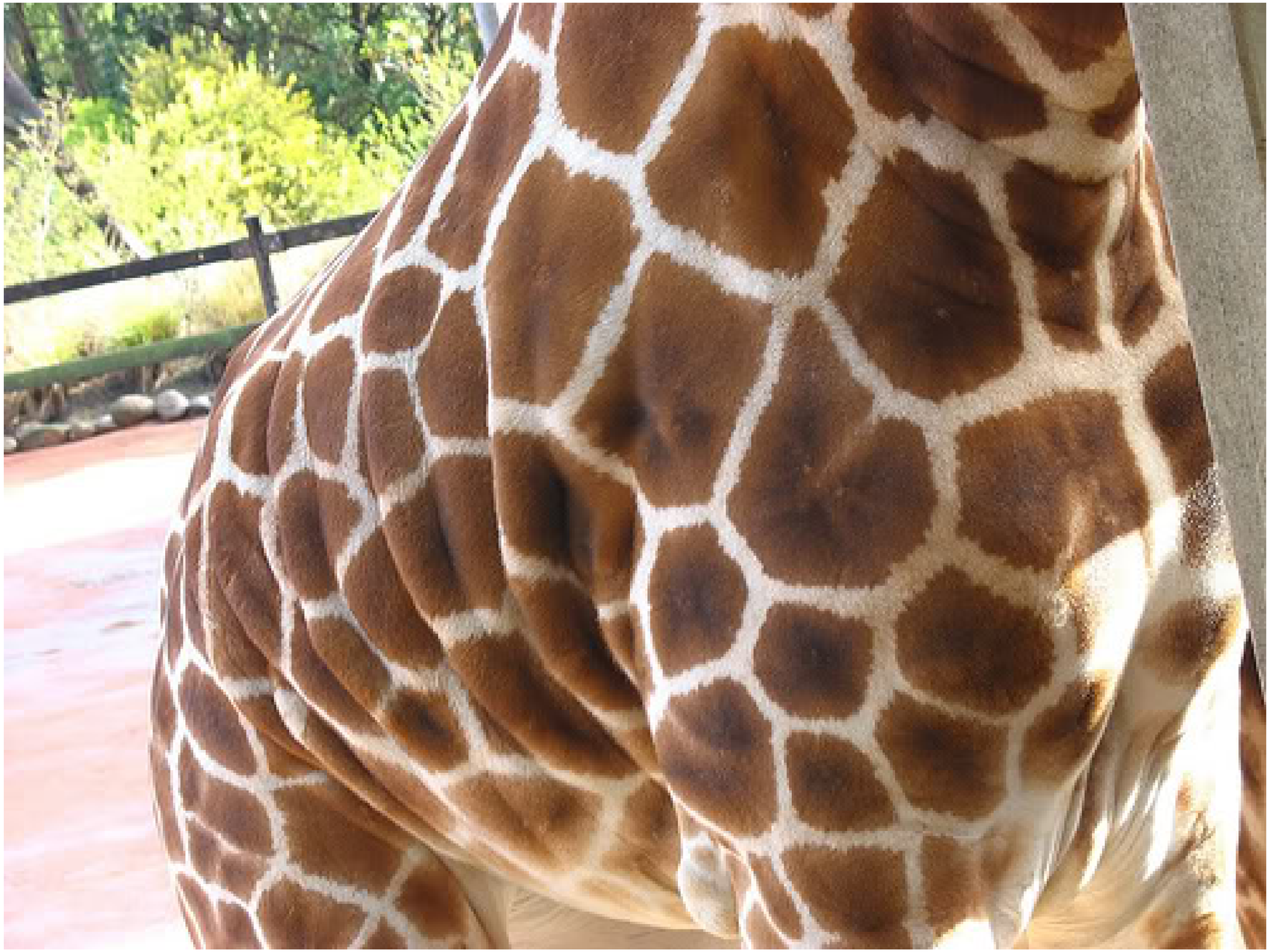
# Lesson 02
# DT + VD

# GEO1015.2023

Hugo Ledoux

# Voronoi diagram: most fundamental spatial data structure



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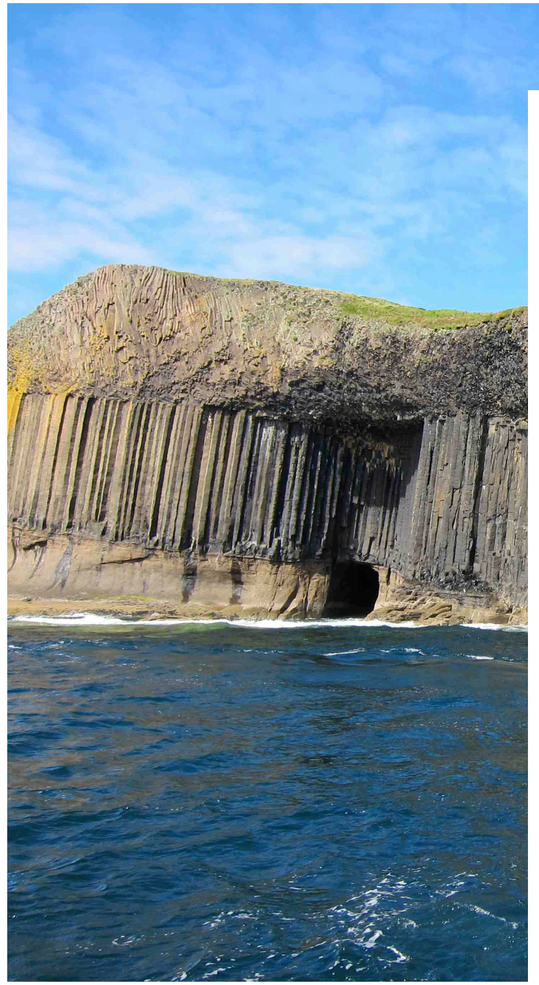
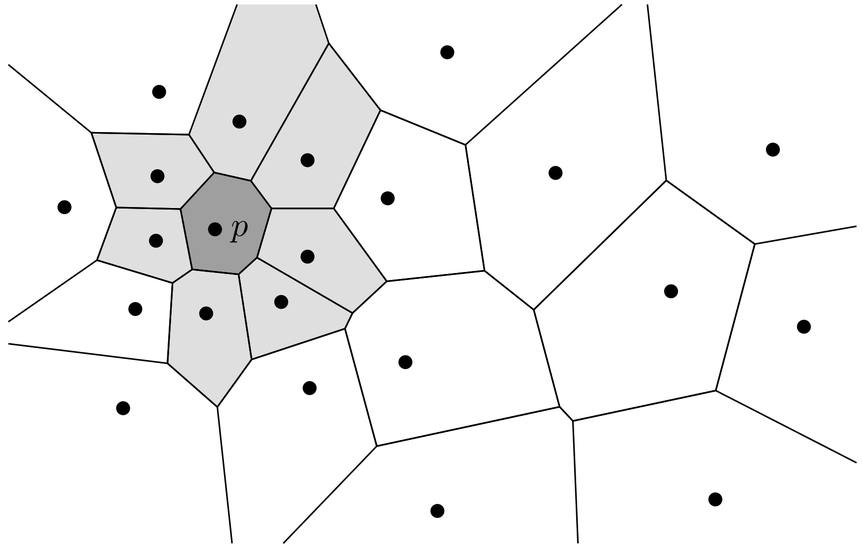


