LUCIA MOURA, University of Ottawa

New families of strength-3 covering arrays using LFSR sequences

A *covering array* of strength t, denoted by CA$(N; t, k, v)$, is an $N \times k$ array C over an alphabet with v symbols with the property that for any subarray consisting of t columns of C, every t-tuple of the alphabet appears at least once as a row of the subarray. An additional parameter λ is used when we require that every t-tuple of the alphabet appears at least λ times as a row of the subarray. An *orthogonal array* is a special case of a covering array, where each t-tuple appears exactly λ times, so in this case $N = \lambda v^t$. Given t, k, v, we aim to determine CAN(t, k, v) which is the minimum N for which a CA$(N; t, k, v)$ exists. This is a hard problem in general, so we seek good upper bounds for CAN.

Raaphorst, Moura and Stevens (DCC 2014) gave a construction for a CA$(2q^3 - 1; 3, q^2 + q + 1, q)$, for every prime power q, using linear feedback shift register (LFSR) sequences over finite fields. In the present work (to appear in the Journal of Combinatorial Designs), we explore the use of this "good" ingredient to build covering arrays of strength 3 with a larger number of columns via recursive constructions and elimination of redundant rows. Several of these covering arrays improve the best upper bounds currently found in Colbourn's covering array tables. This is joint work with Kianoosh Shokri.