The Voronoi diagram is a powerful geometric object that has found lots of applications in different areas. Lots of generalizations of the Voronoi diagram have been studied, however, the higher-order Voronoi diagram of line segments has been still largely ignored in the literature. The goal is to fill the gap. We consider some of the most studied Voronoi diagrams (the nearest neighbor Voronoi diagram of points, the order-k Voronoi diagram of points, etc) and the farthest line segment Voronoi diagram, as the corner cases of the higher-order Voronoi diagram of line segments. And we investigate which of the properties of the corner cases can be generalized to the higher-order Voronoi diagram of line segments.

Applications

The order-k Voronoi diagram of line segments appears in the geometric min-cut problem that can model, among others, the VLSI critical area extraction problem. The special cases of the order-k Voronoi diagram of line segments are also used in the applications:

1) The nearest neighbor Voronoi diagram of line segments can be also applied to build a medial axis of a polygonal object.
2) The nearest neighbor Voronoi diagram of a set of objects can be applied in motion planning, to find a safe path for a moving object.
3) The nearest neighbor Voronoi diagram of a set of objects can be also applied in a growth prediction field.
4) If we treat endpoints and open-partitions as different sites, then the diagram remains the same.
5) Has a relation with arrangements and convex hulls.

Definitions

The nearest neighbor Voronoi diagram of a set of objects S in the plane, called sites, is a partitioning of the plane into regions, such that the Voronoi region of a site s is the locus of points closer to s than to any other site.

The Delaunay triangulation of the point set S is a triangulation of S such that no point of S is inside the circumcircle of any triangle, where triangulation is a subdivision of the convex hull of points S into triangles.

References