Combinatorial Computing Seminar
April 2, 2008, Wednesday, 6:30 p.m.
Room 6417, CUNY Graduate Center
365 Fifth Avenue

Weak epsilon nets, Davenport-Schinzel sequences, and other recent surprizes

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Abstract

In this talk I will tell the story of several recent interwoven results, most of which obtained by my student Gabriel Nivasch. It began with a study of weak epsilon-nets for convex sets, for point sets in convex position in the plane, and for point sets along the moment curve in d-space. The problem was solved by a reduction to a purely combinatorial problem, interesting in its own right, of stabbing interval k-chains by j-tuples. We have obtained sharp upper and lower bounds for the latter problem, which involve functions from the inverse Ackermann hierarchy, and which look suspiciously similar to (and very slightly better than) the known bounds for the maximum length of Davenport-Schinzel sequences. This has led us to conjecture improved bounds for DS-sequences, and we have launched an attempt to improve these bounds, which has been (partially) successful.

Meanwhile, the bounds for weak epsilon-nets and stabbing interval chains extend known bounds for several other (unrelated?!) problems: Answering partial-sum queries, right rotations in trees, and more. In an attempt to unify these problems, we found a reformulation of one of them in terms of Davenport-Schinzel sequences (but not of the others, yet...). This has led to a new view of DS-sequences, and subsequently to a new proof of the upper bounds on their length. The proof was made easy by pulling the off-the-shelf machinery that we have already developed for the interval chains problem (put on the shelf by us a year ago...). And, to top it all, I will also report on a simplified lower bound construction of DS-sequences of even order.

Joint work with Noga Alon, Haim Kaplan, Shakhar Smorodinsky, and, mainly, with / by Gabriel Nivasch.