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MADALGO seminar by Freek van Walderveen, Aarhus University

Cleaning massive sonar point clouds

Abstract:

Due to recent advances in echo-sounder technology, hydrographers can now obtain up to 2.2 billion soundings a day using a single multibeam echo sounder. Apart from the seabed and interesting features on it (such as pipelines), such data sets often also contain a lot of noise appearing as a result of scans of (shoals of) fish, multiple reflections, scanner self-reflections, refraction in gas bubbles, and so on.

In this talk I consider the problem of automatically removing noisy points (cleaning) of massive sonar data point clouds. Existing cleaning methods are mostly based on considering data in a local neighborhood around a point to decide if it is noise or not. Therefore they often fail to recognize large clusters of noisy points. I will describe a new algorithm that avoids the problems of local-neighborhood based algorithms and which therefore can identify large clusters of noisy points. The algorithm is theoretically I/O-efficient, but also relatively simple and thus practically efficient, partly due to the development of a new simple algorithm for computing the connected components of a graph embedded in the plane. The connected component algorithm is theoretically I/O-optimal under a practically realistic assumption about the input graph, and we believe it is of independent interest.

I will conclude with an extensive discussion of possible future directions and open problems related to our cleaning approach.

Joint work with: Lars Arge, Kasper Dalgaard Larsen, and Thomas Mølhave.