

Abstract

Computing the Delaunay triangulation (DT) of a given point set in \mathbb{R}^D is one of the fundamental operations in computational geometry. In this paper we present a novel divide-and-conquer (DAC) algorithm that lends itself equally well to shared and distributed memory parallelism. While previous DAC algorithms generally suffer from a complex – often sequential – merge or divide step, we reduce the merging of two partial triangulations to re-triangulating a small subset of their vertices using the same parallel algorithm and combining the three triangulations via parallel hash table lookups. In experiments we achieve a reasonable speedup on shared memory machines and compare favorably to CGAL’s three-dimensional parallel DT implementation on some inputs. In the distributed memory setting we show that our approach scales to 2048 processing elements, which allows us to compute 3-D DTs for inputs with billions of points.