Geometry Seminar
May 3, 2005, Tuesday, 6:00 p.m.
Room 613, Courant Institute
251 Mercer Street, New York

On the Complexity of Pseudo-Circle Arrangements

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Abstract

How many edges can a simple graph on n vertices have if it can be drawn in the plane without a self-crossing cycle of length 4? How many tangencies can there be among n pseudo-circles (closed plane curves such that any two intersect at most twice)? How many cuts are needed to turn an arrangement of n pseudo-circles into an arrangement of pseudo-segments (curve-segments any two of which intersects at most once)?

The combinatorial problem in the core of the above questions (found by Pinchasi and Radoičić) is the following. Let us be given n subsets of a ground set of size n. Assume there is a cyclic order on each subset. Further assume that the cyclic orders on any two of the subsets yield reverse cyclic orders on the intersection. What is the maximum for the sum of the sizes of the subsets?

We prove an $O(n^{3/2} logn)$ bound on the combinatorial problem. This is tight except for the logarithmic factor. The results represent joint work with Adam Marcus.

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