Accepted paper with abstract, SoCG'09

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Halving Lines and Measure Concentration in the Plane

Given a set P of n points in the plane and a collection of k halving lines of P $l_1,\ldots, l_k$, indexed according to the increasing order of their slopes, we denote by $d(l_j, l_{j+1})$ the number of points in P that lie above l_{j+1} and below l_j. We prove an upper bound of $O(nk^{1/3})$ for the sum $\sum_{j=1..k-1} d(l_j, l_{j+1})$. We show how this problem is related to the halving lines problem and provide several consequences about measure concentration in $\Re^2$.