Vertex unfolding

6.885
L 11.1
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- a different relaxation of edge unfolding
- still cut along edges
- require connectivity just through vertices (vs. edges)

e.g. ~ cut all edges

- every connected simplicial (= triangulated) manifold has a vertex unfolding, computable in linear time [Demaine, Eppstein, Erickson, Hart, O'Rourke 2003] [Bartholdi & Goldsman 2004 – but $O(n^2)$ time]

Facet path = facet, vertex, facet, vertex, facet, vertex, ..., facet
(incident, inc., inc., inc., inc.)

that visits every facet exactly once
& doesn't repeat a vertex twice in a row

(can repeat vertices but not edges) = trail in vertex-facet incidence graph that visits every facet exactly once

converts to
⇒ vertex unfolding: lay out each facet (Δ) in vertical slab

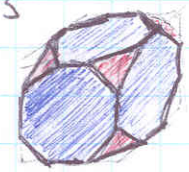
⇒ no overlap

- every connected simplicial manifold has a facet-path (next page)

Beyond Δ's:

– facet path ⇏ vertex unfolding no slabs

– not always a facet path even for convex polyhedra
  – truncated cube has 8 disjoint Δs, 6 ⬡s
  – not enough ⬡s to put between Δs



OPEN: does every convex polyhedron have a vertex unfolding?

OPEN: does every polyhedron with simply connected faces have a vertex unfolding? convex faces?

- "general" vertex unfoldings trivial: just triangulate