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Near-Linear Approximation Algorithms for Geometric Hitting Sets

Given a set system $(X,\mathfrak{R})$, the *hitting set* problem is to find a smallest-cardinality subset $H \subseteq X$, with the property that each range $R \in \mathfrak{R}$ has a non-empty intersection with H. We present near-linear time approximation algorithms for the hitting set problem, under the following geometric settings: (i) $\mathfrak{R}$ is a set of planar regions with small union complexity. (ii) $\mathfrak{R}$ is a set of axis-parallel d-rectangles in d-space. In both cases X is either the entire d-dimensional space or a finite set of points in d-space. The approximation factors yielded by the algorithm are small; they are either the same as or within an $O(\log n)$ factor of the best factors known to be computable in polynomial time.