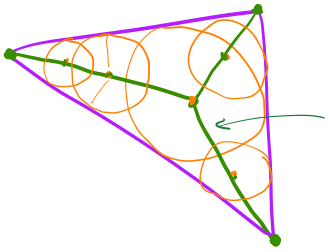
Recall: Voronoi edges consist of points with two (or more) closest sites

What if the sites are the boundary of a polygon?

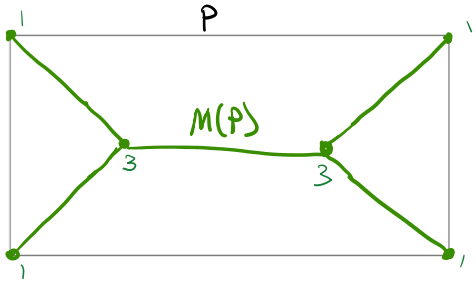


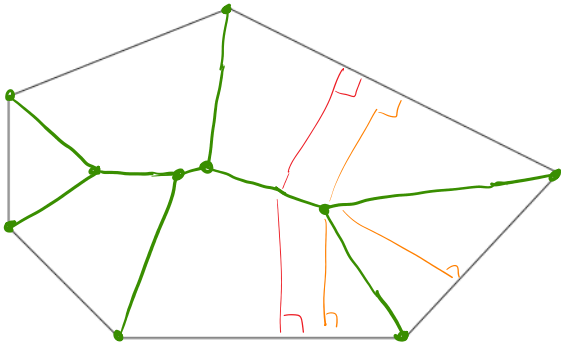
medial axis

DEFINITION:

For a polygon P, the medial axis (or cut locus) is the closure of the set of points that have two or more closest points on the boundary of P.

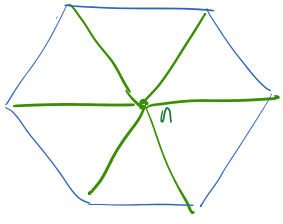
Examples:





For a convex polygon, the medial axis has the structure of a tree, whose leaves are the vertices of the polygon.

2. Let P be a regular n-gon:



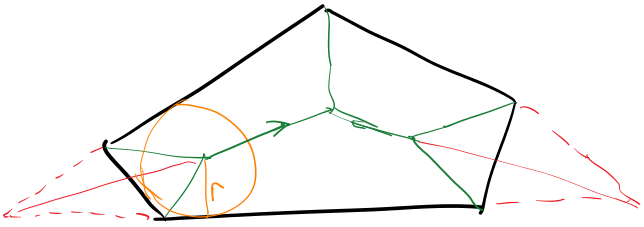
3. Let P have n vertices.

Then: M(P) has at least n segments.

∴ at most $\frac{3n}{2}$? $2n-3$? $2n-2$?

4. Algorithm: Let P be a convex n-gon.

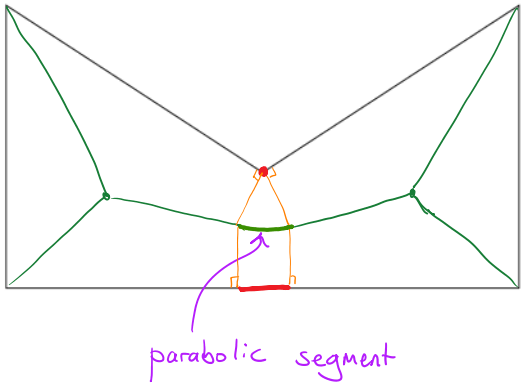
1. Construct angle bisectors.
2. Compute intersection points of concec. angle bisectors, along with radius of circle.

