6. Assignment on
Computational Geometry
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Due on 20. May 2013 in the tutorial session

Problem 1 Visibility Polygon

Let $P$ be a simple planar polygon with $n$ vertices. Let $x$ be a point inside $P$. The visibility polygon $\text{vis}_P(x)$ of $x$ is the set of all points $q$ in $P$ that are visible from $x$, i.e., the line segment $xq$ does not intersect the outside of $P$.

(a) Draw an interesting example of a simple polygon $P$ and visibility polygons for two points in $P$.

(b) Describe the structure of $\text{vis}_P(x)$. What are its vertices and edges?

(c) Suppose that we have a triangulation $T$ of $P$ available. Given a point $x$ inside $P$, show how to find $\text{vis}_P(x)$ in $O(n)$ time. You may make suitable general position assumptions.

Hint: The triangles in $T$ that intersect $\text{vis}_P(x)$ form a connected subgraph of the dual graph $T^*$.

Problem 2 LP – Lower Bound

Give an example that the deterministic incremental algorithm for two dimensional LP may take $\Omega(n^2)$ time.

Problem 3 Largest disk in a convex polygon.

Let $P$ be a convex polygon in the plane. We would like to compute a disk of maximum size that is enclosed in $P$. Formulate this problem as a linear program.