KIANOOSH SHOKRI, University of Ottawa

Improving upper bounds on the size of some covering arrays of strength 3

A Covering array $CA(N; t, k, v)$ is an $N \times k$ array over an alphabet with v symbols with the property that for any t arbitrary columns, all t-tuples from the alphabet occurs at least once as a row. The objective is to minimize N, which is the size of the covering array, for given t, k, and v. We employ $CA(2q^3 - 1; 3, q^2 + q + 1, q)$ constructed by Raaphorst, Moura, and Stevens (2014) based on linear feedback shift register (LFSR) sequences in finite fields as the main ingredients of the generalized "Roux-type" constructions. By using various properties of covering arrays constructed by LFSR sequences, we improve the size of some CAs of strength 3 compared to the best-known CAs provided in the online covering array tables maintained by Colbourn. In particular, we construct $CA(2q^3 + (q-2)(2q^2 - q); 3, 2(q^2 + q + 1), q)$, $CA(2q^3 + (q-2)(2q^2 - q) + q^3 - q^2; 3, q(q^2 + q + 1), q)$, $CA(8q^3 - 10q^2 + 4q - 1; 3, q^2(q^2 + q + 1), q)$, and $CA(8q^3 - 10q^2 + 3q; 3, (q^2 - q + 1)(q^2 + q + 1), q)$ for any prime power q, and $CA(8q^3 - 10q^2 + 3q; 3, q^2(q^2 + q + 1), q)$ for even prime power q. This is joint work with Lucia Moura.