Seminar on Combinatorial Computing
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Room 6417, Graduate Center
365 Fifth Avenue, New York

A generalization of magic squares with applications to digital halftoning

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Abstract

A *semimagic square* of order n is an $n \times n$ matrix containing the integers $0, \ldots, n^2 - 1$ arranged in such a way that each row and column add up to the same value. We generalize this notion to that of a *zero-k-by-k-discrepancy matrix* by replacing the requirement that the sum of each row and each column be the same by that of requiring that the sum of the entries in each $k \times k$ square contiguous submatrix be the same. We show that such matrices exist if k and n are both even, and do not if k and n are are relatively prime. Further, the existence is also guaranteed whenever $n = km$, for some integers $k, m > 1$. We present a space-efficient algorithm for constructing such a matrix. Another class that we call constant-gap matrices arises in application to digital halftoning is also mentioned.

Joint work with Tetsuo Asano, Yosuke Kikuchi, Subhas C. Nandy, Shinji Sasahara, and Takeaki Uno.

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http://www.math.nyu.edu/p̃ach/public_html/combinatorics_seminar.html