# VD is also in 3D and nD (topic of GEO1004)

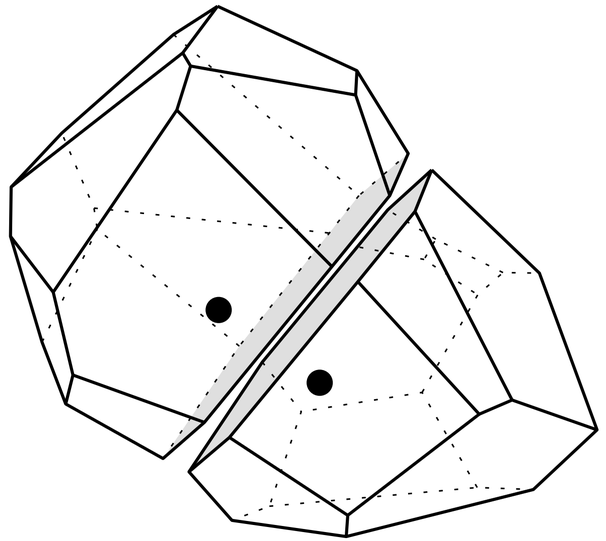
## Definition

The Voronoi cell of a point $p \in S$, defined $\mathcal{V}_p$, is the set of points $x \in \mathbb{R}^2$ that are closer to $p$ than to any other point in $S$; that is:

$$\mathcal{V}_p = \{x \in \mathbb{R}^2 \mid \|x - p\| \leq \|x - q\|, \forall\, q \in S\}.$$

