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Ordered orthognal arrays, LFSRs and hypergraph homomorphisms

We present a new construction of strength-t ordered orthogonal arrays (OOA) with $(q+1)t$ columns over a finite field $\mathbb{F}_q$ using linear feedback shift registers sequences (LFSRs). OOAs are the combinatorial analogue of (t, m, s)-nets. Our construction selects suitable columns from the circulant array formed from an LFSR sequence determined by a primitive polynomial of degree t. We prove properties about the relative positions of runs in the LFSR which establish the OOA properties. The set of parameters of our OOAs are the same as the ones given by Rosenbloom and Tsfasman (1997) and Skriganov (2002), but the constructed arrays are different: our OOAs cover many more t-sets of columns than the Rosenbloom-Tsfasman-Skriganov OOAs. We also discuss this construction from the point of view of hypergraph homomorphisms.