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Rectilinear Convex Hull of a Set of Points in 2D

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In this talk we review the last progress done in the computation of the *rectilinear convex hull* of a set S of n points in the plane in general position, $\mathcal{RCH}(\mathcal{S})$ for short. Since the $\mathcal{RCH}(\mathcal{S})$ is orientation dependent, we show recent optimal algorithms for computing and maintaining $\mathcal{RCH}(\mathcal{S})$ for a complete rotation of the coordinate system in $O(n \log n)$ time and $O(n)$ space. We also show optimal algorithms for computing the rotation angle α such that once we have rotated the coordinate axes by angle α the area of $\mathcal{RCH}(\mathcal{S})$ is maxima; this algorithm runs also in $O(n \log n)$ time and $O(n)$ space. Moreover, we will illustrate some statistical applications for computing the fitting of a two-joint orthogonal chain to a set of points (cf. [1, 4]).

We show how to extend the notion of *rectilinear convex hull* to the *oriented hull* of a point set S by considering two non-orthogonal directions, and also for k directions where $k > 2$ (cf. [2, 3]). Finally, we consider the computation of the un-oriented rectilinear convex layers (cf. [5]) and the computation of the orientation of the coordinate system such that the number of rectilinear layers is minimum. Some 3D open questions will be illustrated.

References

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