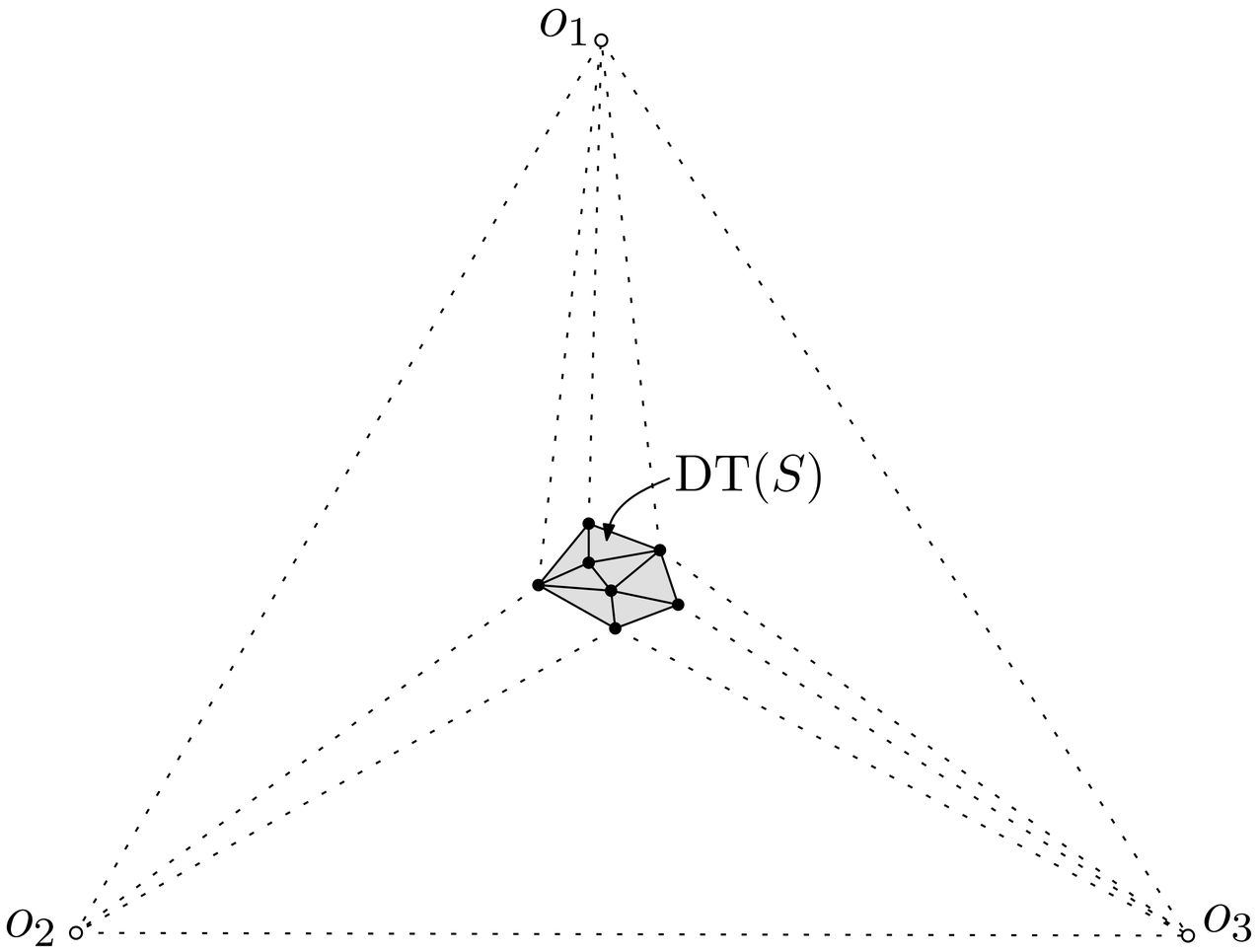


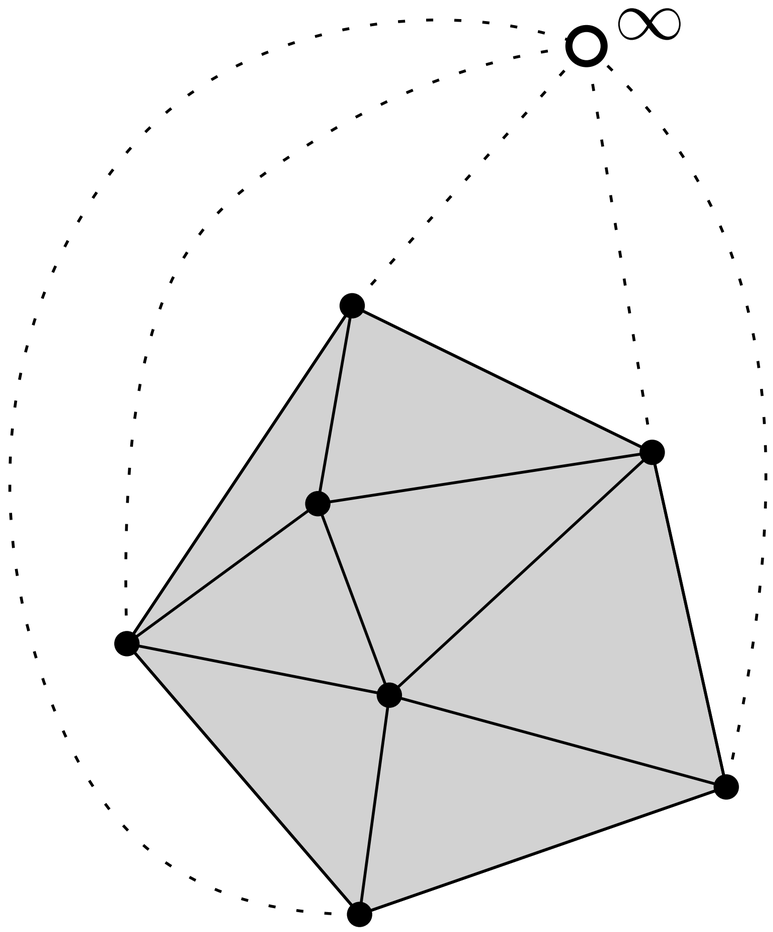

(a)



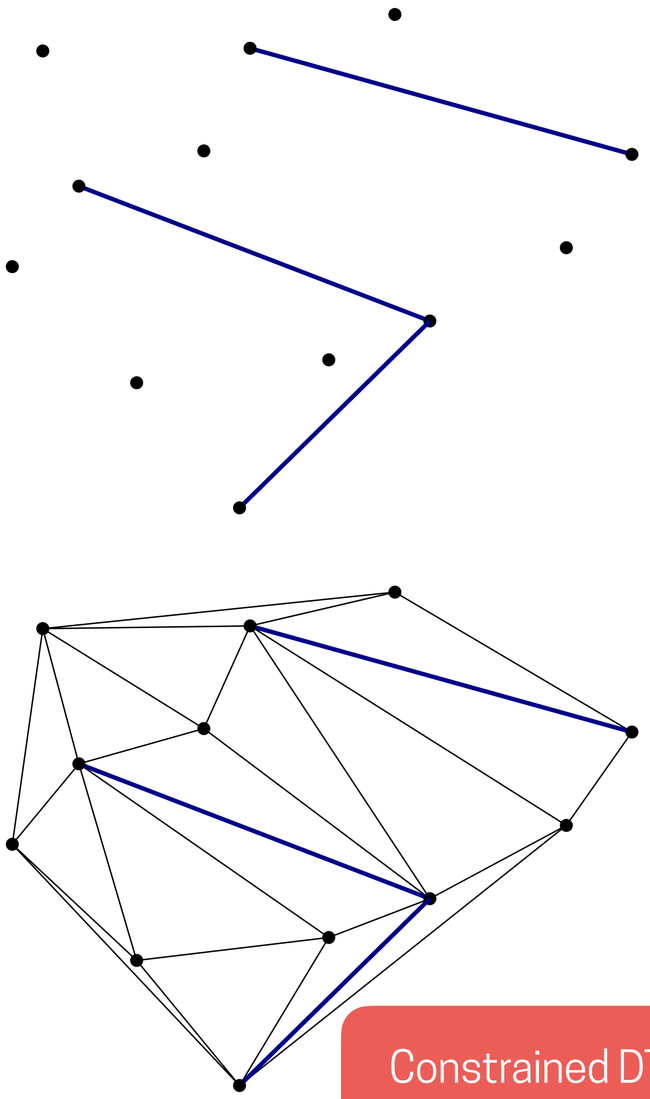
(b)

