October 2012

MADALGO seminar by Bryan Wilkinson, Aarhus University

Adaptive and Approximate Orthogonal Range Counting

Abstract:

We present new results on one of the most basic problems in geometric data structures, 2-D orthogonal range counting. All of our data structures operate under the w-bit word RAM model.

It is well known that there are linear-space data structures for 2-D orthogonal range counting with worst-case optimal query time O(log_w n).

We give an O(n loglog n)-space adaptive data structure that improves the query time to O(loglog n + log_w k), where k is the output count. When k = O(1), our bounds match the state of the art for the 2-D orthogonal range emptiness problem [Chan, Larsen, and Pătraşcu, SoCG 2011].

We give an O(n loglog n)-space data structure for approximate 2-D orthogonal range counting that can compute a (1 + delta)-factor approximation to the count in O(loglog n) time for any fixed constant delta > 0. Again, our bounds match the state of the art for the 2-D orthogonal range emptiness problem.

Joint work with Timothy M. Chan, University of Waterloo