Geometry Seminar
November 12, 2002, Tuesday, 6:00 p.m.
Room 613, Courant Institute
251 Mercer Street, New York

Distinct distances in higher dimensions

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Abstract

We consider the following question of P. Erdős: Given n points in d-space, at least how many of the $\binom{n}{2}$ pairwise distances are distinct?

While the planar problem is well studied, the higher dimensional case got less attention. In the 3-dimensional case (using an upper bound on the number of occurrences of the same distance) an approximately $n^{1/2}$ bound was known. We improve this bound to approximately $n^{77/141} = n^{0.546\cdots}$. For an upper bound construction, only the grid is known with $n^{2/3}4$ distinct distances.

We extend the 3-dimensional result to higher dimensions. Note that here no lower bound is possible using the pigeonhole principle, because the same distance can occur $n^2/4$ times.

Joint work with B. Aronov, J. Pach, and M. Sharir.

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