# One warning: be sure you understand the Big Triangle or Infinity

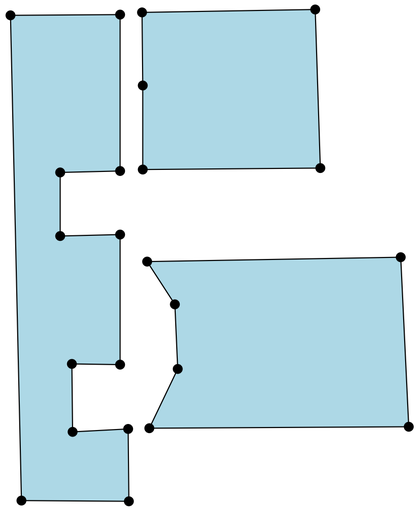


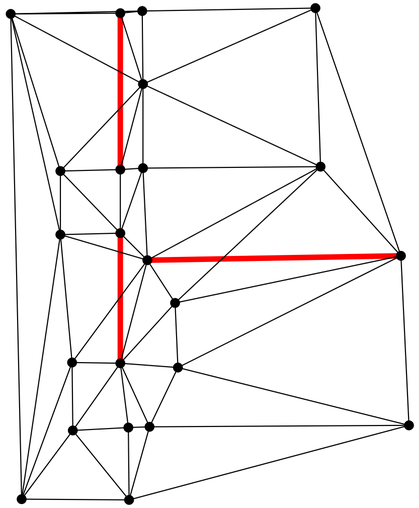
# What if we had lines/polygons? (And not just points)



