Seminar on Combinatorial Computing
October 3, Wednesday, 6:30 p.m.
Room 6417, Graduate Center
365 Fifth Avenue, New York

Searching a target in a grid graph

Peter Brass
City College/CUNY

Abstract

Consider a target that moves in a given graph, how many searchers, moving at the same speed as the target, do we need to catch it? The minimal number of searchers that are sufficient to catch any target was first studied by T.D. Pearsons in 1978, who defined the 'search number' of a graph. Recently, the same problem appeared for the $n \times n$ grid graph as offline 'Lion and Man' problem in a paper by Dumitrescu, Suzuki and Zylinski. They showed that $c\sqrt{n}$ searchers are not enough to always catch the target, but n searchers are enough, sweeping the grid by a row of searchers. We show that $n/2$ searchers are not enough, and in a very similar model, when searchers and target move alternatingly, instead of simultaneously, we find the exact minimum number of required searchers: $\left\lfloor \frac{1}{2}n \right\rfloor$ searchers are not enough, and there is a search strategy with $\left\lfloor \frac{1}{2}n \right\rfloor + 1$ searchers that catches any target. We show a connection of this problem to a discrete isoperimetric theorem for subsets of the grid graph.

This is a joint work with Kyue D. Kim, Hyeon-Suk Na, and Chan-Su Shin.

For further information contact János Pach at pach@cims.nyu.edu,
or visit our website
http://www.math.nyu.edu/∼pach/public_html/combinatorics_seminar.html