Computational Geometry and Geometric Computing
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Exercise 6

Motivation

We practise arrangements.

Bounding box

Give an $O(n \log n)$ algorithm to compute an axis-parallel rectangle R that contains all vertices in an arrangement of n lines.

Zone of segment in triangulation

Given a triangulation $\mathcal{T}$ with n triangles and a segment $s := \overline{pq}$. Compute all triangles intersected by s. Especially take care about degenerate situations.

Trapezoidal decomposition

The *trapezoidal decomposition* of an arrangement $\mathcal{A}$ induced by a set of curves is given by drawing vertical extensions from each vertex in upward and downward direction. Such an extension is either a segment if it hits another curve, or a ray that extends to infinity.

1. Sketch an algorithm to compute this decomposition.
2. Assume that the arrangement consists of n_e edges and they are in general position. Use a sweep argument to show that the vertical decomposition consists of $3n_e+1$ trapezoids.
3. Relax the conditions for a trapezoid and show that the upper bound of $3n_e+1$ trapezoids still holds for edges not being in general position.

Have fun with the solution!