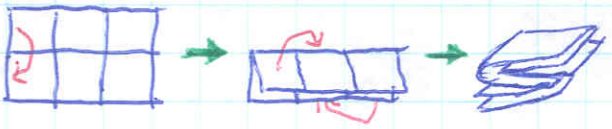
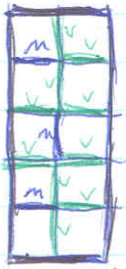
2D map folding [Arkin et al. 2004]

6.885
L6.5
Sept. 27, 2004

↳ rectangular paper with axis-parallel creases

- again every crease pattern is flat foldable
  - zig-zag in x then y

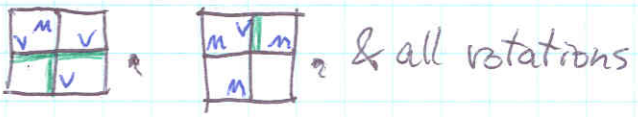




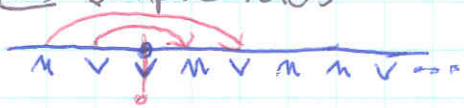
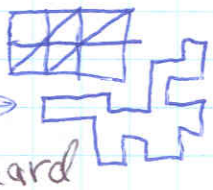
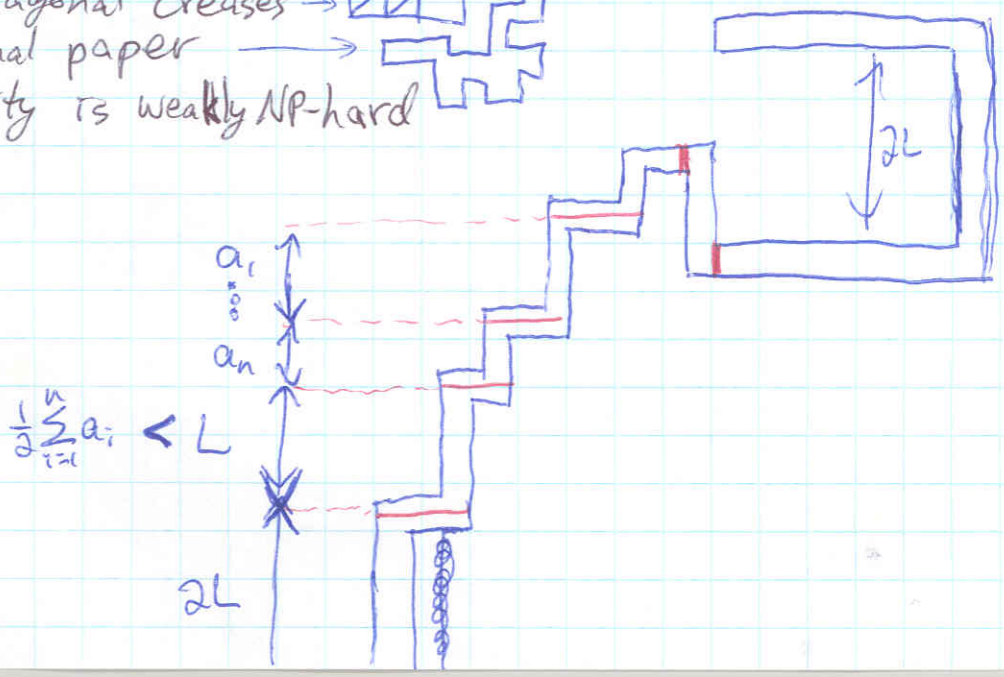
Justin's unfoldable map

← OPEN: characterize flat-foldable M-V patterns [Edmonds 1997] (even 2×n)

- focus (for now) on simple folds: fold by 180° along one line at once
  - in 1D, crimps can be executed by simple folds
    ⇒ simple folds are omnipotent in 1D
- if simply flat foldable, there is a uniform line – all M or all V
  - crossing lines must switch M↔V here
  - local M/V assignments: flat-foldable



- thus all uniform horizontal lines must be folded before any vertical lines become uniform & foldable (& vice versa)
  ⇒ sequence of 1D problems on current uniform lines
- linear-time algorithm – O(mn) for m×n map – by maintaining crimpability & end foldability everywhere & uniformity
- another linear-time algorithm for "all-layers" simple folds
  - uses string-matching algorithms



- adding 45° diagonal creases → or orthogonal paper →
  ⇒ simple foldability is weakly NP-hard