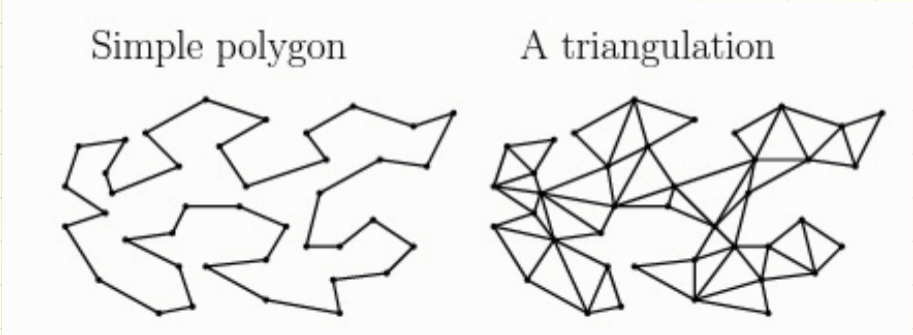
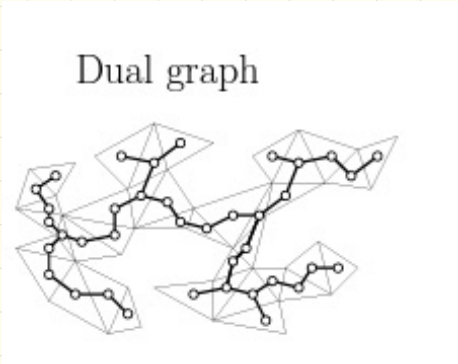
Polygon Δtion

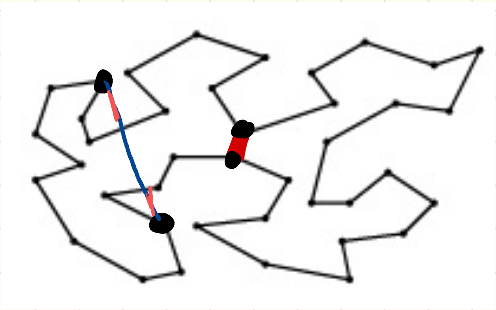
key Δs = triangles
Δtion = triangulation

Polygon Δtion problem:
subdivide a domain into a collection of simple disjoint shapes
e.g. region of the plane into Δs





Prelim ideas



we add "diagonals"

visible - 2 verts of polygon are visible if the segment connecting them is entirely in the polygon

diagonal: line segment joining a pair of visible verts

Lemma: any simple polygon w/ at least 4 verts the polygon has at least 1 diag

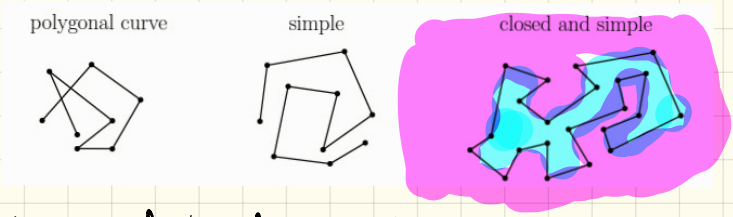
Today $O(n \lg n)$ time, n # of verts in polygon

2 steps:

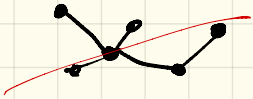
1. decompose poly into a set of monotone polygons — $O(n \log n)$ -time
2. triangulate each monotone polygon and combine results — $O(n)$ -time

Monotone Polygon!

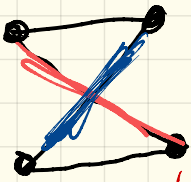
polygonal curve: collection of (like) segments joined end-to-end



closed curve: first and last vertex is the same
edges: line segments of the curve
vertices: endpoints of the segments
each edge is **incident** to 2 verts
each vertex is **incident** to up to 2 edges

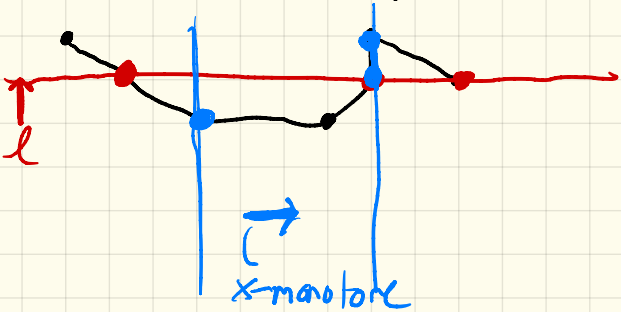


simple poly curve: no 2 non-incident objects intersect
simple polygon: simple poly curve that is closed and divides plane into an interior and exterior

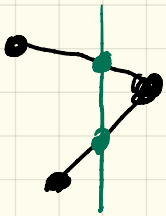


non-simple closed polygonal curve

Given a poly curve C,
C is **monotone** w.r.t. ℓ
if each line $\perp$ to ℓ intersects C in a single connected component

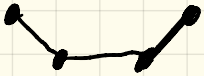


not y-monotone



not x-monotone

Strictly monotone:
w.r.t ℓ if any line $\perp$ to ℓ intersects at at most 1 point



Simple polygon P is monotone w.r.t ℓ if P's boundary ($\partial(P)$) can be split in 2 curves each monotone w.r.t ℓ