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Approximating generalized distance functions on weighted triangulated surfaces with applications

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Given P, a simple connected, possibly non-convex, polyhedral surface composed of positively weighted triangular faces, we consider paths from generalized sources (points, segments, polygonal chains or polygonal regions) to points on P that stay on P and avoid obstacles (segments, polygonal chains or polygonal regions). The distance function defined by a generalized source is a function that assigns to each point of P the cost of the shortest path from the source to the point. In this paper we present an algorithm for computing approximate generalized distance functions. We also provide an algorithm that computes a discrete representation of the approximate distance function and, as applications, algorithms for computing discrete order-k Voronoi diagrams and for approximately solving facility location problems. Finally, we present experimental results obtained with our implementation of the provided algorithms.

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