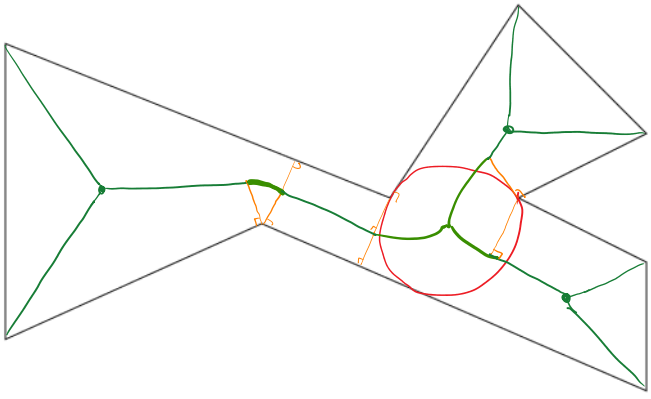


3. For each intersection, extend sides of P and compute new angle bisector. Compute new intersections.
4. The last 3 angle bisectors meet at the incenter of a triangle

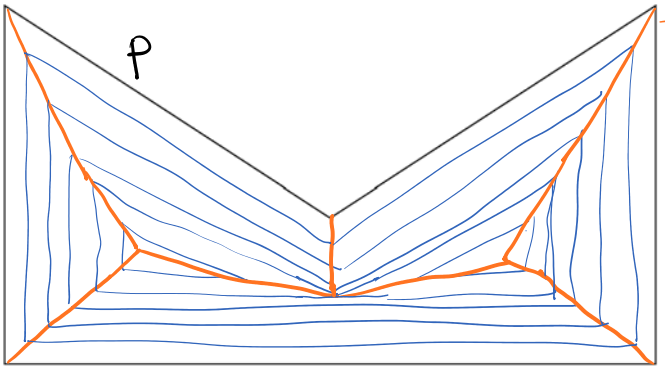
complexity: $O(n \cdot \log n)$ with priority queue

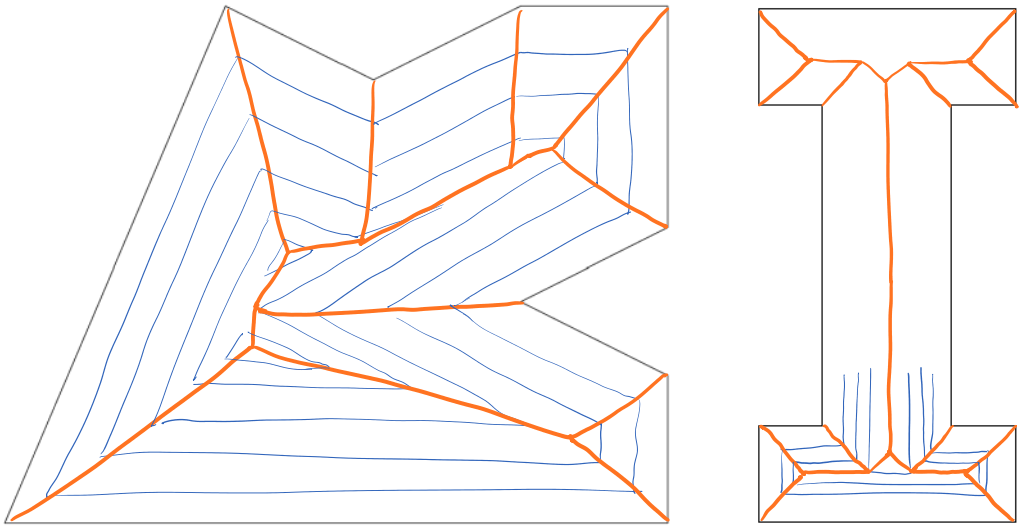
MEDIAL AXIS OF NONCONVEX POLYGONS



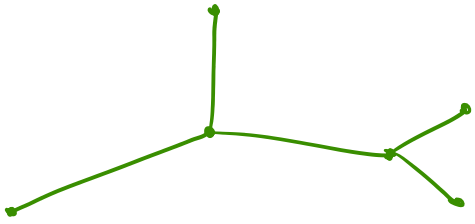


STRAIGHT SKELETON





tree:



ALGORITHM FOR STRAIGHT SKELETON

- Shrink edges to create offset polygons.
  Two events may occur:
  1. Edge shrinks to zero length. Process continues without that edge.
  2. Reflex vertex collides with an edge.
     Two smaller polygons are formed.

Naive implementation: $O(n^3)$

Best known complexity: $O(n^{12/11+\varepsilon})$ $\varepsilon > 0$