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MADALGO seminar by Jeff M. Phillips, Duke University

Creating ε-Samples for Terrains

Consider a point set *D* with a measure function $\mu : D \rightarrow R$. Let *A* be the set of subsets of *D* induced by containment in a shape from some geometric family (e.g. axis-aligned rectangles, half planes, balls, k- oriented polygons). We say a range space (*D, A*) has an ε-sample (a.k.a. ε-approximation) *P* if

$$\max_{R \in A} |\mu(R \cap P) / \mu(P)| - |\mu(R \cap D) / \mu(D)| \leq \varepsilon .$$

We describe algorithms for deterministically constructing discrete *ε*- samples for continuous point sets such as distributions or terrains.
Furthermore, for certain families of subsets *A*, such as those described by axis-aligned rectangles, we reduce the size of the ε- samples by almost a square root from $O(1/\varepsilon^2 \log 1/\varepsilon)$ to $O(1/\varepsilon \text{ polylog } 1/\varepsilon)$. This is often the first step in transforming a continuous problem into a discrete one for which combinatorial techniques can be applied. I will describe applications of this result in geo-spatial analysis, biosurveillance, and sensor networks.