Abstract

In a networking environment, interference for detecting CDMA signals is not only resulted from signals within one signal set, but also from several different signal sets when users are allowed to roam to different geographical areas. This type of interference is referred to as *intraference* among these signal sets, i.e., correlation among the signal sets.

In this paper, we first provide a mathematical formalization for this concept, and exhibit the fact that constructing a family of binary signal sets with low maximum correlation is equivalent to constructing a binary signal set with larger size and low maximum correlation, which can be easily decomposed into a family of signal sets. We then derive a general formula for 0-1 distributions of the so-called one-shot sequences which has important applications in calculation of correlation functions among signal sets. Thirdly, we give constructions for three families of binary signal sets with low maximum correlation using three common signal sets: Kasami (small) signal sets (or generalized Kasami signals sets), interleaved signal sets, and bent function signal sets. We show that the family of m Kasami signal sets satisfies the mth-order shift-distinct property, which is a new concept introduced in this paper.

The other interesting findings here are that (1) the maximum correlation of the enlarged interleaved signal set is comparable with the original interleaved signal set while the size is greater than the square of that of the original interleaved signal set, and (2) the maximum correlation of the enlarged bent function signal sets maintains the same maximum correlation as that of the original bent function signal set while the size is slightly smaller than the square of that of the original bent function signal set. Thus, the enlarged bent function signal set is the best among all known constructions of binary signal sets in terms of the sizes and maximum correlations.