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A fast and efficient algorithm for determining the connected orthogonal convex hulls.

Summary: The Quickhull algorithm for determining the convex hull of a finite set of points was independently conducted by W. F. Eddy [ACM Trans. Math. Softw. 3, 398–403 (1977; Zbl 0374.68036)] and A. Bykat [Inf. Process. Lett. 7, 296–298 (1978; Zbl 0392.52002)]. Inspired by the idea of this algorithm, we present a new efficient algorithm, for determining the connected orthogonal convex hull of a finite set of points through extreme points of the hull, that still keeps advantages of the Quickhull algorithm. Consequently, our algorithm runs faster than the others (the algorithms introduced by Montuno and Fournier [Finding x-y convex hull a set of x-y polygons, Tech. Rep., Univ. of Toronto (1982)] and by P. T. An et al. [Appl. Math. Comput. 397, Article ID 125889, 16 p. (2021; Zbl 07422768)]. We also show that the expected complexity of the algorithm is $O(n \log n)$, where $n$ is the number of points.

MSC:
52A30 Variants of convex sets (star-shaped, (m, n)-convex, etc.)
52B55 Computational aspects related to convexity
68Q25 Analysis of algorithms and problem complexity
65D18 Numerical aspects of computer graphics, image analysis, and computational geometry

Keywords:
orthogonal convex hulls; quickhull algorithm; orthogonal convex sets; orthogonal polygons; x-y convex hulls; extreme points

Full Text: DOI

References: