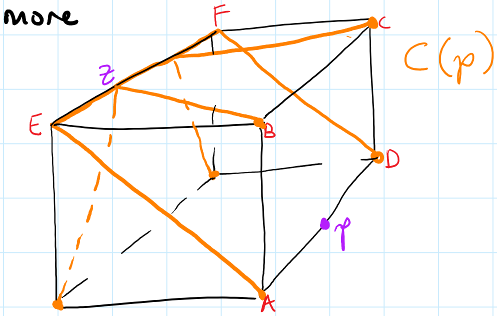
CUT LOCUS: The cut locus $C(x)$ is the closure of the set of all points y to which there is more than one shortest path to x.



ALGORITHMS FOR CUT LOCUS

Imagine pouring paint on the surface of polyhedron P, starting at x. Paint flows at constant speed in all directions.

Keep track of the frontier, and $C(x)$ is the set of points where the "wave fronts" meet.

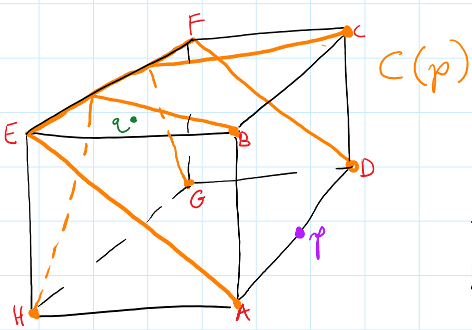
Discretize a sequence of events. ← generalization of Dijstra's algorithm for computing all shortest paths on a graph

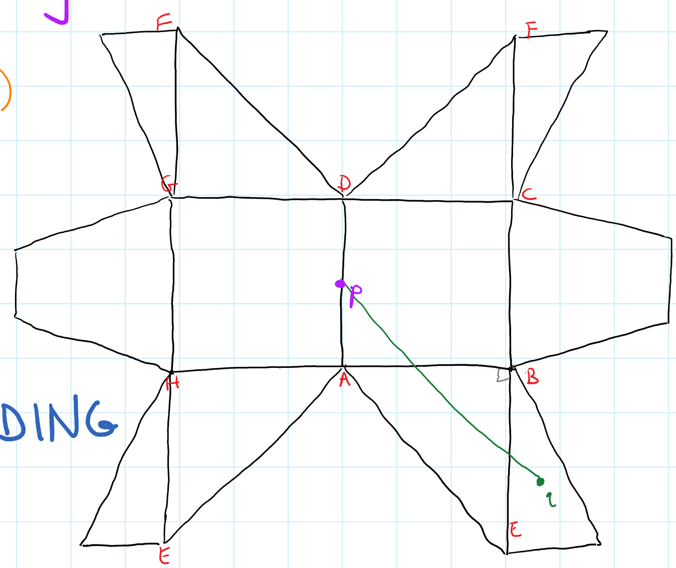
1987: $O(n^2 \log n)$ implenatation

1997: $O(n^2)$

2008: $O(n \log n)$

What happens if we cut along the cut locus?