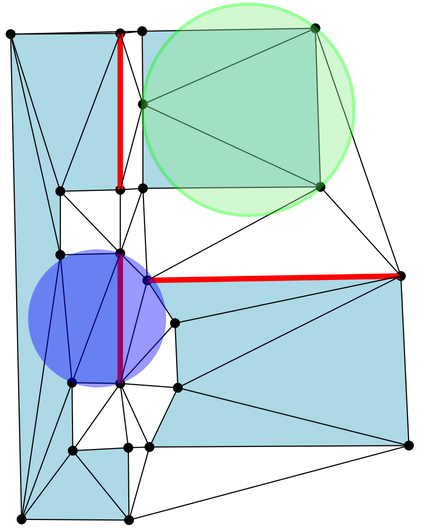
Constrained DT



3 buildings

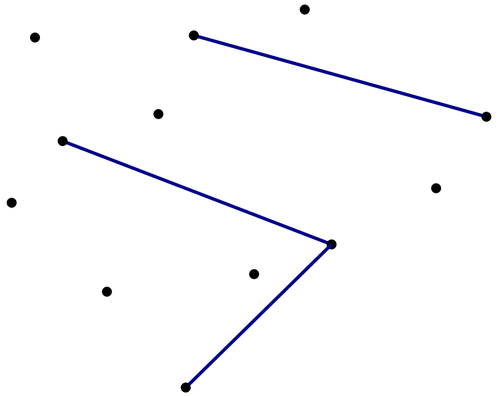


DT of the vertices of the buildings

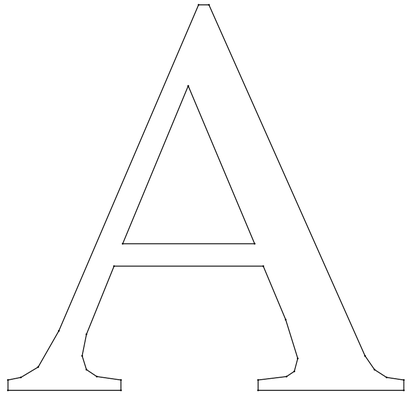


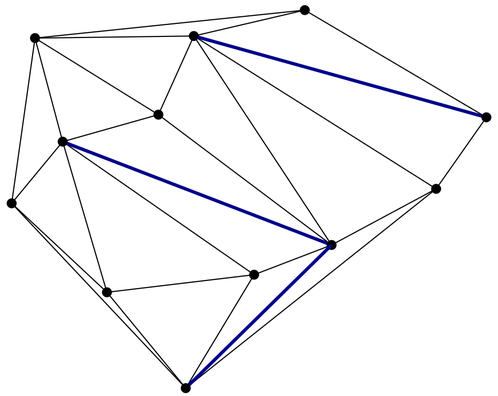
Constrained DT

# Conforming DT

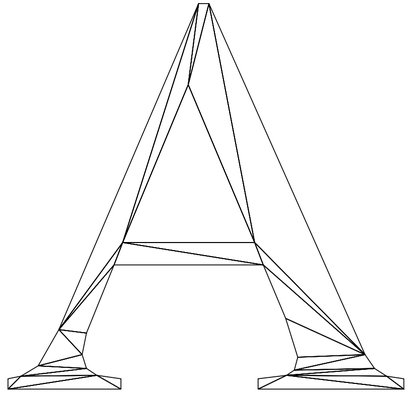


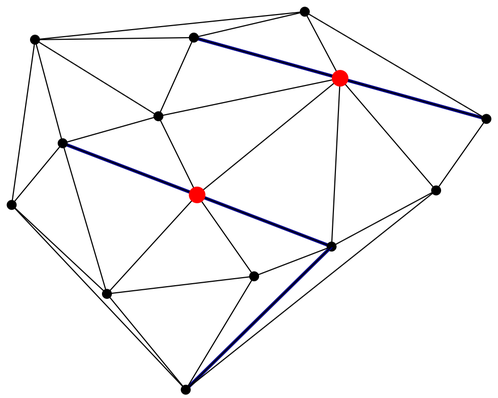
Input



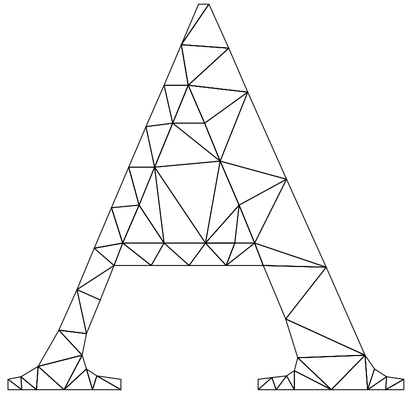


Constrained DT

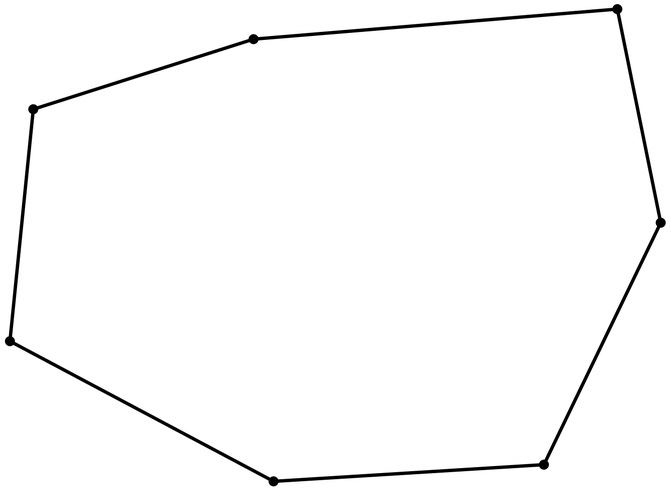


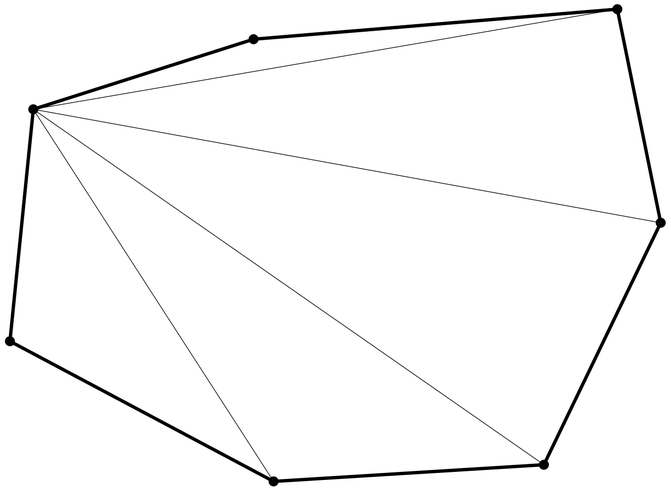


Conforming DT

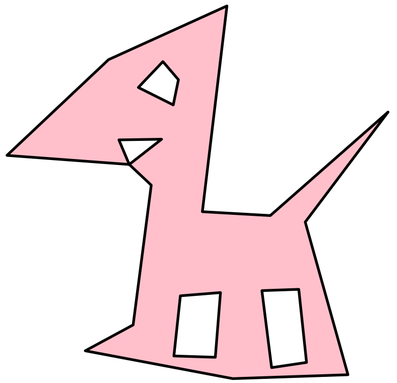


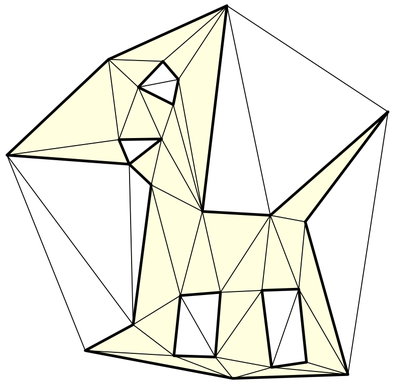
# Related problem: triangulation of a polygon

