

Constructions of complementary sequences from 2-level autocorrelation sequences, and permutation polynomials*

Guang Gong
University of Waterloo, Canada
Email: ggong@uwaterloo.ca

Abstract

In this talk, I will present our new work on constructions of complementary sequence sets and complete complementary codes from 2-level autocorrelation sequences and permutation polynomials. In general, the known constructions of Golay pairs and complementary sequence sets (CSS) can be classified into two classes. One is directly to start with boolean/multivariate functions, and the second method is to start with unitary matrices with polynomial entries, the so-called PU matrix method.

For the later, we have obtained an earlier result for which a seed PU matrix can be obtained by succeedingly multiplying the product of a Butson-type Hadamard matrix and a diagonal matrix. So how to extract the explicit forms of the functions from the seed PU matrices is converted to find explicit forms of the representatives in the equivalent class of Butson-type Hadamard (BH) matrices, called delta-quadratic forms. Using this method, all known CSSs can be explained as special cases of this construction.

Now by taking the algebraic structure of Butson-type Hadamard matrices into consideration, we are able to determine the delta-linear terms and delta-quadratic terms. Along this way, we have discovered an extremely fascinating hidden connection between the sequences in CSSs and the sequences with 2-level autocorrelation, through the trace function and permutation polynomials over finite fields, which are two completely separate fields in the literature for more than 7 decades.

*Joint work with Zilong Wang