Cuttings in 2D Revisited

Timothy M. Chan*

Given n lines in the plane, a $(1/r)$-*cutting* is a subdivision of the plane into cells such that each cell intersects at most n/r lines. Cuttings are fundamental to the design of geometric divide-and-conquer algorithms and have numerous applications. Early suboptimal constructions of cuttings were given implicitly in the works by Megiddo and by Dyer in the 80s; simple randomized constructions were later discovered by Clarkson and by Haussler and Welzl; subsequently deterministic algorithms were given by Chazelle and Friedman, by Matoušek, and by Agarwal; eventually $O(nr)$-time deterministic algorithms to construct $(1/r)$-cuttings of optimal $O(r^2)$ size were obtained by Matoušek and by Chazelle in the early 90s. In this talk, I will survey some of these past works. I will also give a self-contained presentation of an $O(nr)$-time deterministic algorithm in 2D which does not require any background on derandomization techniques and which (I hope) is easy to understand.

(Based on joint work with Konstantinos Tsakalidis.)

*Cheriton School of Computer Science, University of Waterloo, tmchan@uwaterloo.ca