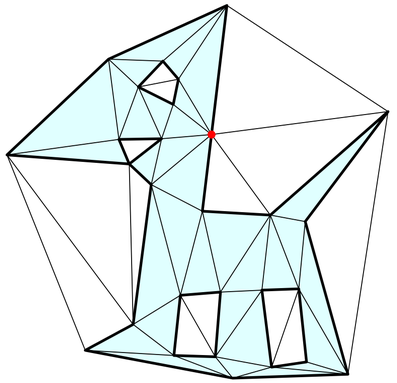




If convex it's easy:
Fan-shaped triangulation

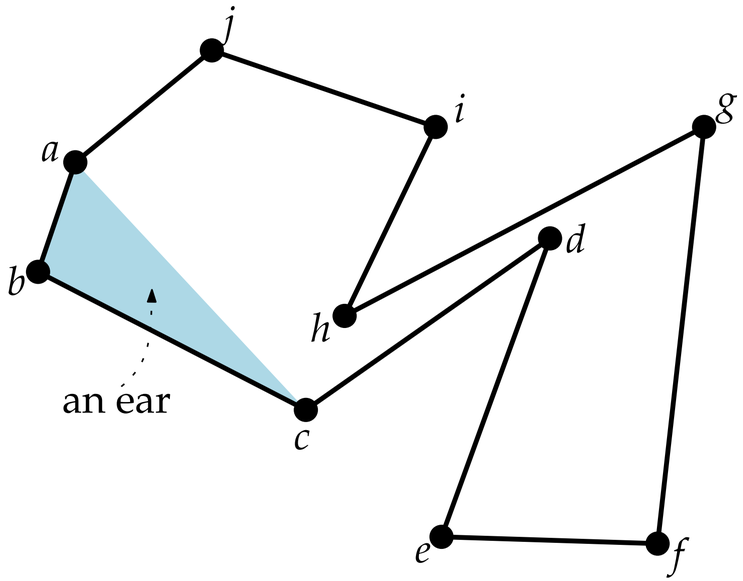


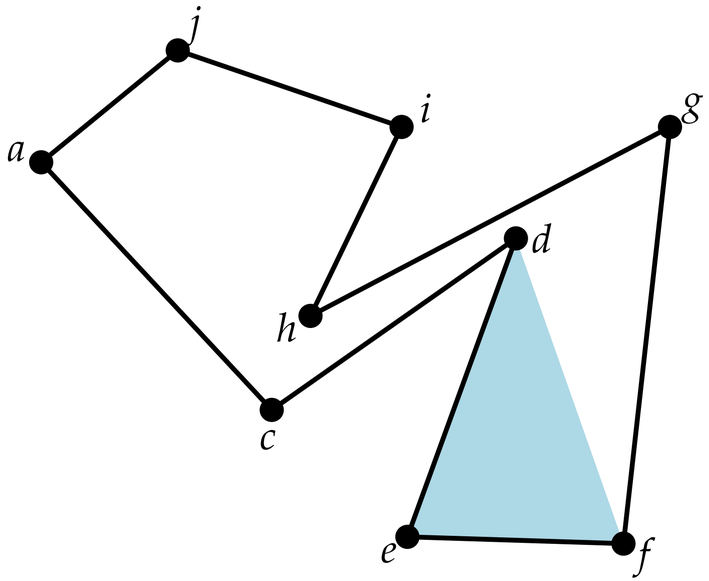


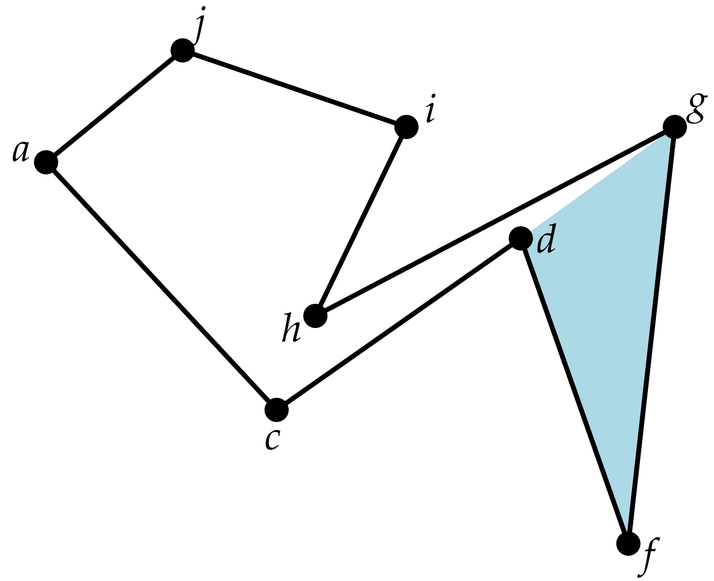


