Combinatorics Seminar

Wednesday March 18th, 2015
3:50 PM-4:50 PM in Hume 201

Subtending many angles with few points

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ABSTRACT Suppose that $d \geq 2$ and n are fixed, and that $\theta_1, \theta_2, \ldots, \theta_n$ are n specified angles. How many points do we need to place in $\mathbb{R}^d$ to realize all of these angles by triples of these points? A simple degrees of freedom argument shows that m points in $\mathbb{R}^2$ cannot realize more than $2m-4$ general angles. We give a construction to show that this bound is sharp when $m \geq 5$.

In d dimensions the degrees of freedom argument gives an upper bound of $dm - \binom{d+1}{2} - 1$ general angles. However, the above result does not generalize to this case; surprisingly, the bound of $2m-4$ from two dimensions cannot be improved at all: there are sets of $2m-3$ of angles that cannot be realized by m points in any dimension.

Joint work with Béla Bollobás, Zoltán Füredi, Imre Leader, and Mark Walters.