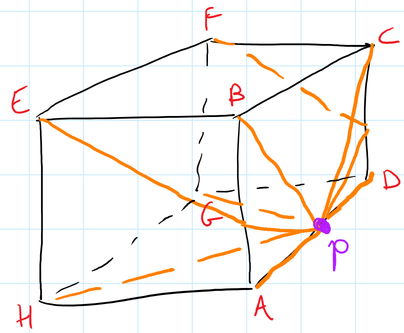


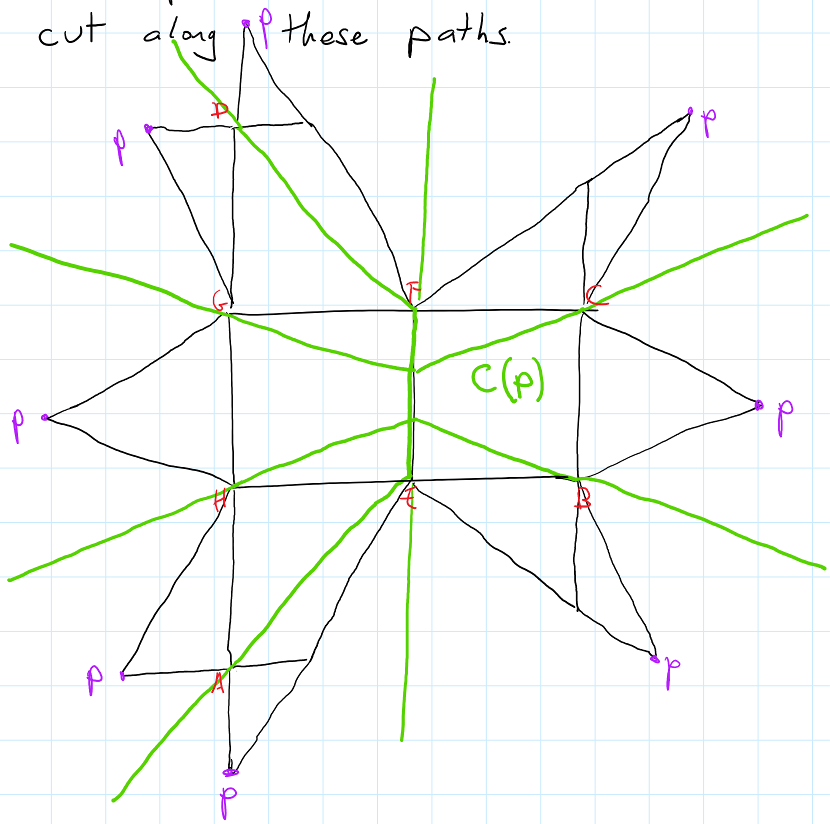
SOURCE UNFOLDING FROM POINT p

STAR UNFOLDING

Fix $x \in P$. Find the shortest path from x to each vertex of P, and cut along these paths.

EXAMPLE:

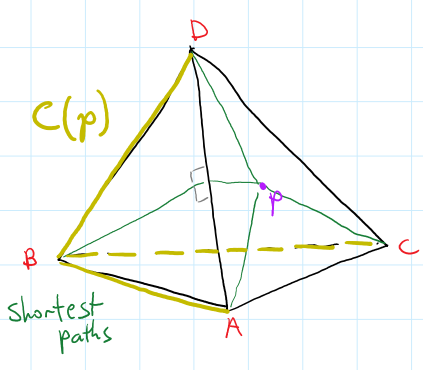


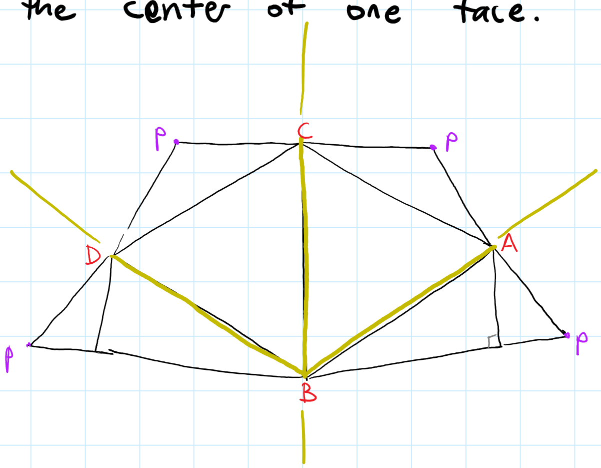


This point p is not generic, meaning there is not a unique shortest path from p to each vertex

FACT: The cut locus $C(p)$ is the Voronoi diagram of the images of p in the star unfolding. (restricted to the interior of the unfolding)

EXAMPLE: Draw the star unfolding of a regular tetrahedron, with p the center of one face.





What is known about unfoldings:

	edge unfoldings (nets)	general unfoldings
convex polyhedra	open question!	YES
nonconvex polyhedra	NO	open question

Some classes of convex polyhedra are known to have nets:

- prismoids (right prisms & oblique prisms)
- pyramids
- domes
- deltahedra: surface composed entirely of equilateral triangles