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MADALGO seminar by Kostas Tsakalidis, Aarhus University

Dynamic 3-sided Planar Range Queries with Expected Doubly Logarithmic Time

Abstract:

We consider the problem of maintaining dynamically a set of points in the plane and supporting range queries of the type $[a,b] \times (-\infty, c]$. We assume that the inserted points have their x -coordinates drawn from a class of *smooth* distributions, whereas the y -coordinates are arbitrarily distributed. The points to be deleted are selected uniformly at random among the inserted points.

For the RAM model, we present a linear space data structure that supports queries in $O(\log \log n + t)$ expected time with high probability and updates in $O(\log \log n)$ expected amortized time, where n is the number of points stored and t is the size of the output of the query.

For the I/O model we support queries in $O(\log \log_B n + t/B)$ expected I/Os with high probability and updates in $O(\log_B \log n)$ expected amortized I/Os using linear space, where B is the disk block size.

The data structures are deterministic and the expectation is with respect to the input distribution.

Joint work with: G.S. Brodal, A. Kaporis, S. Sioutas, K. Tsichlas