Seminar on Combinatorial Computing
September 22, Wednesday, 6:30 p.m.
Room 6417, Graduate Center
365 Fifth Avenue, New York

Generalized de Bruijn Cycles

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Abstract

A (binary) de Bruijn cycle of order k is a cyclic string of 0's and 1's so that a sliding "window" of length k will see every binary k-word exactly once. It is classical that such strings exist for every k, even for alphabets with more than two symbols. If we change the "window" from $\{1, 2, \ldots, k\}$ to another set W of cardinality k, then we may ask whether there exists a q-ary string S of length q^k with the same property: that, when restricted to the indices $W + r$ modulo q^k for each r from 0 to $q^k - 1$, S yields every possible k-tuple exactly once. It turns out that this problem is surprisingly difficult, and only the case of $k = 2$ has been settled completely. We present the proof of this result and discuss several related questions, including the issue of finding bounds on the shortest string which, for a given window, yields every k-tuple at least once.

Joint work with Ron Graham.

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or visit our website
http://www.math.nyu.edu/p̃ach/public_html/combinatorics_seminar.html