Geometry Seminar
September 11, 2007, Tuesday, 6:00 p.m.
Room 613, Courant Institute
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Points surrounding the origin

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Abstract

A planar point set P in general position with respect to the origin 0 is said to surround 0 if for every pair of points from P, there is a third one such that the triangle induced by them contains 0 in its interior. This property was explored by Lovász and others and is crucial in obtaining upper bounds on the number of halving-lines in planar point sets. In this talk we explore possible extensions of this property to dimension $d > 2$, and we will show how this property is related to Caratheodory's classical theorem from combinatorial convexity and convex polytopes with many facets.

Let $2 < d < n$ and let $P = \{p_0, \dots, p_n\}$ be a set of points in general position in $\mathbf{R}^d$, whose convex hull contains 0 in its interior. We show that there exists a d-tuple $Q = \{p_{i_1}, \dots, p_{i_d}\} \subset P$ such that 0 is not contained in the convex hull of $Q \cup \{p\}$ for any $p \in P$.

Joint work with J. Pach.

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