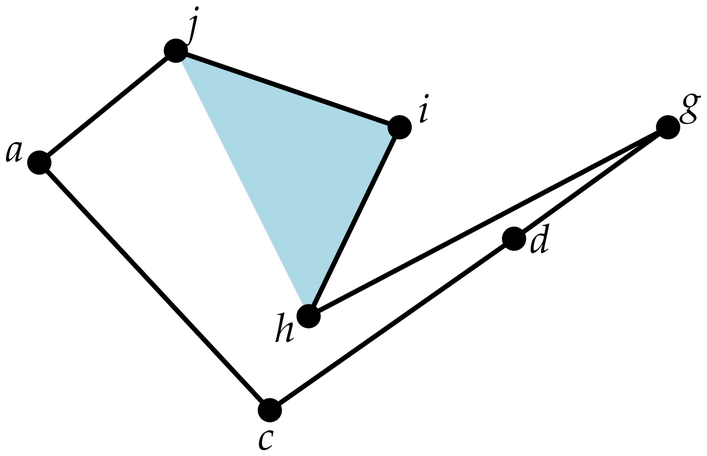
⚠
whole convex hull
is triangulated

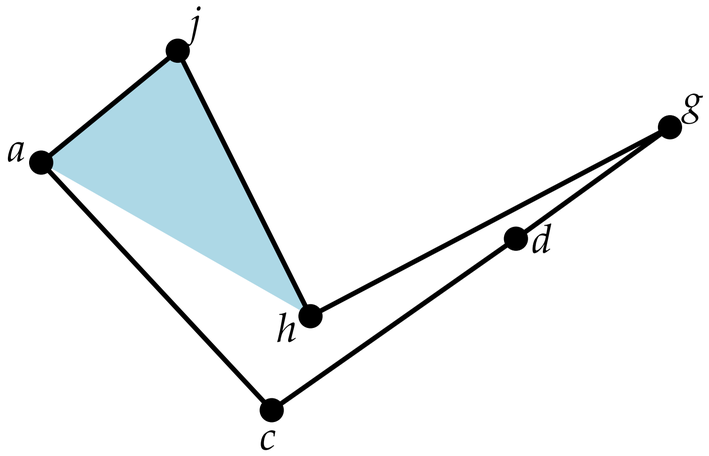
# Related problem: triangulation of a polygon

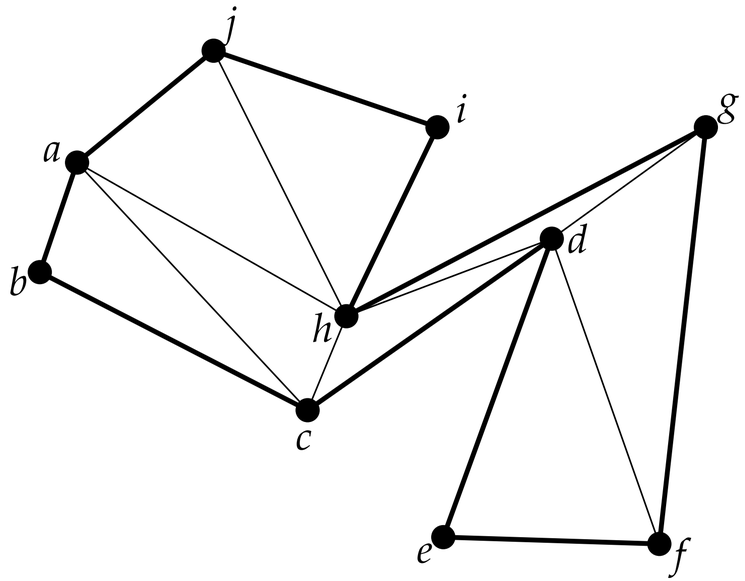


https://3d.bk.tudelft.nl/courses/geo1015/