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MATHEMATICS COLLOQUIUM SERIES

03/02/05 Colloquium

Dr. Jeong-Hyun Kang
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will speak on:
Coloring and Covering of Metric Spaces

A long-standing open problem in combinatorial geometry is the chromatic number of the unit-distance graph in \mathbf{R}^n ; here points are adjacent if their distance in the ℓ_2 -norm is 1. For $n = 2$, we know the answer is between 4 and 7. Little is known about higher dimensions. We generalize the problem to ℓ_p -norm. In this talk, we prove a lower bound of $(1.2)^n$ and three upper bounds $\sqrt{p/(2\pi n)}(5(\epsilon p)^{1/p})^n$, 9^n and $c(n \ln n)5^n$ on the chromatic number. The three upper bounds are proved using partitions of the n -space, a sphere packing argument, and a covering of the n -space by translates of a convex body, respectively.

The covering argument in the third upper bound uses a theorem of Erdős and Rogers [1962]. More precisely, for sufficiently large n , there is a covering of \mathbf{R}^n by translates of C such that each point in \mathbf{R}^n is covered by at most $O(n \ln n)$ copies of C . In this talk, we give a combinatorial proof of this using the Lovasz Local Lemma from probabilistic combinatorics.

Dr. Kang received the Ph.D. in Mathematics from the University of Illinois at Urbana-Champaign in Summer, 2004. Currently she is a visiting postdoctoral fellow at UCF. Her research interests include combinatorics, graph theory and combinatorial geometry.

DATE: Wednesday, March 2, 2005
TIME: 10:30 – 11:30 AM
PLACE: Math and Physics Building, Room 233